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Organized By

Department Of Mechanical Engineering

AMRITSAR COLLEGE OF ENGINEERING & TECHNOLOGY

NBA Accredited | NAAC Accredited

National Conference

On

Latest Developments in Science, Engineering and Management

(LDSEM-2014)

March 28-29, 2014

Chief Editors

Gaurav Tejpal

Amandeep Singh Bhui

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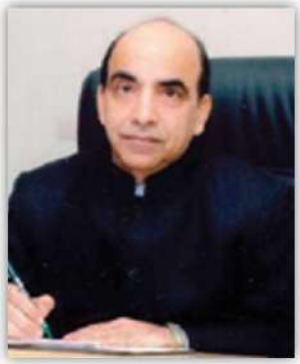

Message

It gives me immense pleasure to witness a major milestone for us all – the publication of the Proceedings of the "National Conference on Latest Developments in Science, Engineering and Management" organized by the Department of Mechanical Engineering, ACET Amritsar.

Research in all the fields of Engineering and Technology has to be undertaken earnestly, with the objective of original findings in new realms. I am particularly happy to know that Department of Mechanical Engineering of ACET, Amritsar is carrying forward the legacy of PTU by organizing such an event with a clear agenda for researchers to provide solutions to the myriad of problems in the field of Science, Engineering and Management that continue afflicting the Industries & Society.

I am sure that the Conference will not only provide a useful forum to the participants to share their expertise in their respective fields but will also be professionally beneficial to them. The Conference is being held in Amritsar, which is the place of spiritual importance in Punjab and I hope the delegates will have a comfortable stay and they will enjoy the traditional hospitality offered by the Institute.

I compliment the organizers of LDSEM-2014 for holding this event and wish all success to the conference.

Dr. Rajnish Arora
Vice Chancellor
Punjab Technical University
Kapurthala

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Message

I am glad to know that a National Level Conference on "Latest Developments in Science, Engineering and Management (LDSEM-2014)" is being organized by Department of Mechanical Engineering of Amritsar College of Engineering and Technology on March 28-29, 2014.

This is indicative of the achievements of the team concerned not only in academics but also in various other fields such as research and developments, extracurricular activities, project developments and the list is much more long.

Technology in world is going through a tremendous flux. The Conference aims at bringing together Researchers, Scientists, Academicians and many others to interact and exchange their experiences, which in turn would help the students and faculty to gain immensely at the Professional front. I believe that the conference will serve its objectives and will provide the necessary impetus in setting forth a dynamic process of continuous interaction amongst the researchers, teachers and professionals of the country.

I also take the opportunity to congratulate the Department of Mechanical Engineering for organizing this event and convey my greetings to the organizers and wish a grand success in the endeavor for the event.

Advocate Amit Sharma
Chairman & CEO
ACET Amritsar

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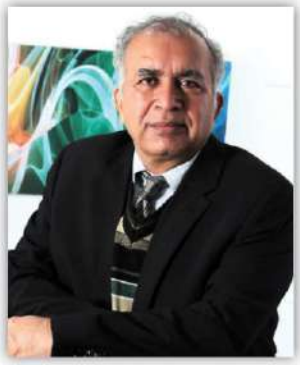

Message

It gives me immense pleasure to note that a National Level Conference on "Latest Developments in Science, Engineering and Management (LDSEM-2014)" is being organized by Department of Mechanical Engineering of Amritsar College of Engineering and Technology on March 28-29, 2014. It is a timely step in sharing new innovations and transmitting the same to its consumers at a very fast pace. Learning is a continuous and unending process and such conferences unveil the treasure of knowledge. It creates the talent, creativeness and professional skills of an individual.

This Conference will spread the light of awareness about the latest and upcoming fields and research areas in Engineering and Technology. While praying for the institute to accomplish its mission, I send my best wishes and congratulate the students and the staff of the department for organizing this event.

I am very confident that, we all are going to gain a highly rewarding and learning experience through this conference. I further extend warm wishes and good luck to this endeavor.

I on behalf of ACET, Amritsar wish all academicians and professionals for fruitful interaction and future direction in this significant field. I congratulate the Department of Mechanical Engineering for organizing this Conference.

Dr. Om Kumar Harsh
Group Director
ACET Amritsar

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Message

On Behalf of Amritsar College of Engineering and Technology, I welcome all the participants to National Level Conference on "Latest Developments in Science, Engineering and Management (LDSEM-2014)".

The main aim of our Institute is to educate young minds to be equipped for the future challenges. Our mission is to groom students in accordance with latest Technologies. I am proud to say that our Institute is working tirelessly to make students ready to march towards these challenges. I wish that this conference would serve our agenda for improvements in our teaching curriculum so that students successfully match the market requirements in the global scenario.

I am sure that this conference will pave the way for providing a forum to the researchers, academicians and students to express their innovative and creative research skills. This event will spread the light of awareness about the latest and upcoming fields and research areas in Engineering and Technology.

I pray for the institute to accomplish its mission. I congratulate the students and the staff of the department for organizing this event. I also wish that such events should be a routine feature.

Dr. V.K. Banga
Principal

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Message

It is a matter of great pleasure for me that Department of Mechanical Engineering of our college is organizing a National Conference on "Latest Developments in Science, Engineering and Management (LDSEM-2014)" on March 28-29, 2014.

It is outcome of indeterminable efforts put by the organizers in planned manner within a stipulated period. This conference is an effort to meet the surging technological challenges in topical themes and areas of Science, Engineering, Management & other related areas, which is very important for national development.

The Conference will provide the ideal forum to stimulate ideas and establish collaborations and to initiate intense discussions about latest developments in the area of Science and Technology. It is not an easy job for the organizers of this national conference of such a magnitude, and I would like to thank all the members of the organizing committee for their hard work.

I wish the conference a great success.

Dr. H.S. Gill
Principal, ACHMT

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Message

I feel Proud that the Department of Mechanical Engineering is organizing a National Level Conference on "Latest Developments in Science, Engineering and Management (LDSEM-2014)" on March 28-29, 2014.

In today's era new developments are occurring almost on daily basis. These developments are changing the shape of the society. Considering the fast pace of globalization and dynamic nature of Trends in Science, Engineering and Management, the need of the hour is to provide a platform where experts on respective subjects may share the latest developments and trends.

The conference received an overwhelming response from various professionals across the country. We have received around 120 papers covering various areas of Science, Engineering, Management and other related topics. The papers received in this conference have been reviewed by reviewer committee and editorial board depending upon the subject matter of the paper. After the review process, the submitted papers were selected on the basis of originality, significance, clarity for the objective of the conference.

I am confident that the deliberations during the Conference will enrich all the participants in particular and institute in general. This will become an occasion for academicians, professionals, researchers and students to acquire latest knowledge in their respective fields.

I hope that the sincere efforts, zeal and vigor of the members of Mechanical Engineering Department of ACET would be prolific enough in making this event a grand accomplishment.

I wish this Conference a grand success.

Gaurav Tejpal
Organising Secretary
LDSEM-2014

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Message

It is a matter of great pleasure for me that our department is organizing a National Level Conference on "Latest Developments in Science, Engineering and Management (LDSEM-2014)" on March 28-29, 2014. This Conference is going to be an important event in the process of unfolding many new ideas.

This Conference aims at exploiting the ideas through enlightened deliberations and their fruitful implementation both in industries and academics curricular activities. Experts will deliver keynote lectures during the conference for value addition to the professional skills of conference delegates.

I believe that organizing such events is a must for enabling professionals, scientists, scholars and educators to analyze the future needs and to keep themselves updated with the latest advances in the field of science and technology. This event too is an effort to meet the surging technological challenges in Research & Development areas, which is very important for National development.

I also take the opportunity to thank the Management, Principal and staff of ACET for their encouragement and continuous support without which this event would not have taken shape.

I extend my personal kudos to the all organizers of this National Conference and wish them to make this Conference and event, very hard to forget and long to cherish.

Best Wishes.

Amandeep S. Bhui
Convener
LDSEM-2014

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Message

The urge to look for Advancements in Research and Experimental Techniques today is felt in almost every domain of Science, Engineering and Management. Different spheres of Engineering starting from makers and suppliers around the world increasingly rely on research and experimental studies, for both component and systems level analysis. They can't move the product to the market without experimentation.

National Conference on "Latest Developments in Science, Engineering, and Management (LDSEM – 2014)" is a platform where research scientists and practicing engineers can share their experiences and ideas. The plenary sessions incorporating presentations and discussions by experts will certainly create awareness of the intricacies of the subject among the professionals, technologists' and research scholars.

It would be a matter of great satisfaction, not only to the organizers but the whole research community in the country, if some useful thoughts and directions for prospective developments can come out of the deliberations of the conference.

As you all know organizing a conference is a large task. I have been able to accomplish this with the will and cooperation of my numerous colleagues and seniors of ACET. I would like to express my gratitude to all those who have contributed towards this. I am thankful to all the authors whose papers are accommodated in the proceedings of the conference and also to those who could not find space. I hope they will understand my predicament.

We would like to make this conference a memorable event by offering sufficient opportunities and hope that you will enjoy the hospitality.

Amandeep Sharma
Convener
LDSEM-2014

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Impact of Information Technology on Supply Chain Partners Relationship in Indian Industries

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Abstract—**Objective- The main objective of this paper is to examine the impact of information technology (IT) on the buyer-supplier relationship, second to judge the level of the usage of IT in Indian Industries, third to analyze the level of benefit of Information Technology; and finally to develop a context-dependent, and multilevel concept called 'Usage of IT' at different nodes among supply chain members. The field related to usage of Information Technology among supply chain partners has historically been collected through studies in micro functional areas. While some effort towards producing a broader organizational perspective has been made, nonetheless, IT in SCM continues to be largely eclectic with little consensus on its conceptualization and research methodological bases. This paper seeks to clarify aspects of this emerging perspective.**

Design/methodology/approach – A total of 117 responses of questionnaire were collected and analyzed.

Findings – A number of key findings emerged: Although researchers have recognized that IT is an enabler of supply chain management (SCM) activities, there has been limited research that has directly, associated the usage of IT to partner relationships; usage of IT is very well correlated to partners relationship; usage of IT, in operations & in delivery affect the vendor relationship, the most; Applying multiple regression analysis, the study indicated that a higher level of usage of IT in supply chain leads to better relationship among partners of supply chain. This research is essential in order to ascertain the impact of usage of IT to vendor relationships, particularly in the Indian industry.

Practical implications – This paper proposes a model that assesses the usage of information technology (IT) tools at three different nodes sourcing, operations, delivery, its impact to the vendor relationships, and level of usage to the level of benefit in the SCM in the Indian industry.

Originality/value – This paper is one of the first to focus on the level of usage of IT in sourcing, in operations, and in delivery for partners relationship in supply chain across Indian Industries.

Keywords— **Supply chain management, Information Technology, vendor relationship, level of benefit.**

I. Introduction

During the past ten years, use of information technology in supply chain management has attracted much attention from both practitioners and researchers. As the use of information technology has increased, firms tend to become more integrated. Therefore, integrating effective supply chain practice with effective information sharing becomes critical for improving relationship among supply chain partners'. Supply chain practice focuses on material movement (Chopra and Meindl, 2001), while information technology focuses on information flow (Premkumar and William, 1994). In this study, use of information technology in three different functions of supply chain practice have been considered: supply chain, sourcing, production and delivery practice. Buyer-supplier relationship is another focus of this study. Information technology has had remarkable impact on supply chain practice. This study focuses on all three aspects for the use of information technology in sourcing, production/operations, and delivery, along with the level of benefit to supply chain in terms of better buyer-supplier relationship.

The purpose of this study is to investigate (1) the relationship between the use of information technology in sourcing, operations and delivery and buyer supplier relationship, (2) the relationship between the level of usage of IT to the level of benefit to the supply chain, (3) the impact of information technology on buyer-supplier relationship, (4) to judge the level of the usage of IT in Indian Industries, and (5) to develop a context-dependent, and multilevel concept called 'Usage of IT' at different nodes among supply chain members. The next section covers, review of literature for different tools used for IT, usage of IT in supply chains and hypothesis formulation. In Section 3, the research methodology and measurement scale development are presented. In Section 4, the results of testing the relationship among use of IT in sourcing, operations and delivery and vendor relationship, level of usage of IT in supply chain and its benefit are given. Section 5, 6 and 7 provides the discussion, managerial implications & limitations of the study. Finally, Section 8 highlights the conclusions of the study.

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II. Literature Review

A. Usage of IT Tools

Use of IT is defined as IT used to facilitate SCM practices (Li, 2002). In this study, usage of IT is defined as the use of IT to facilitate inter-organization activities, because this study focuses on the buyer-supplier relationship. Many researchers have extensively examined the role and impact of specific types of IT tools in the supply chain field (Lee & Whang 2001; Sanders, 2005).

The common IT tools, which are being used in managing a supply chain, are: Electronic Data Interchange (EDI), Supplier relationship management (SRM), Internet & Extranet, Distribution Requirement Planning (DRP), Data Warehouse (DW).

1) Electronic Data Interchange (EDI)

EDI enables the transfer of data in an agreed electronic format, such as invoices, bills, and purchase orders between companies. Cited the benefits of EDI from literature are implementation as quick access to Information & better customer service. EDI improves performance of supply chain through enhancing supplier delivery performance, (Lee & Whang 2001). Yu, Yan, and Cheng (2001), found that using EDI to support a Vendor-Managed Inventory (VMI) strategy not only eliminates the bullwhip effect but also enhances the overall performance of the supply chain. VMI is an inventory planning and fulfillment technique in which a supplier is responsible for monitoring and restocking customer inventory at the appropriate time to maintain predefined levels. The vendor here is given access to current customer inventory and forecast and sales order information to initiate replenishment as required.

2) Supplier relationship management (SRM)

SRM is the management of information flow between suppliers and purchasing organizations and the integration of supplier information in the buyer's procurement process. The use of SRM has a positive impact on cost reduction as well as on improving procurement and providing real time visibility across the supply chain (Wisner et al., 2005). SRM supports solutions to assist in planning, execution and optimization of the supply chain. SRM mostly includes planning, demand management, supply management, fulfillment planning/execution, warehouse management, delivery management and so on.

3) Internet & Extranet

Internet is relatively fast and cheaper with no incremental fee associated with the frequency and length of information transfer. Internet technology has significantly enabled VMI, Electronic Fund Transfer (EFT), collaborative planning, forecasting and replenishment (CPFR) (McCormack & Kasper, 2002). EFT allows the electronic transfer of money or funds across the supply chain without the exchange of paper money, facilitating rapid transfer of goods and supplies between the buyer and the seller. The Internet or extranet also enables the integration of supply chains with lower cost, the availability of rich content, and support for linking supply chain partners located at long distances from each other. The Internet provides direct connectivity to anyone over a local area network (LAN) or Wide Area Network (WAN) or Metropolitan Area Network (MAN) through Internet Service Providers (ISPs). Whereas, an extranet uses Internet world wide web (www) to disseminate information from within an organization to a predefined group of users outside of the organization, typically customers, suppliers, or business partners. Sanders (2005) indicated that IT has a significant direct impact on a firm's performance. Large volume of information can move smoothly and inexpensively in real time along the supply chain. Thus, IT enables supply chain members to optimize effective strategies, indispensable to the success of the supply chain (Kulp, Lee, & Ofek, 2004).

4) Distribution Requirement Planning (DRP)

In addition to smoothening the coordination of cash flow in the supply chain, IT is required in managing the movement of physical goods along the supply chain. IT tools such as Distribution Requirement Planning (DRP) provide a linkage between warehouse operations and transportation requirement. DRP links demand forecasts to inventory and transportation capacities.

5) Data Warehouse (DW)

Usage of a Data Warehouse (DW) provides a linkage between many different databases in the entire enterprise, which helps management in the decision-making process. The system channelized the effective management of information from various sources towards a single location. Organizations which use DW are able to access a wide variety of data. For example, information regarding sales or trend reports at a particular location or region can be obtained. The stored data can then be used for making report and information analysis. Hence, DW provides speed and cost effectiveness in meeting management information requirements.

In short, in order to react quickly to supply chain uncertainty while maintaining the good relations with buyers and suppliers, organizations need to develop capable information systems to gather and exchange information with supply chain partners (Bowersox et al., 2000).

B. IT on SCM

There has been a continuous growth in the number of studies of Information Technology's (IT) effect on supply chain and inter organizational relationships, [Grover (2002)]. A popular belief is that IT can increase the information processing capabilities of suppliers, thereby enabling or supporting greater relationship in addition to reducing uncertainty [Subramani, (2004)]. IT reduces transaction costs between buyers and suppliers and leads to better cooperative governance structure, for closer buyer-supplier relationships Bakos & Brynjyoolfsson (1993). The review of literature revealed that the role of IT in SCM may be divided in to three categories as role of IT in procurement, operations and delivery process, which is further described as follows:

1) Role of IT in Procurement

The review demonstrates that the major use of IT in activities like procurement, is negotiating the price quotes with vendors, releasing the purchase order, queries from vendors, providing vendors with information, the processing of

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returning the damaged goods, term agreements etc., Olsen and Ellram (1997). The other popular use of IT in supply chains is in order processing applications. Information Technology is most frequently used in placing orders and checking order status. This has dramatically reduced the costs of order processing. The error rate involved in it.

2) Role of IT in Operation

The most important use of IT in supply chain is the management of inventory. This is taken care of use of IT in the communication of stock outs by customers to vendors, or the notification of stock outs by companies to their customers. IT has affected inventory management most dramatically in the ability of firms to be proactive in managing the inventory systems. By the use of IT, organizations have become more transparent in terms notifying the customers about delays in order shipping and inventory emergencies. Production scheduling has traditionally been the most difficult aspect of SCM. IT has minimized the difficulty to manage production scheduling by improving the communication between vendors, firms and customers. The literature review showed that some of the firms use IT to coordinate their JIT programs with vendors. In addition, some of the firms have started using IT to coordinate their production schedules with their vendors.

3) Role of IT in Logistics

Transportation typically is the highest cost component in a supply chain, according to literature review. The research showed that the monitoring of pickups at regional distribution centers by carriers is the most popular application of IT in this area. This is particularly important for a company, since tracking shipments to regional depots provides the firm with the data on reliability performance of the carriers, it is using. The use of IT enables transportation managers to make sure that the delivery system delivers the right kind of finished goods, in right amount, at the right location well in time, ensuring that they are meeting their committed arrival times. The use of IT in logistics has equipped managers with the capacity to inform about carriers of shipment delays as they occur, Fasanghari et al. (2008).

C. Hypothesis:

Vendor relationship has received increased attention, in the recent past for the effective management of a supply chain. Many authors have discussed the issue, which contribute to improved buyer-supplier relationship. For example, Orshesky (2003) has observed improved collaboration and greater responsiveness in the supply chain that may be achieved by greater level of shared information and communication among partners. This observation is supported by many researchers who observed that for the smooth functioning of these relationships an information sharing mechanism among partners of supply chain is essential, Subramani (2004). Otherwise, one partner in a supply chain is so dominant over other partners that it may unilaterally dictate to them own terms and conditions. The dominant stakeholder may take some of the decisions without consulting others (smaller partners). Smaller partners may later be forced to comply with these decisions, Subramani (2004). Top management of all partner organizations in a supply chain may play important role in developing the policies, which may lead to healthy and collaborative relationship between the buyers and the suppliers (Sanders, 2005; Bowersox et al., 2000). Further, the commitment of top management towards SCM, such as improved buyer-supplier relationships and information sharing, is a key component for the successful adoption of SCM, Grover (2002). These observations lead to the formulation of the hypothesis for this study.

Hypothesis 1. Use of Information Technology significantly affects the vender relationship in supply chain.

Hypothesis 1a. Use of Information Technology in procurement process significantly affects the relationship with suppliers.

Hypothesis 1b. Use of Information Technology in operations process significantly affects the relationship with suppliers.

Hypothesis 1c. Use of Information Technology in delivery process significantly affects the relationship with suppliers. .

Hypothesis 2. Extent of IT usage determines the level of the benefit from IT in supply chain.

III. METHODOLOGY

A. Research Model

The This research draws upon the work of Fasanghari et al. (2008), which is focused on assessing the impact of Information Technology on Supply Chain Management because this study focuses on the buyer-supplier relationship; adaptations have been made by focusing on inter-organizational relationships.

B. Research Methods

Questionnaires were used to collect the required data from manufacturing companies located in the northern region of India over a period of three months. A total 685 questionnaires were distributed through e-mail and post mail and to the purchasing directors, managers, executives, and buyers in manufacturing companies who had direct contact with suppliers. The lists of possible companies were generated from CII directory, 2012. A total of 127 questionnaires were collected from respondents, a response rate of approximately 18.5%. However, of the 127 questionnaires, only 117 questionnaires could be used. Four respondents answered the questionnaires incompletely and another six questionnaires were rejected due to improper answers.

C. Measurement and validation

The questionnaire in this study was derived from the literature, either through adoption or slight modification to make it relevant to this study. The pilot test was conducted to improve the overall quality of the questionnaire. Pilot test was performed by distributing the questionnaire to purchasing managers among four organizations and two academic organizations to solicit feedback on questionnaire design. Based on their feedback, several minor changes were made to tailor the questionnaires as per/keeping view the target

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audience. The questionnaires were deemed ready for distribution after these modifications.

D. Research instruments

A total of 21 questions were constructed to measure the level of use of IT in sourcing, operations & logistics. 10 questions were asked related to the use of IT in sourcing, 5 related to the operations, & 6 related to the use of IT in delivery. Further a total 12 questions were asked to know the level of use of IT in supply chain and 20 questions were asked to know the benefit of using IT in supply chain. [Questions were adapted from Fasanghari et al. (2008), rest were developed from the various discussions from literature]. A 5-point rating scale, ranging from "1= strongly disagree" to "5= strongly agree," was adopted to measure the use of IT in sourcing, operations, delivery, level of usage of IT and lastly the benefit of using IT to facilitate the supply chain.

IV. Results

A. Respondent Profile

Before Table I shows that 46.0% of respondents are senior executives, while 26.6% of respondents hold middle level managerial positions; another 25.64% of respondents hold higher level managerial positions.

TABLE I. Respondent Personnel Profile

Variable (Job Title)	Frequency	Percentage
Director/Senior Manager	30	25.64
Managers/Assistant Manager	53	46.00
Section Head/Senior Executive	31	26.6
Others	03	1.76

B. Respondent Organization Profile

Define The majority of the respondents come from Original Equipment Manufacturers (OEM), i.e. 77.56%, and 22.44% from the supporting Industry. 43.10% of the organizations have been operating for more than 20 years; furthermore, 62.9% of companies have employed more than 1,000 people (Table II).

TABLE II. Respondent Organization Profile

Variable	Frequency	Percentage
OEM	90	77.56
Supporting Industry	27	22.44
Primary Business Automobile	43	36.74
Electronic/Electrical	33	28.36
Metal Products	18	15.80
Computer Products	15	12.10
Others	08	07
Years in Industry		
1-5	08	6.90
5.1-10	12	10.34
10.1-15	40	34.48
15.1-20	06	5.17
>20 years	51	43.10
Number of Employees		
100 & below	15	12.97
10-500	20	17.24
501-1000	8	6.90
Above 1000	74	62.90

TABLE III. Correlations among the ITS, ITO, ITL & VR

		VR	ITS	ITO	ITL
VR	Pearson Correlation	1	.299(**)	.690(**)	.517(**)
	Sig. (2-tailed)		.001	.000	.000
	N	117	117	117	117
ITS	Pearson Correlation	.299(**)	1	.424(**)	.119
	Sig. (2-tailed)	.001		.000	.203
	N	117	117	117	117
ITO	Pearson Correlation	.690(**)	.424(**)	1	.380(**)
	Sig. (2-tailed)	.000	.000		.000
	N	117	117	117	117
ITL	Pearson Correlation	.517(**)	.119	.380(**)	1
	Sig. (2-tailed)	.000	.203	.000	
	N	117	117	117	117

** Correlation is significant at the 0.01 level (2-tailed).
ITS: Use of IT in Sourcing
ITO: Use of IT in Operations
ITS: Use of IT in Logistics
VR: Vendor relationship

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Table III shows three things. First, the table shows the value of Pearson's correlation coefficient between every pair of variables (eg. We can see that the use of Information Technology in operations had a large positive correlation with vendor relationships. r=.690). Second, the two-tailed significance of each correlation is displayed (eg. The correlation is significant, p<.05). Finally the number of cases contributing to each correlation N=117 is shown.

You might notice that along the diagonal of the matrix the values for the correlation coefficients are all 1.00 (i.e. a perfect positive correlation). The reason for this is that there values represent the correlation of each variable with itself, so obviously the resulting values are 1. Table III is extremely useful for getting a rough idea of the relationship between predictors and the outcome.

If we look only at the predictors (ignore vendor relationship) then the highest correlation is between the use of IT in sourcing and the Use of IT in operations which is significant at a .05 level (r=.424, p=.000). In table IV you should note that there is only one model, which refers, when all three predictors are used to find out the effect of all together on the outcome i.e. vendor relationship. Table IV concludes that all three predictors use of IT in sourcing, operations and delivery (logistics) in order contribute 55.2% in vendor relationship.

To check the co linearity, VIF value and tolerance were checked. For our model the VIF values are all well below 10 and the tolerance statistics all well above 0.2; therefore, we can safely conclude that there is no co-linearity within our data.

It (table V) provides us with some very important information about the model: the value of R, R^2 and the adjusted R^2. The table also tells us that what was the nature of the dependent variable and predictors in each of the two models. In the column labeled R, are the values of the multiple correlation coefficient between predictors and the outcome when only use of IT in operation is used as a predictor, this is the simple correlation between use of IT in operations and vendor relationship (.690). The next column gives us a value of R^2, which is a measure of how much of the variability in the vendor relationship, is accounted by predictors. For the first model its value is .476, which means that use of IT in operations accounts for 47.6% of the variation in vendor relationship. However, when the other predictors (use of IT in delivery) are included as well (model 2), this value increases to .552 or 55.2% of the variance in vendor relationship. Therefore, if use of IT in operations accounts for 47.6%, we can tell that use of IT in delivery (Logistics) accounts for 7.6%. The adjusted R^2 gives us several ideas of how well our model generalizes and ideally we would like its value to be the same, or very close to, the value of R^2.

So looking at the difference

.476 - .471 = .005

.552 - .544 = .008

We can conclude that model 2 shrinkage means that if the models were derived from population rather than a sample it would account for approximately .8% less variance in the outcome.

TABLE IV. SUMMARY FOR SINGLE MODEL

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	*F Change*	*df1*	*df2*	*Sig. F Change*
1	.743(a)	.552	.540	.40552	.552	46.472	3	113	.000
a Predictors: (Constant), ITL, ITS, ITO									

TABLE V. MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	*F Change*	*df1*	*df2*	*Sig. F Change*
1	.690(a)	.476	.471	.43496	.476	104.401	1	115	.000
2	.743(b)	.552	.544	.40395	.076	19.336	1	114	.000
a Predictors: (Constant), ITO									
b Predictors: (Constant), ITO, ITL									

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Table VI shows the next part of the output, which contains an ANOVA that tests whether the model is significantly better at predicting the outcome than using the mean as a "best guess". Specifically, the F-ratio represents the ratio of the improvement in predicting that results from fitting the model, relative to the inaccuracy that still exists in the model. The table shows the value of sum of squares for the model, the value is generally represented as SS_M and represents the improvement in predicting resulting from fitting a regression line to the data rather than using mean as an estimate of the outcome. Table VI also shows the residual sum of squares (SS_R), it represents the total difference between the model and the observed data. Degree of freedom (df) is also shown in the table VI.

For the residual sum of squares it is the number of observations minus the number of coefficients in the regression model. The first model has two coefficients (One for the predictor and other for the constant) where as the second model has four (one for each of the three predictors and one for the constant). Therefore model 1 has 115 degree of freedom where as model 2, has 114. The average sum of squares (MS) is then calculated for each term by dividing the SS by the df. The F ratio is calculated by dividing the average improvement in the prediction by the model (MS_M) by calculating the average difference between the model and the observed data (MS_R) if the improvement due to fitting the regression model is much greater than the accuracy within the model then the value of F will be greater than 1. For the accepted model 2 the value of F 70.192 which is also highly significant ($p<.001$). So far we have looked at several summary statistics telling us whether or not the model has improved our ability to predict the vendor relationship through the use of IT in sourcing, operations and delivery. The next part of the output is concerned with the parameters of the model.

Table VII shows the parameters for all three models, but we will be concerned only with the parameters for the final model (in which all predictors were included). The multiple regression models take the form of equation

$$Yi = b_0 + b_1 X i_1 + b_2 X i_2 + + \text{-----} + b_4 X_4) + \epsilon i$$

In the above equation there are several unknown qualities (the b-values). The first part of table VII gives us estimates for the b-values and these values indicate the individual contribution of each predictor to the model. If we replace the b-values in the equation, we find that we can define the model as follows:

VR = 1.476 + .502ITO + .214ITL

TABLE VI. ANOVA(C)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19.752	1	19.752	104.401	.000(a)
	Residual	21.757	115	.189		
	Total	41.509	116			
2	Regression	22.907	2	11.453	70.192	.000(b)
	Residual	18.602	114	.163		
	Total	41.509	116			
a Predictors: (Constant), ITO						
b Predictors: (Constant), ITO, ITL						
c Dependent Variable: VR						

TABLE VII. COEFFICIENTS(A)

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95% Confidence Interval for B		Collinearity Statistics	
		B	*Std. Error*	*Beta*			*Lower Bound*	*Upper Bound*	*Tolerance*	*VIF*
1	(Constant)	1.810	.212		8.538	.000	1.390	2.230		
	ITO	.601	.059	.690	10.218	.000	.485	.718	1.000	1.000
2	(Constant)	1.476	.211		6.994	<.001**	1.058	1.894		
	ITO	.502	.059	.577	8.508	<.001**	.385	.619	.856	1.168
	ITL	.214	.049	.298	4.397	<.001**	.118	.311	.856	1.168
a Dependent Variable: VR										

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The b-values tell us about the relationship between vendor relationship and each predictor (use of IT, in Sourcing, Operations and delivery). If the value is positive, there is positive relationship between the predictor and the outcome, whereas a negative coefficient represents a negative relationship. For these data no predictors have negative relationship. So, as use of IT increases in operations, Vendor relationship improves; similarly as ITL increases, so do VR. Other than this b-values tell us more than this, though. They tell us to what degree each predictor affects the outcome if the effects of all other predictors are held constant. Use of IT in operations (b=.502): this value indicates that as use of information technology in operations increases by one unit, vendor relationship increases or improves by .410 units. This interpretation is true only if the effect of use of IT in delivery is held constant. Use of IT in delivery (b=.214): This value indicates that as the use of IT in delivery increases by one, vendor relationship increases by .214 units. This interpretation is true only if the use of IT in operations is held constant. Each of these beta values has an associated error indicating to what extent their values would vary across different samples, and these standard errors are used to determine whether or not the b-value differs significantly from zero. A t-statics can derive that tests whether a b-value is significantly different from 0. In simple regression, a significant value of t indicates that the slope of the regression line is significantly different from horizontal, but in multiple regression, it is not so easy to visualize what the value tells us. Well, it is easiest to conceptualize the t-test as measures of whether the predictor is making a significant contribution to the model. Therefore, if the t-test associated with a b-value is significant (if the value in the column labeled sig. is less than 0.05) then predictor is making a significant contribution to the model. The smaller the value of sig. (and the larger the value of t), the greater the contribution of that predictor. For this model, the use of IT in operations (t(114)=8.508), p<.001), and use of IT in delivery (t(113)=4.397, p<.001) are significant predictors of vendor relationship. From the magnitude of the use of IT in operations has larger impact on vendor relationship than on use of IT in delivery (ITL).

Table VIII shows three things. First, the table shows the value of Pearson's correlation coefficient between pair of variables. As we can see that the usage of Information Technology had a large positive correlation with the benefit received from the usage of IT (r= .518). Second, the two-tailed significance of correlation is displayed (e.g. The correlation is significant, p<.05). Finally the number of cases contributing to each correlation N=117 is shown.

Table IX provides us with some very important information about the model: the value of R, R^2 and the adjusted R^2. The table also tells us about the nature of dependent variable (outcome) and the predictor was in the model. The column labeled as value of R^2, which is a measure of how much of the variability in the benefit from the usage of IT, is accounted by predictors. For the model its value is .268, which means that level of use of IT in supply chains accounts for 26.8% of the variation in benefit from the usage of IT. The adjusted R^2 give us ideas of how well our model generalizes and ideally we would like its value to be the same, or very close to, the value of R^2.

So looking at the difference

.268 - .261 = .007

We can conclude that model shrinkage means that if the model were derived from population rather than a sample it would account for approximately .7% less variance in the outcome.

TABLE VIII. CORRELATIONS AMONG LEVEL OF USAGE OF IT & BENEFIT

		Level of Usage IT	Level of Benefit
Level of Usage IT	Pearson Correlation	1	.518(**)
	Sig. (2-tailed)		.000
	N	117	117
Level of Benefit	Pearson Correlation	.518(**)	1
	Sig. (2-tailed)	.000	
	N	117	117
** Correlation is significant at the 0.01 level (2-tailed).			

TABLE IX. MODEL SUMMARY FOR USAGE OF IT & ITS BENEFIT

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	*F Change*	*df1*	*df2*	*Sig. F Change*
1	.518(a)	.268	.261	.43415	.268	42.068	1	115	.000
a Predictors: (Constant), Level of Usage IT									

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TABLE X. ANOVA(B)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.929	1	7.929	42.068	.000(a)
	Residual	21.676	115	.188		
	Total	29.605	116			
a Predictors: (Constant), Level of Usage IT						
b Dependent Variable: Level of Benefit						

TABLE XI. COEFFICIENTS(A)

Model		Unstandarlized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Collinearity Statistics	
		B	*Std. Error*	*Beta*			*Lower Bound*	*Upper Bound*	*Tolerance*	*VIF*
1	(Constant)	2.662	.170		15.704	.000	2.326	2.998		
	Level of Usage IT	.300	.046	.518	6.486	<.001**	.208	.391	1<.001**	1<.001**
a Dependent Variable: Level of Benefit										

Table X shows the next part of the output, which contains an ANOVA that tests whether the model is significantly better at predicting the outcome than using the mean as a "best guess". Specifically, the F-ratio represents the ratio of the improvement in predicting the results from fitting the model, relative to the inaccuracy that still exists in the model. The table shows the value of sum of squares for the model, the value is generally represented as SS_M and represents the improvement in predicting resulting from fitting a regression line to the data rather than using mean as an estimate of the outcome. Table X also shows the residual sum of squares (SS_R), it represents the total difference between the model and the observed data. Degree of freedom (df) is also shown in the table X.

For the residual sum of squares it is the number of observations minus the number of coefficients in the regression model. The present model has two coefficients (One for predictor and other for constant) where as the third model has four (one for each of the three predictors and for the constant). Therefore model has 115 degree of freedom. The average sum of squares (MS) is then calculated for each term by dividing the SS by the df. The F ratio is calculated by dividing the average improvement in the prediction by the model (MS_M) by the average difference between the model and the observed data (MS_R) if the improvement due to fitting the regression model is much greater than the accuracy within the model then the value of F will be greater than 1. For the model the value of F 42.068 which is also highly significant ($p<.001$). So far we have looked at several summary statistics telling us whether or not the model has improved our ability to predict the benefit of IT through use of IT in supply chains. The next part of the output is concerned with the parameters of the model.

As per the explanation mentioned earlier for the present table XI equation may be derived as:

Level of benefit = 2.662+.3 usage of IT in Supply chain

V. DISCUSSION

The results show a significant co relationship between usage of IT in all functions of supply chain management and buyer-supplier relationship. This is because structured and standardized routines of procedures tools are unable to cater to business cases that require real time sharing of information for doing business. Thus, IT tools are required at all nodes for sharing real time information, in order to keep pace with a changing business environment and to cope with new business strategies and practices, organizations must constantly invest in upgrading its existing IT system in order to meet any circumstantial needs (Orshesky, 2003).

Though the usage of IT in all the functions of SCM was correlated to vendor relationship, yet it is found that the use of IT in sourcing is not affecting buyer-supplier relationship significantly. It is found that use of IT in operations and delivery were affecting buyer-supplier relationship significantly. Information Technology in operations were affecting by 47.6%. In other words we can say that 47.6 % variation in Vendor relationship is by use of IT in operations. Multiple regression resulted in to a model VR = 1.476 + .502ITO + .214ITL. Similarly it was found that usage of IT has strong correlation with benefit to the SCM. Also it was found that it is causing 26% variation in benefit of IT in supply chain. Model proposed for this is the level of benefit= 2.662+.3 usage of IT.

While summarizing, the findings indicated that the impact of Usage of IT in operations and delivery is more important than usage of IT in sourcing on buyer-supplier relationship. Also that level of benefit of IT in supply chain is directly proportional to the extent of usage of IT.

VI. MANAGERIAL IMPLICATIONS IN SUPPLY CHAINS

The findings of this study raise several implications for buyer-supplier relationship in supply chains. The mindset that

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heavily investing in IT tools will automatically improve buyer-supplier relationship needs to change. Successful SCM is the result of human interaction that can only be supported by IT, not replaced. The relational factors of the use of IT in operations and delivery were found to be positively impacting/affecting/influencing buyer-supplier relationship. Level of usage of IT, which is central to successful partner relationships, and overall benefit to the supply chain.

Thus, supply chains who demonstrate higher levels of usage of Information Technology will perform better in terms of better and smooth working patterns between partners. The results of this study suggests that management should strengthen the investments in usage of information Technology tools in operations and delivery to make supply chain practice better during operations and delivery, and to make best relationship with their supply chain partners.

VII. Limitations

This study was confined to the northern region of India, and therefore, the findings from this study cannot be generalized to all manufacturing companies in India. Additionally, the survey response rate was low (18%), which may indicate non-response bias. Because the number was small, we could not perform a non-response bias test. Studies using larger sample sizes should be performed on all Indian manufacturing companies to evaluate whether the findings of this study truly reflect the reality. Second, we only used a single respondent within each organization as our source of information. This may have resulted in some bias, but many researchers have argued that this bias is not a serious issue. Moreover, this study only focuses on inter-organizational relationships. However, SCM encompasses a spectrum of activities, both internally and externally. To have an effective supply chain, good internal collaboration is required in order to facilitate external collaboration. Future research should examine how both inter and intra- collaboration impact buyer-supplier relationship. There are also many other variables which can influence buyer-supplier relationship. Thus, future research may include other variables identified in the literature to extend the model of research.

VIII. Conclusion

Currently, SCM has become the main focus of many organizations. SCM is viewed as an essential part of business success. Organizations should not isolate themselves from SCM if they want to compete in the marketplace. To survive, organizations must strengthen the support from the entire chain. Collaboration with the entire supply chain is critical to achieve an excellent relationship with all its partners. Based on the results of this study, usage of IT in all dimensions of SCM are found to be positively related to buyer-supplier relationship. However, usage of IT in operations is affecting the vendor relationship the most out of usage of IT in other dimensions of supply chain management. Study validates its entire hypothesis except 1 (b). Hopefully, these findings will provide impetus for local companies to invest in IT more strategically if they wish to improve upon their inter-organizational relationships. Also that if any organization wants to receive the benefit from the usage of the IT, then the management of the organization must realize it can be achieved only through more investments in it.

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A Novel Approach for Improving the Characteristics of Aluminum by Using Waste Generated During Alumina Extraction as a Reinforcement Material

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***Abstract*: In this paper we describe the behavior of Metal matrix composites. A lot of work has been done on aluminum based metal matrix composite with different types of reinforcements, different sizes and manufactured techniques either by stir casting or by spray casting technique and then subjected to study the wear behavior. Alloy composition and its condition influence the wear rate. With increase in weight % of reinforcement in the matrix the wear resistance of composite increases. The hardness will also increase with increase in weight % of reinforcement. As we know that these metal matrix composites are used mostly in liberty ships, aerospace, automotive, and nuclear. In the present paper the study on sharp show off activities of Aluminum metal matrix composite reinforced with Alumina slag, SiC and Al2O3 has been carried out. There are various production technique offered where the value fraction of Strengtheners could be inflamed and are likely to vary the wear performances of the composite. Composites posses excellent Strength and Stiffness and this describes that these are very light Materials. So this paper describes that these possess high resistance to oxidization, chemicals and other weather agents. In this paper, the combination of waste as reinforcement and matrix is Al alloy 6061 was used with the help of simple and cheaper technique called stir casting technique. Other reinforcements are also used in place of waste such as silicon carbide and aluminum oxide varying from 2.5 to 10% by wt. in Al alloy 6061 and studied the effect of all these combinations on macroscopic and microscopic behavior such as wear rate, wear loss, hardness, microstructure and XRD etc.**

***Keywords*-Alumina slag, SiC,Al_2O_3.**

I. INTRODUCTION

A composite material is a material composed of two or more constituents. The constituents are combined at a microscopic level and are not soluble in each other. Generally, a composite material is composed of Strengthener (fibers, particles/ particulates, flakes, and/or fillers) embedded in a matrix (metals, polymers). The matrix holds the Strengthener to form the desired shape while the Strengthener improves the overall mechanical properties of the matrix. When designed properly, the new combined material exhibits better strength than would each individual material. The most primitive man-made composite materials are straw and mud combined to form bricks for building construction [1, 2]. Composites posses excellent Strength and Stiffness. They are very light Materials and they possess high resistance to corrosion, chemicals and other weathering agents. They have High strength to weight ratio (low density high tensile strength), High creep resistance, High tensile strength at elevated temperature and high toughness.

For many researchers the term metal matrix composites is often equated with the term light metal matrix composites (MMCs). Substantial progress in the development of light metal matrix composites has been achieved in recent decades, so that they could be introduced into the most important applications. In traffic engineering, especially in the automotive industry, MMCs have been used commercially in fiber reinforced pistons and aluminum crank cases with strengthened cylinder surfaces as well as particle strengthened brake disks. These innovative materials open up unlimited possibilities for modern material science and development; the characteristics of MMCs can be designed into the material, custom-made, dependent on the application.

II. ALUMINIUM MATRIX

Aluminum is the most abundant metal in the Earth's crust, and the third most abundant element, after oxygen and silicon. It makes up about 8% by weight of the Earth's solid surface. The chief source of aluminum is bauxite ore. Its Atomic number is 13. Aluminum is a soft, durable, lightweight, ductile and malleable metal with appearance ranging from silvery to dull gray, depending on the surface roughness. Aluminum is nonmagnetic and non-sparking. Aluminum has about one-third the density and stiffness of steel. It is easily machined, cast, drawn and extruded. Corrosion resistance can be excellent due to a thin surface layer of aluminum oxide that forms when the metal is exposed to air, effectively preventing further oxidation.

III. OBJECTIVES OF METAL MATRIX COMPOSITES

Increase in yield strength and tensile strength at room temperature and above while maintaining the minimum ductility or rather toughness.

A. Waste as Reinforcement

The role of the Strengthener in a composite material is fundamentally one of increasing the mechanical properties of the neat resin system. All of the different particulates/ fibers used in composites have different properties and so affect the properties of the composite in different ways. The desirable properties of the Strengtheners include:

- High strength
- Ease of fabrication and low cost

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- Good chemical stability
- Density and distribution.

B. Alumina slag as Strengthener

Alumina slag is the caustic insoluble slag residue generated by alumina production from bauxite by the Bayer's process at an estimated annual rate of 66 and 1.7 million tons, respectively, in the World and India [1]. Under normal conditions, when one ton of alumina is produced nearly a ton of alumina slag is generated as a slag. This slag material has been accumulating at an increasing rate throughout the world.

C. Need for the reinforcement of Waste into Aluminum matrix.

To obtain Optimum performance from composite materials there is an advantage to selecting the shape and size of the Strengthener material to fit the application. It is apparent that different material types and shapes will have advantages in different matrices. There are so many researchers have worked out separately to reinforce SiC, Al2O3 (i.e. carbides, Nitrides and oxides) TiC, Boron and Graphite in to the Aluminum matrix to achieve different properties and are expensive.

IV. RESULTS AND DISCUSSIONS

- Effect of different reinforcements on weight loss of MMCs under dry sliding condition.

A pin-on-disc tribometer is used to perform the wear experiment. The wear track, alloy and composite specimens are cleaned thoroughly with acetone prior to test. Each specimen is then weighed using a digital balance having an accuracy of ±0.0001 gm. After that the specimen is mounted on the pin holder of the tribometer ready for wear test. For all experiments, the sliding speed is adjusted to 1.6 m/s, track diameter 60mm, load 2kg and total time is 30 minute under room temperature.

Length (mm)	Diameter (mm)	Velocity (m/s)	Track Diameter (mm)	Weight (Kg)	Time (Sec)
50	8	1.6	60	2	1800

Sample No.	Specimen Name Al alloy 6061+	Initial Weight (gm)	Final Weight (gm)	Weight Loss(gm)
1	2.5% Sic	6.71898	6.70330	0.01568
2	5% SiC	6.86166	6.84660	0.01506
3	7.5% SiC	6.62918	6.61820	0.01098
4	10% SiC	6.30940	6.29884	0.01056
5	2.5% Al_2O_3	5.84633	5.82111	0.02522
6	5% Al_2O_3	6.16840	6.15064	0.01776
7	7.5% Al_2O_3	5.50940	5.49290	0.01650
8	10% Al_2O_3	5.89106	5.87688	0.01418
9	2.5 % Waste	6.15920	6.13370	0.0255
10	5% Waste	5.82509	5.80113	0.02396
11	7.5% Waste	6.17206	6.15575	0.01633
12	10% Waste	5.71050	5.68728	0.02322
13	Base alloy (Al alloy 6061)	6.64630	6.62088	0.02542

Table 1: Weight loss of Sample no. (1-13) under dry sliding condition

As shown in the table results predict that as the Strengthener wt. % increases, the weight loss of MMCs decreases. But in the case of alumina slag Strengthener, the weight loss decrease upto 7.5 wt. % then increases. This happens may be due to either the improper dispersion of alumina slag into the matrix due to high viscosity of molten composites or weak interfacial bonding in between the Al alloy 6061 and alumina slag interfaces.

Comparing the weight loss properties of composites reinforced with silicon carbide, alumina and alumina slag, it is observed that despite their higher hardness, composites reinforced with alumina and alumina slag particles show greater weight loss as compared to composites reinforced with SiC particles. It can be attributed to the comparatively poor bonding between alumina slag-matrix and in alumina-matrix. There might be particle pull out, in the case of composite reinforced alumina and alumina slag particles during wear test, which enhances weight loss.

V. CONCLUSION

Aluminum based metal matrix composites have been successfully fabricated by stir casting technique with fairly uniform distribution of Alumina slag, Silicon carbide and Aluminum oxide particulates. For synthesizing of composite by stir casting process, stirrer design and stirrer position, stirring speed and time, particles preheating temperature, particles incorporation rate etc. are the important process parameters. It is found that wear rate tends to decrease with increasing particles wt. percentage (2.5- 10%), which confirms that silicon carbide; alumina slag and alumina addition is beneficial for reducing the wear rate of MMCs. Alumina slag, the alumina slag generated from alumina production can be successfully used as a reinforcing material to produce Metal-Matrix Composites (MMCs). It can be replaced by other expensive Strengthener materials such as SiC and Al2O3. Thereby saving of expensive Strengtheners could be achieved.

VI. FUTURE SCOPE

Same metal matrix composites can be manufactured by using other manufacturing techniques like spray casting etc. and results can be compared with stir casting technique. In this study alumina slag, SiC and Al2O3 particles of sizes 103-150, 60- 90 and 30-50 microns have been used. This can further be extended by varying the particle size and then effect of particle size on the wear behavior of the composite can be studied.

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A Review of Applications and Use of Dissimilar Metal Welding

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***Abstract*—A literature review of studies and researches has been attempted in the field of dissimilar metal welding. Dissimilar metal welds have large applications in area of thermal power, chemical, petrochemical, automobile, aerospace industries and nuclear plants. The purpose of this paper is to review: (a) the applications of dissimilar metal welding processes (b) microstructural and mechanical properties of dissimilar metal joints studied by researchers.**

***Index Terms*— Dissimilar metal welding processes, mechanical properties, applications**

I. Introduction

Since ancient time people have been joining dissimilar metals. Ornaments and trinkets were made with metals of differing colors and workability, even though the joining methods used in ancient times were very different from those in present. Joining dissimilar metals is, therefore, to compose different properties of metals in order to minimize material costs and at the same time maximize the performance of the equipment and machinery. Presently, the methods of joining dissimilar metals include fusion welding, pressure welding, explosion welding, friction welding, and diffusion welding, brazing, and soldering [1].

Joints of dissimilar metal combinations are employed in different applications requiring certain special combination of properties as well as to save cost incurred towards costly and scarce materials. Many of the structural components in pressure vessels, transport vehicles, earthmoving equipment, spacecraft, etc. are made of welded joints. The dissimilar joints are the most common ones in the fabrication and construction of many structures. The wide application of dissimilar joints in various structures, including offshore, nuclear, and spacecraft, gives large scope for the researchers to analyze the behavior under different types of loading condition [2]. Owing to these attributes at moderately high temperatures, such combinations of metals are extensively used in the power generation industry. In a nuclear water reactor, dissimilar metal welds are employed to connect the low alloy steel reactor pressure vessel and stainless steel pipe systems. The dissimilar metal weldment joining boiler water reactor nozzles to safe ends is one of the more complex configurations in the entire recirculation system. The problem of making welds between dissimilar metals relates to the transition zone between the metals and the intermetallic compounds formed in this transition zone [3].

II. Dissimilar Metal Welding Processes And Applications

The dissimilar welded joints are formed between two different metals in aspect of difference in their chemical composition and various metallurgical and mechanical properties. Different welding processes are used to weld these dissimilar metals with the help of different types of welding electrodes. Various authors have studied the joining of dissimilar metals by different welding processes such as SMAW, TIG, MIG, Spot welding, Laser welding and Gas tungsten arc welding etc. These joints undergo various types of service conditions of temperature, pressure, corrosion, wear, stress environment. Ferritic stainless steel conformed to AISI 409M gradewas welded with autogeneous arc welding processes. Ferritic Stainless Steels are noted for their excellent stress corrosion cracking (SCC) resistance and good resistance to pitting and crevice corrosion in chloride environments. Even though ferritic stainless steels have a greatdeal of potential to become a cheaper alternative toaustenitic stainless steels , the fabrication processes, especially the arc welding processes are not conducive to this materiet al.[1]

Ferritic-Austenitic Dissimilar Weld Metals was prepared by gas metal arc welding process. Ferritic stainless steel (FSS) are now commonly used in the coal mining industry for bulk transport of coal and gold, for cane and beet sugar processing equipment, road and rail transport, power generation, petrochemical, pulp and paper industries *etc*. In fact, the use of these steels in the past few years has been increased markedly with their successful applications in passenger vehicles, coaches, buses, trucks, freight and passenger wagons. [2]

Joints of down comers for RBMK reactors were prepared which were fabricated from austenitic stainless steel using TIG and MAW welding methods. The type RBMK reactor is graphite moderated, channel type, direct cycle boiling water nuclear reactor with online refuelling. Austenitic stainless Cr–Ni steels of the type 18-10 are widely used in power engineering because of their high resistance to general corrosion. The rate of general corrosion for these steels does not exceed 0.01 g/m2 h under conditions of boiling reactor operation. This provided a reliable,stable operation of reactors,

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because there was no problem of precipitation and removal of metal oxides from heat exchanging surfaces of reactor channels.[3]

304 austenitic stainless steels (SS) is joined by tungsten inert gas (TIG) welding by using 308 stainless steel filler wire. TIG welding which uses a non-consumable tungsten electrode and an inert gas for arc shielding is an extremely important arc welding process. In TIG welding, shielding gas plays an important role. Composition of a shielding mixture in arc welding depends mostly on the kind of material to be welded. The selection of the shielding gas should, by all means, take into account chemical–metallurgical processes between the gases and the molten pool that occur during welding.[4]

The stainless steel (STS304L) hybrid welded butt joints was prepared by using hybrid CO2 laser-gas metal arc welding. Laser-arc hybrid welding has come to great attention in a large variety of industries from shipbuilding to automobile production because of high welding speed, low distortion, deep penetration and good gap bridging ability. Laser-arc hybrid welding offers many advantages for heavy industrial applications involving thick walled materials as it enables full penetration weld of thick plates without the need of multiple passes and at that reduces welding after works such as cutting for adjustment and fairing at the assembly stage. Hybrid welding improves productivity by two to four times as compared to the conventional arc welding. [5]

The welding of Mo–Cu composite and 18-8 stainless steel was carried out by Tungsten Inert Gas welding process with Cr–Ni fillet wires. Mo–Cu composite has been concerned in recent years due to its attractive combination of high strength at elevated temperatures and excellent physical properties including high thermal, electrical conductivities and low thermal expansion coefficient. Therefore, Mo–Cu composite has been applied widely in the fields of high power semiconductors, thermal dissipation components, sealing materials and high-temperature aerospace materials. However, the poor oxidation resistance of Mo–Cu composite has limited its practical applications in project seriously. Welding of Mo–Cu composite and stainless steel to form a compound structure, not only can bring their property advantages into play and make up for their shortcomings, but also can reduce the cost of the component and broaden the application scope of Mo–Cu composite. [6]

HTLA steel welds were obtained by the tungsten arc welding and resistance spot welding. Weld heat changes the microstructure around the weld by raising the temperature of these regions above the Ac1. So, the microstructure of weld zone is complicated and inhomogeneous. Since the mechanical properties of steel are highly dependent on the microstructure, and distribution of each phase present so, this in homogeneity causes irreparable damages in industry. The hardness of the material is dependent on its microstructure. So, hardness measurement would be an acceptable method to investigate the inhomogeneous microstructures. [7]

A dissimilar weld joint consisting of an austenitic stainless steel (ASS) and a martensitic stainless steel (MSS) was obtained under optimized welding conditions by autogenous gas tungsten arc welding technique. The weld metal was found to be dual-phased, and was constituted with an austenite matrix containing interdendritic ferrite of about 3–8 EFN, with over-matching mechanical properties. Excellent mechanical properties combined with corrosion resistance make stainless steels as candidates, even today, for many of the demanding engineering applications. There are potential applications in the nuclear and aerospace sectors for the employment of dissimilar joints an attempt has been made in this work to understand the microstructural evolution in a dissimilar weld joint comprising an austenitic stainless steel and a martensitic stainless steel by employing autogenous GTAW. [8]

Dissimilar weldment between the tempered martensitic steel T91 and the non-stabilized austenitic steel TP316H with Ni-based weld metal (Ni WM) was prepared by gas tungsten arc welding (GTAW) method using the Ni-based filler metal ThermanitNicro 82. Dissimilar martensitic/austenitic (α'/γ) welded joints are typically used in heat-conversion systems of fossil-fired power plants. The Cr–Mo bainitic and martensitic creep-resistant steels are used for water-evaporators and steam headers from economical and flexibility reasons. The steam super heaters and re-heaters exposed to higher temperatures are constructed from Cr–Ni austenitic steels with better creep and corrosion resistance. [9]

Tungsten inert gas (TIG) welded joints between Zircaloy-4 and stainless steel 304L was prepared. Zircaloy-4 is used as cladding material for fuel element in nuclear thermal reactors due to its several attractive properties like low neutron absorption cross-section, excellent corrosion resistance and good mechanical properties at elevated temperature. Stainless steel is used as a structural material in nuclear reactors. The interaction of these materials could take place in case of an accident when temperature is raised suddenly. [10]

AISI 430 ferritic stainless steel weldment was prepared by gas tungsten arc welding process. Ferritic stainless steel (FSS) in the absence of nickel pro- vides moderate corrosion resistance at lower cost. The higher chromium grades offer good resistance to oxidation at high temperature. Ferritic stainless steels are commonly used in automobile exhaust systems, furnace parts and combustion chambers because of their excellent resistance to stress corrosion cracking, good toughness, ductility and weld- ability compared with austenitic stainless steels. Gas tungsten arc welding (GTAW) is generally used for fabrication of ferritic stainless steel components because it produces a very high quality weld. [11]

III. Mechanical And Metallurgical Properties Of Dissimilar Welds

A K Lakshminarayanan et al. [1] have demonstrated the effect of autogeneous arc welding processes on tensile and impact properties of ferritic stainless steel conformed to AISI 409M grade. Tensile and impact properties, micro hardness, microstructure, and fracture surface morphology of continuous current gas tungsten arc welding (CCGTAW), pulsed current gas tungsten arc welding (PCGTAW), and plasma arc welding (PAW) joints are evaluated and he found that the joints fabricated by PAW exhibited higher strength. The

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enhancement in strength was approximately 40% when compared with CCGTAW joints, and 35% when compared with PCGTAW joints. The joints fabricated by PAW exhibited higher impact toughness values and the enhancement in impact toughness was approximately 25% when compared with CCGTAW joints, and 50% when compared with PCGTAW joints. Lower heat input, finer fusion zone grain diameter, and higher fusion zone hardness may be the reasons for superior tensile and impact properties of PAW joints compared to CCGTAW and PCGTAW processes.

M. Mukherjee et al. [2] have studied the Influence of heat input on Martensite formation and impact property of Ferritic-Austenitic dissimilar weld metals and found that for the two austenitic filler wires, the weldmetals prepared by 308L having higher Cr/Ni ratio, MT temperatures and relatively low SFE provide higher amount of martensite laths than 316L weldmetals. Furthermore, weld metals prepared by high heat input associated with slower cooling rate generate higher amount of martensite compared to those prepared by medium and low heat input, which is probably due to the influence of MT temperatures and hence hardenability elements. Charpy impact toughness of weld metal, in general, is better than that of base metal. The welds under high heat input exhibits relatively higher impact toughness values than those under medium and low heat input irrespective of filler wires. Furthermore, a close look at the toughness values reveals that 308L weld metals have relatively higher impact toughness than 316L weld metals.

B.T. Timofeevet et al. [3] have discussed the Corrosion and mechanical strength of welded joints of down comers for RBMK reactors. Formation and development of ISCC of welded joints of piping Φ325 X16 mm of the circuit of multiple forced circulations is a result of damage accumulation from the effect of three basic factors: mechanical, corrosion and microstructuret al. The rate of HAZ failure corrosion processes at the innersurface of welded joints of Φ325X16 mm down comers achieves its saturation already with oxygen content of 0.2–0.3 mg/kg and a further increase in oxygen content in the circulating water influences slightly the duration of the incubation period of ISCC. The process of ISCC crack development is discrete. Each initiation of crack growth takes place in the process of hydraulic tests. A trend of crack growth rate decrease is observed with the increase of its depth.

Halil İbrahim Kurt et al. [4] have studied the microstructure and mechanical properties of 304 SS material jointed by TIG welding and he found that according to base metal, hardness value of welding zone decreased and the value of welding zone is higher heat affected zone. Coarse grained structure in HAZ occurred, the hardness of HAZ affected, negatively. The tensile strength, yield strength and elongation are 1800, 75 MPa and 25%, respectively. The failure started via crack in heat affected zone and fracture carried out in heat affected zone. Fracture which carried out 304 SS material jointed TIG welding is ductile. Fracture of the specimens showed an intragranular fracture. Microstructure analyses reveal austenite, lathy ferrite and skeletal ferrite. Transition zone or HAZ demonstrates obviously a dendrite structure.

HeeSeon Banget et al. [5] have examined the mechanical characteristics of the stainless steel (STS304L) hybrid welded butt joints. Two-dimensional thermal elasto-plastic analysis has been carried out and he found that thermal behaviour of the SAW shows ellipsoid isothermal distribution, however, thermal behaviour of the hybrid welding shows combination of ellipsoid and line distribution that characterize the heat source of both arc and laser welding. It was observed that the temperature at the weld region is exposed to faster rate of heating and cooling in hybrid welding than SAW. Lower heat input, faster cooling rate and smaller volume of the weld metal than SAW process were the reason for lower residual stresses in hybrid welds. Because of sufficiently large cooling rate, the weld metal of both hybrid and SA welded joints exhibits very fine dendritic structure. However, as a result of larger heat input of SAW process, the HAZ of SA welded joints became more than two times thick, than that of hybrid welded joints. As for welding process, in terms of the mechanical and microstructure characteristics, hybrid welded joints seems to be advantageous compared to SA welded joints.

Jiang Qingleiet et al. [6] have studied the microstructure characteristics in TIG welded joint of Mo–Cu composite and 18-8 stainless steel. He found that the welding of Mo–Cu composite and 18-8 stainless steel was carried out by Tungsten Inert Gas welding with Fe–25 wt.%Cr–13 wt.%Ni fillet wire. Austenite and netted ferrite structures were obtained in weld metet al. The fusion zone near 18-8 stainless steel exhibited d-ferrite and austenite matrix. Microstructure in the fusion zone at Mo–Cu composite side was ferrite and austenite. Cu agglomeration regions formed in Mo–Cu composite HAZ. From the weld metal to the fusion zone boundary near Mo–Cu composite, the microhardness increased gradually. And the microhardness reached peak value HV1225 near the Mo–Cu composite boundary close to fusion zone due to the formation of Fe–Mo intermetallic compound. Analysis of XRD indicates the formation of c-Fe (Ni) phasesand Fe0.54Mo0.73 and Cu3.8Ni compounds. Fe0.54Mo0.73 compound must have contributed to the high microhardness.

H. Ghazanfariet et al. [7] have demonstrated the the microstructure and mechanical properties of HTLA steel welds obtained by the tungsten arc welding and resistance spot welding and he found that After quench-tempered heat treatment, martensite microstructure produced from the weld zone has a higher hardness value than those produced from the HAZ and base plate, respectively. In spot weld sample, penetration of liquid phase to base plate causes 0.1 mm bands with the same hardness as weld. Heat affected zone in TIG weld sample is larger than the same

Region in spot weld sample due to the shorter welding time in resistance spot welding. The microstructure of weld metal and HAZ in spot weld was finer than the same regions in TIG weld and also the mean hardness of these two regions in spot weld was higher due to the higher cooling rate in resistance spot welding.

P. Bala Srinivasanet et al. [8] investigated microstructural and electrochemical characterization of a thin-section dissimilar stainless steel weld joint. He found that Weld joints

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comprising MSS and ASS can successfully be accomplished without the problems of cracking, with weld metals having a dual phased structure and over-matched mechanical properties. In terms of corrosion behaviour, the composite region comprising the weld metal/ASSHAZ/MSSHAZ was found to be highly susceptible to pitting corrosion in neutral chloride solution similar to the MSS parent alloy. In acidic chloride solutions, despite having a distinctly different microstructural feature, the dissolution and pitting behaviour of the composite region was nearly the same as that of the MSS parent alloy, and the MSSHAZ portion of the composite region was found to be the vulnerable region for the corrosion damage.

LadislavFalatet et al. [9] studied microstructure and creep behaviour of dissimilar weldment between the tempered martensitic steel T91 and the non-stabilized austenitic steel TP316H with Ni-based weld metal (Ni WM). Microstructure analyses were performed using light microscopy, scanning and transmission electron microscopy and energy-dispersive X-ray spectroscopy. He found that the microstructure of martensitic T91 part of the studied martensitic/austenitic T91/TP316H weldment close to the Ni-based weld metal exhibits a typical HAZ region consisting of its coarse-grained and fine-grained part as a result of austenite-to-martensite phase transformation during the welding. In contrast, the HAZ microstructure of the austenitic TP316H part is exclusively formed of coarsened polygonal grains as a result of welding heat input without the participation of phase transformation. The microstructure of Ni-based weld metal ThermanitNicro 82 is very heterogeneous with respect to the size, morphology and distribution of grain boundaries and precipitates. The creep deformation and fracture behaviour of the investigated α/γ weldment is controlled by its martensitic T91 part. The lowest hardness of ICHAZ region corresponds to the region of the lowest creep strength of the studied T91/TP316H welded joint which was also supported by the microstructural observations.

M. Ahmadet et al. [10] have studied the Microstructure and characterization of phases in TIG welded joints of Zircaloy-4 and stainless steel 304L and he found that Zr(Cr, Fe)2 intermetallic compound and Zr2Fe–Zr2Ni eutectic phases have been observed in the molten zone of the TIG welded joints of the Zircaloy-4 and stainless steel 304L. The density of Zr(Cr, Fe)2 is about twice as compared to Zr2Fe–Zr2Ni eutectic phase. Hardness of the Zr(Cr, Fe)2 intermetallic compound is about three times higher compared to Zr2Fe–Zr2Ni eutectic phase. Density of Zr(Cr, Fe)2 intermetallic compound is low on the side of Zircaloy-4 as compared to stainless steel 304L.

Mallaiah Gurram et al. [11] have demonstrated the Effect of copper and aluminium addition on mechanical properties and corrosion behaviour of AISI 430 ferritic stainless steel gas tungsten arc welds and he found that the ferritic stainless steel joints fabricated by the addition of 2gAl(2.4wt.%) in post-weld annealed condition resulted in better tensile properties (ultimate tensile strength, yield strength and elongation%) compared to all other joints. This is due to the fine grain microstructure and also formation of precipitates such as Al4C3 and Al2O3 which are believed to be responsible for grain refinement in the weld zone. There is a marginal improvement in the ductility of ferritic stainless steel weldments by the addition of 2 g Cu (0.18 wt.%) in post-weld annealed condition compared to all other joints and base metal. This is attributed to the forma- tion of fine dimples in the weld zone of the ferritic stainless steel joints. The FSS welds made by the addition of 3 g Cu (0.25 wt.%) in as-weld condition resulted in increased hardness. This could be due to the precipitation hardening effect of copper.

IV. CONCLUSIONS

This paper provides a detailed literature review in the field of dissimilar metal weldments done by various researchers. The analysis of variety of dissimilar metal joints, appropriate welding processes, variations in mechanical and metallurgical properties has been shared. This paper has presented the various industrial aspects of dissimilar metal welding along with the changes in mechanical and metallurgical properties.

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CNC Process Parameter Optimization by Using ANN Approach

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***Abstract*—In this globalization era every organization looking after cost effective production. In flexible manufacturing system Computer Numerical Control (CNC) play an important role as organization can produce a variety of products. In this research work an attempt has been made to analysis the effects of input parameters such as speed (rpm), feed (mm/rev), and depth of cut (mm) and nose radius (mm) on response parameters such as material removal rate and surface roughness. The AHP approach has been applied to get the weightage of response parameter. In present study (artificial neural network (ANN) approach has been implemented to get optimize result. The application of MATLAB software has been used in present study.**

***Index Terms*— Machining, CNC, AHP, ANN**

I. Introduction

The main root of the CNC is the NC (Numeric Control) Machines which work on the main principle of coding. Coding is done for each and every move saved on magnetic tapes and the limitations of NC machines gave birth to CNC machines. The new control systems are termed as computer numerical control (CNC). Numerical control machining has been around for decades already, with its theory first developed in the late 1940s by the United States Air force mechanics. From here, MIT engineers took the idea to the next level. The whole concept of using computers to run machines like grinders, routers, mills and lathes was one outstanding process from the beginning, as it allowed companies to make complex cuts with utmost accuracy It overcome the traditional machining process because of non-requirement of more harder tool than work piece in conventional machining process.CNC machines are characterized by the availability of a dedicated computer and enhanced memory in the controller. These may also be termed "soft wired numerical control". Information can be stored in a memory bank. The program is read from a storage medium such as the punched tape and retrieved to the memory of the CNC computer. Some CNC machines have a magnetic medium (tape or disk) for storing programs. This gives more flexibility for editing or saving CNC programs. Figure 1 illustrates the general configuration of CNC Control unit Greater flexibility, improved production planning and control.

An attempt has been made to optimize the cutting parameter of end milling process of the halloysite nanotubes (HNTs) with aluminum reinforced epoxy hybrid composite material under dry condition.

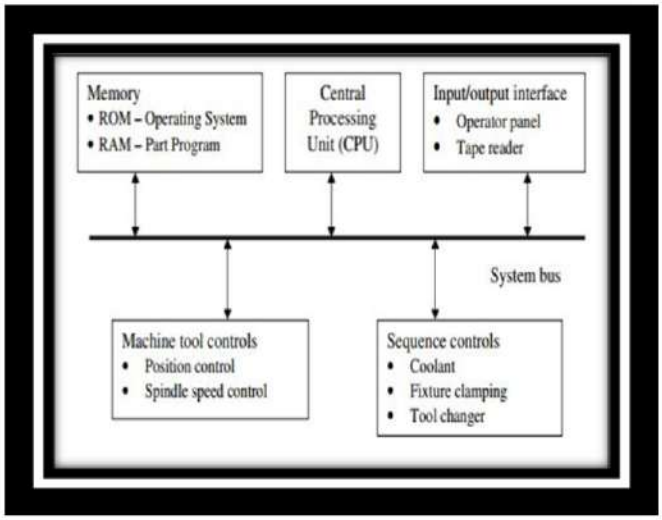

Fig. 1. Configuration of CNC Control Unit.

The Taguchi method was applied to get the optimize parameter setting. The three input parameter such as depth of cut, cutting speed and feed rate and output parameter such as surface roughness has been examined. The micro-structure surface morphology study was demonstrated to get the more reliable result (Pang et al.)

AN attempt has been made to reduce the error present in CNC machine tool by proper feedback and control of machining process and environmental parameter. This study narrates the dimensional and geometrical errors of real three-axis milling machining operations. To validate the purposed simulation work free form profiles and surfaces of virtual and real machined parts were compared and it was shown that result was more realistic Soori et al., 2013). A framework has been developed to utilize the energy consumption in CNC machining. The mathematical model has been developed to get the solution of multi-criteria process planning systems such as process planning of energy consumption. Two different experiment was performed to validate the results (Newman et al., 2012).An effort has been made maintain the milling cutter axis in parallel with the straight lines of the ruled surface. The five-axis CNC interpolator was implemented to achieve the above mentioned goal. The new two G code of CNC programming was developed to produce part surfaces in CNC

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milling machines (Lin and Koren, 2000). Neuro based hybrid models for prediction of machining parameters in CNC turning process. Experiments are designed based on Taguchi's Design of Experiments (DOE) and conducted with cutting speed, feed rate, depth of cut and nose radius as the process parameters and surface roughness and power consumption as objectives. Results from experiments are used to train the developed Neuro based hybrid models Ahilan et al., 2013).

II. Research Methodology

A. Data Collection.

- The data was collected through Experiment performed in workshop. The input parameters such as Speed (rpm), Feed (mm/rev.), D.OC (mm) and Nose radius and output parameters such as MRR, Surface roughness and time has been considered in experiment work. The value of experiment data is shown in Appendix A.

B. Analytical Hierarchy Process (Satty, 1980)

- AHP has been used for solving complex decision-making problems in various disciplines such as strategic planning, knowledge management, logistics, pharmacy department, mergers and acquisitions (M&A) strategy and others. In recent years, there have been many applications of the ANP in a variety of problems, logistics, purchasing, production, project management, and product design.

1) Step 1:- Degree of preference;

The degree of preference or intensity of the decision maker in the choice of each pair-wise comparison used in this model is quantified on a scale of 1-9. This scaling process can then be then translated in priority weight (scores) for comparison of alternatives. Even number (2, 4, 6, 8) can be used to represent compromises among the preference above. The suggest numbers used in this model to express degree of preference are shown in Table 1.

2) *Step 2:-* The degree of preference or intensity Description of selected factors (sub-objectives) for decision making. In this research work an attempt has been made to analysis the effects of input parameters such as speed (rpm), feed (mm/rev), and depth of cut (mm) and nose radius (mm) on response parameters such as material removal rate and surface roughness.

3) Step 3:- The Pair-wise comparison of different sub – objectives. The importance of i^{th} sub-objective is compared with j^{th} sub-objectives is calculated.

	MRR	Surface Roughness	Time	Weigtage
MRR	1	2	5	0.582
Surface Roughness	1/2	1	3	0.309
Time	1/5	1/3	1	0.109

4) Step 1:- Normalized matrix of different sub – objectives.

After a pair-wise comparison matrix is obtained, the next step is to divide each entry in column by the sum of entries in column to get value of normalized matrix.

The normalized value r_{ij} is calculated as

$$r_{ij} = a_{ij} / \sum_{i=1}^{n} a_{ij}$$

Thus, the approximate priority weight (W_1, W_2, W_j) for each attribute is obtained as shown in Table 2.

$$W_j = 1/n \times \sum_{i=1}^{n} a_{ij}$$

III. Artificial Neural Network

After the text edit has been completed, the paper is ready for the template. An artificial neural network (ANN), usually called neural network (NN), is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural networks. A neural network consists of an interconnected group of artificial neurons, and it processes information using a connectionist approach to computation. In most cases an ANN is an adaptive system that changes its structure based on external or internal information that flows through the network during the learning phase. Modern neural networks are non-linear statistical data modeling tools. They are usually used to model complex relationships between inputs and outputs or to find patterns in data.

An ANN is typically defined by three types of parameters:

1. The interconnection pattern between different layers of neurons
2. The learning process for updating the weights of the interconnections
3. The activation function that converts a neuron's weighted input to its output activation

IV. Real Life Application

The tasks artificial neural networks are applied to tend to fall within the following broad categories:

- Function approximation, or regression analysis, including time series prediction, fitness approximation and modeling.
- Classification, including pattern and sequence recognition, novelty detection and sequential decision making.
- Data processing, including filtering, clustering, blind source separation and compression.
- Robotics, including directing manipulators, Computer numerical control.

V. Conclusion

In this work an AHP approach has been implemented to get the weightage of response parameter. Then ANN was so

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applied to get the optimization result of process parameter. An algorithm has been developed in MATLAB to get the reliable result. This resent study help to achieve the best optimize best process parameter setting. The more parameter can be included for future works. The different approach can be used to validate the result. The latest algorithm such as Teaching Learning Based Optimization (TLBO) can be used to get global optimal results.

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Comparative Review on Dissimilar Metal Weld Joints and Stress/Strain State of Weld

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***Abstract* - The aim of this review is to provide a complete view of the reported experiences with investigations and research into dissimilar weld joints. This literature provides a complete review of metallurgical properties of dissimilar weld joints, stress/strain of the weld and mechanism of joint failure of dissimilar joints. It has been evaluated that the majority of failures have been associated with austenitic stainless steel filler metal joints.it has been found that the joint design —groove angle —and weld quality interrelationship is considered by many to be a significant variable. The type of weld metal is of major significance from the diffusion and thermal restraint standpoints.**

***Keywords*: Weld, Joint, dissimilar metals.**

I. INTRODUCTION

The open literature provides a relatively complete picture of the general subject with the details of the metallurgical characteristics of the interface zones between filler metal and base metal except for the magnitude of the problems associated with dissimilar weld joints .The level of the problem with the service ability of dissimilar joints has a differentmagnitude depending on one's vantage point. For example, those who have to deal with stainless filler metals perceive and realize in practice far more substantial difficulties than do those who have to treat the nickel-base filler metal dissimilar joints. In the accomplishment of mechanical properties, almost all investigations recognized the same factors although the variables are given different credence in many instances.

II. REVIEW OF THE LITERATURE

The chronology of use of dissimilar weld joints revealed the first concerted use of austenitic filler metals by Krupp for armor steels. In the 1940's transition joints were manufactured and/or fabricated for use in boilers. These early joints were made with austenitic stainless steel filler metals.In the 1950's and 1960's there was an increase in the use of transition joints for boiler service, especially as steam temperatures rose to 1050°F (566°C). The 1970's and 1980's have seen increases in both the use andfailure incidents of dissimilar metal joints.

Dissimilar metal welds are used in nuclear power plants and in oil refineries at locations where two different types of materials, e.g., carbon steel and stainless steel are joined.The nickel-base alloy dissimilar metal welds are typically made of Alloy 182 and Alloy82. Recently, Alloy 52 has started to be used both in new constructions as well as inrepair welding. The trend towards alloys with higher amounts of chromium is driven bythe observed cracking in Alloy 182, and recently also in Alloy 82. One driving forcetowards what are today believed to be more resistant alloys is also the challenges andcosts related to non-destructive examination of dissimilar metal welds.

As the literature is read and the reporting's of failure investigations noted, anumber of general facts emerge which most investigators can support from theirown experience. (It should be noted here that the majority of failures have been associated with austenitic stainless steel filler metal joints, and it is currently heldby some investigators that the failure mode with the nickel-base filler metals is fundamentally different than that with the austenitic stainless fillers.) The generalfacts are as follows:

- Failures occur almost invariably in the HAZ of the ferritic component adjacent to the weld interface.
- The carbon-depleted (soft) zone in the low alloy material is essentially ferriteand carbide. The carbon-enriched (hard) zone may contain many constituents but carbides predominate.
- The joint design —groove angle —and weld quality interrelationship is considered by many to be a significant variable.
- Tensile properties of the weld and the base metals were essentially unchanged fromnew material properties.
- The relative expansion coefficients of the various weldment regions are extremely important with regard to thermal stress generation
- PWHT contributes to earlier failures in both stainless and Ni-base filler metal transition joints
- Bending and vibration stresses are conceded to play a major but loosely defined role. They may provide an explanation for the apparent variability of service life.
- The type of weld metal is of major significance from the diffusion and thermal restraint standpoints.

III. METALLURGICAL PROPERTIES OF WELDS

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Welding opens up the possibility to productunexpected phase propagation and a series negative metallurgicalchange such as delta ferrite phase, grain boundarycorrosion, strain corrosion and sigma phase occurs at thewelding interface. Therefore, extensive care and precautionslike pre and post heat treatment or quick weldingspeeds are required to produce the good metallurgical properties.

- The micro-segregation which occurs in weld fusion zones of dissimilar metals leads to a situation where inter-dendrite regions are enriched in Fe, Cr and C. This segregation within the dendrite structure results in deterioration of the mechanical properties and corrosion resistance of the joints.
- Higher hardness at weld interface can be due toenrichment of this zone with Fe, Ni and Cr and subsequent formationof intermetallic FeNi/CrNiFe phases in the case of Ni based alloys.
- Dissimilar weld of alloy steel and stainless steel, the soft zone obtained on the low alloy steel can be ascribed to carbon depletion whereas enrichment in the stainless steel side results leads to the formation of hard and brittle carbide phase formation.Chromium and nickel diffuse towards low alloy steel from the stainless steel whereas iron diffuses from low alloy steel side towards stainless steel.
- In the case of dissimilar weldments,the coefficients of thermal expansion differ for base metal,weld and the scale.This difference generates thermal stresses during cooling which may affect adhesion property of scale.
- Fusion welding of dissimilar steels have problem that long waiting time which lead to grain boundary corrosion between grains and probably to be arisen chrome-carbide precipitate at 450-850°c.Thus to avoid this friction welding is most suitable.

Stress/Strain State of Welds

Cracking cannot occur in the absence of stress (strains), regardless of themicrostructure and/or its condition. For cracking to occur, the strains imposed onthe various Microstructural regions by weldment loadings must exceed thestrain tolerance of the microstructure in one of the regions. It is often simpler andmore convenient to talk of stresses.However, in the case of transition joints,it is probably more relevant to discuss the behavior in terms of strain.

The stresses and strains produced with the production and use of dissimilar weld jointsarise from

- Difference in expansion coefficients of the base metals and filler metals (with the greatest difference being evident for stainless filler metals and ferritic base metals). Simple heating and cooling of joints with different coefficients producestangential, longitudinal and radial componentsof stress. The radial or shearcomponent is the most difficult to treat(especially if weld interface properties areunknown) and probably the most importantwith regard to behavior
- Joint configuration — basically groove or bevel angle — controls shearing and other stresses. Graded transition joints mitigate joint configuration influences as well as differential expansion stresses.
- External bending stress and vibration loadings are considered very important but are difficult to assess.
- Plastic flow occurs by creep to relieve the imposed strains/stresses while the joint is at elevated temperature leading to a creep/fatigue type of damage in the microstructure.
- The number of cycles and the times at the temperatures during cycling are important in the damage introduced into the soft zone even in the absence of any external loadings.

  The final result of the strain accommodation in the soft zone is cavitations and cracking.

IV. MECHANISM OF WELD JOINT FAILURES

It should again be noted that in the majority of the failures the filler metal was austenitic Stainless steel and some investigators indicate that the failure mechanism with the Ni-base filler metals may be different. The general consensus concerning the mechanism of dissimilar metal joints failure can be summarized as follows:

- The strain accumulation in the carbon depleted softened zone is relieved by creep at elevated temperature.
- The carbon-depleted soft ferritic zone is constrained by the surrounding harder and stronger material and is subjected to strains induced by:
  a. Thermal expansion
  b. Mismatch
  c. Bending
  d. vibration and pressure
- The formation of the carbon depleted zone is the initial step and any treatment which accelerates the formation of this zone will enhance failure probability.Creep damage in the form of cavitations,grain boundary sliding and tearing results in cracking in the carbon-depleted soft zone along and adjacent to the weld interface.The mechanism postulated combines the reporting's of many investigators and may seem over-simplified. However, complete operational information is seldom available on failed transition joints, and the metallurgical aspects are not rigorously defined. The difference in thinking concerning the Ni-base filler metals involves the reduction in rate of formation of the carbon-depleted zone and the establishment of very complex microstructures in the carbon-enriched hard zone. It is considered by some investigators that the complex Microstructural constituents and their time dependent formation are the controlling factors in the Ni-base filler metal failure occurrences. The picture is less complete in regard to Ni-base filler metal transition joints however.
- As the nature of the failure phenomenon became clearer (over a period of years) methods for minimizing failures evolved. To mitigate against failure the following considerations have been cited:

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a) Closer match of expansion coefficients in the transition joint components, i.e., Ni-base filler metals.
b) The use of "graded" transition joints or spool pieces which spread-out
c) Thecoefficient of expansion mismatch effect.
d) The use of stabilizing buttering techniques to minimize carbon migration.
e) Stabilization of the ferritic component with carbide formers to minimize carbon migration.
f) Elimination of PWHT which enhances carbon migration due to the temperatures employed.
g) Joint configuration choice and enhanced control of weld quality.

V. CONCLUSIONS

The review of the literature has revealed areas in which research and evaluationefforts need to be undertaken to better define the transition joint problem

- Better documentation of failures and more thorough failure analysis
- .Physical and mechanical property measurements of the zones at the interface including modulus, CTE, tensilestrength and creep rupture properties
- Microstructural studies to more clearly characterize the joint interface including the "soft" carbon-depleted zone and the "hard" carbon-enriched zone.
- Chemical analysis profiles for all elemental species across the interfaceregion.
- Stress analysis work utilizing measured properties and encompassing thestress relaxation by creep during cycling.
- Better test procedures incorporating axial loading, bending, fatigue, and internal pressure.

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Design Analysis and Performance of Tesla Turbine

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Abstract - **This paper presents results of the design analysis of a Tesla bladeless turbine. Numerical calculations of flow in several Tesla turbine models were performed for a range of design parameters. An analysis of the performance and efficiency of the disc turbine is carried out. It has been determined that surface roughness and spacing affects the performance of the multiple disc turbines significantly. Results of investigations exhibit interesting features in the distribution of flow parameters within the turbine interdisk space.**

Keywords - **Tesla turbine, flow efficiency, calculations**

I. INTRODUCTION

The Tesla turbine is a bladeless centripetal flow turbine patented by Nikola Tesla in 1913. It is referred to as a bladeless turbine because it uses the boundary layer effect and not a fluid impinging upon the blades as in a conventional turbine. The Tesla turbine is also known as the boundary layer turbine, cohesion-type turbine, and Prandtl layer turbine. The design makes use of the effects which occur in the boundary layer flow between the rotating disks placed very close to one another. Distances between disks are very small. The highest value of efficiency appears when they are approximately equal to the double boundary layer thickness. The efficiency of the Tesla turbine depends on many parameters, namely on: pressure, temperature, inlet medium velocity, number, diameter, thickness and distance between the disks as well as on the state of the disk surface, rotational speed of the rotor, flow kinematics at the inlet to and outlet from the turbine, etc. In the subject-matter literature, examples of experimental research referring to the following models of Tesla micro turbines can be found. High velocity water enters tangentially to outer periphery of the disk pack through inlet nozzle; it forms boundary layer on either side of discs. The pressure ratio is pushing it towards the center of the turbine. It forms a helical path down into the center of the device, and exit in the center, after it has transmitted all of its energy to the discs through the boundary layer drag.

Tesla intended to use his turbine to propel aircraft, in geothermal power plants, in cars instead of pistons, for vacuum pumps, for compressing air and liquefying gases. His turbine, with discs 22.5 cm in diameter and entire rotor 5 cm thick, used steam as propulsive fluid and developed 110 horse power.

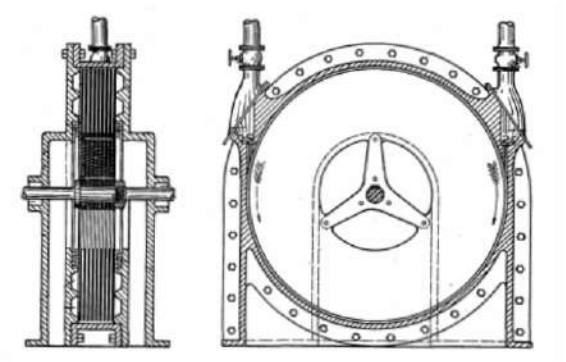

Fig 1 View of Tesla turbine "bladeless" design

In general, spacing should be such that the entire mass of fluid, before leaving the rotor, is accelerated to a nearly uniform velocity, not much below that of periphery of the discs. An efficient turbine requires small inter-disc spacing (0.4 mm in a steam powered type). Discs must be maximally thin to prevent drag and turbulence at the edges. But metallurgical technology in Tesla's time was unable to produce discs of sufficient rigidity to prevent warping at high rotation rates. This drawback is probably the main reason why the turbine was never commercially interesting

Experimental works aimed first of all at establishing relationships between the turbine efficiency and parameters given below:

- Distance between the micro-turbine disks;
- Number and diameter of the micro-turbine disks;
- Number of inlet nozzles to the micro-turbine;
- Rotational speed of the rotor;
- Medium inlet pressure;
- Medium inlet temperature;
- Medium inlet velocity and inlet angle;
- Corrosion and erosion of micro-turbine elements;
- Constructional materials (composites, ceramic materials, bronzes, aluminium alloys);
- Kind of medium flowing through the micro-turbine

II. LITERATURE REVIEW

Several authors have studied Tesla turbines in order to gain insight into their operation. In the 1960s, Rice[10] and Breiter.[1] conducted extensive analysis and testing of Tesla turbines. However, Rice did not directly compare

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experimental data to analytical results and lacked an analytical treatment of the friction factor. Breiter [1] provided a preliminary analysis of pumps only, and used a numerical solution of the energy and momentum equations. Hoya[11] and Guha extensively tested sub-sonic and super-sonic nozzles withTesla turbines, however their analysis was focused on experimental results and not an analytical treatment of the fluid mechanics that drive turbine performance. Krishnan [12] tested several mW-scale turbines, and reported 36% efficiency for a 2 cc/sec flow rate with a 1cm diameter rotor.

Carey[2] proposed an analytical treatment that allowed for a closed-form solution of the fluid mechanics equations in the flow in the rotor; however, Carey's model analysis invoked several idealizations that neglected viscous transport in the radial and tangential directions, and treated lateral viscous effects using a friction factor approach.

Nikola Tesla [4] has filed a patent for a Disk Turbine which uses smooth rotating disks inside a volute casing. In his patent, Tesla described the motive forces of his machinery as being dependant on the fluid properties of viscosity and adhesion.

Romanin [9] applied Carey's [2] solution to flow through the rotor to test data for a 73 mm diameter turbine running compressed air. In this study, Romanin [8] outlines several performance enhancement strategies based on the combination of test data and Carey's analytical solution to flow in the rotor, including decreasing disk spacing, increasing turbine speed, and increasing the number of disks (or decreasing the mass flow rate per disk). Romanin also raised issues concerning several of the assumptions made in Carey's analytical model, including the assumption that flow is axisymmetric when most Tesla devices use a discrete number of nozzles and the lack of focus on nozzle design. The conclusions of this study motivated the present study, which aims to improve on the analytical treatment of flow in the rotor presented by Carey [2], to address issues of nozzle flow and non-axisymmetric rotor flow, to provide tools for predicting the pressure drop through the rotor, and to make further recommendations for Tesla turbine design and application.

Croce [3] used a computational approach to model conical roughness elements and their effect on flow through micro channels. Like Kandlikar, he also reports a shift in the friction factor due to surface roughness, and compares the results of his computational analysis to the equations proposed by several authors for the constricted hydraulic diameter for two different roughness element periodicities.

Gamrat [7] provides a detailed summary of previous studies reporting Poiseuille number increases with surface roughness. He then develops a semi-empirical model using both experimental data and numerical results to predict the influence of surface roughness on the Poiseuille number. Gamrat's analysis, to the best of the author's knowledge, is the most thorough attempt to predict the effects of surface roughness on the Poiseuille number of laminar flow in micro channels.

H.S.Couto, J.B.Duarte and D.Bastos-Netto [6].reviews the physical principles behind the Tesla Bladeless Turbine, using basic fluid mechanics only, Considered the relative motion of rotating surfaces, it sets up the transport equations describing the flow between parallel rotating disks, estimated the boundary layer thickness under laminar and turbulent regimes, leading to expressions yielding the width between consecutive disks. H.S.Couto explained how to calculate the total number of disks required to attain the desired performance. Finally also described the device behavior acting as an air compressor or water pump and noticed that the as a unit source of rotating motion, these Tesla machines can run under a very wide spectrum of not only fuels but also fluids in general

III. THEORETICAL ANALYSIS

Let us consider water incompressible fluid selected for performance measurement with assuming flow is study flow.
For sample calculation following data considered
Constant parameters:-
Spacing between discs: 3mm, Medium: water
Disc Thickness: 3mm, Outlet Nozzle Size: 35mm^2
Material of Discs: SS304, Disc Dia.: 155mm
Inlet Size: 23mm^2, No. of Discs: 6
Surface Finish: smooth, Flow Rate: 0.25 lit/s., Pressure: 20psi
We Know

$$P_1/\rho g+V_1/2g+Z_1=P_2/\rho g+V_2+Z_2 \qquad (1)$$

Where,
P_1=Pressure at pt. 1, V_1=velocity at pt. 1, $Z_1=Z_2$=Pressure head (at same elevation), P_2=pressure at pt. 2, V_2=velocity at pt. 2, ρ=Water density= 1000kg/m^3, g= 9.81m/s^2

We know flow rate i.e. Q=0.25lit/s, P_1=20psi= 1.37 bar
By continuity equation:-

$$Q=A_1V_1=A_2V2 \qquad (2)$$

Where A_2=area of cross section at pt.2=23mm^2=2.3 x 10^-5 m^2
And $A_1=\pi/4 \times (d)^2 =\pi/4 \times (0.155)^2 =0.01886$ m^2
$V_1=Q/A_1=0.00025/0.01886 = 0.0132$ m/s
$V_2=Q/A_1 =0.0025/(2.3 \times 10^{-6}) = 10.869$m/s

Now put the values of V_1 & V_2 in equation (1) to get P_2. But both $Z_1=Z_2$=both pt. at the same level. Now eq. (1) becomes

$$P_1/\rho g+ V_1/2g =P_2/\rho g+ V_2/2g$$

$$P_2= \{(1.37 \times 10^5/1000 \times 9.81) + (0.0132/2 \times 9.81) - (10.869/2 \times 9.81)\} \times 9810$$

$$P_2=0.76 \text{ bar.}$$

Now P= F/A
We know the value of P_2. Put this value in equation to get force acting on Discs thickness.
F=$P_2 \times A_2 =0.76 \times 10^5 \times 2.3 \times 10^{-5}$ =1.748 N (Force acting on 3mm area only)
But we know the jet force formula from Peltan Turbine:-

$$F = \rho A (V - U)^2 \text{Cos } ø \qquad (3)$$

Where A = Jet area = A_2, V= velocity of jet= 10.869 m/s,
U = relative velocity of discs and ø = 10^0
Now put these values in equation (2) to get U:-
$(V - U)^2 = 1.541/ (1000 \times 2.3 \times 10^5 \times \text{Cos}10^0)$
$V - U = 8.78$
$U = V - 8.78$

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U = 2.084 m/s

We know the angular momentum for rotating part

$$L = m\ r\ U \quad (4)$$

Where L= angular momentum and r = radius of disc.

But $L = I\ \omega$ (5)

Where I= moment of inertia and ω= angular velocity

In this case

$$I = I_{SHAFT} + I_{DISCS} \quad (6)$$

$I_{SHAFT} = MR^2$

Where M = mass of shaft = 1.08 kg

R = Radius of the shaft = 15mm

$I_{SHAFT} = 1.08 \times (15/1000)^2 \times 9.81 = 0.0238\ Nm^2$

$I_{DISCS} = 1/2 \times M_d (a^2 + b^2)$ (7)

Where M_d = mass of disc =0.300 kg, a = inner radius of disc = 32mm and b = outer radius of disc = 78mm

$I_{DISC} = 1/2 \times 0.300 (0.032^2 + 0.078^2)$

$= 0.00102\ Nm^2$

For 6 Discs

$I_{DISC} = 0.00102 \times 6 = 0.00612\ Nm^2$

From equation (5):-

$I = 0.0238 + 0.00102 = 0.0248\ Nm^2$

Now from (3) and (4)

$\omega = m\ r\ U/I = (2.82 \times 0.078 \times 2.084)/0.0248$

$\omega = 18.48$ rad/sec

But $\omega = 2\pi N/60$

$N = (18.48 \times 60)/2\pi = 176.75$ rpm

Now Torque 'T' =F x R

$T = 1.748 \times 0.078 = 0.136$ Nm

Power 'P' = $(2\pi NT)/60$

By putting the values of N and T we get

Therefore $P = (2\pi \times 176.75 \times 0.136)/60$

P = 2.51 watt.

IV. RESULTS AND DISCUSSION

Torque on the shaft is measured by Prony Break Dynamometer. The methodology for the use of this device is simple. Essentially the measurement is made by wrapping a belt around the output shaft of the unit and measuring the force transferred to belt through friction. The friction is increased by tightening the belt until the frequency of rotation of the shaft is reduced. In its simplest an engine is connected to rotating drum by means of output shaft. A friction band is wrapped. Around half the drum's circumference and each end attached to a separate spring balance. A substantial pre-load is then applied to the ends of the, so that each spring balance has an initial and identical readings. When the engine is starting the frictional between the drum and the band will increased the force reading on one balance and decrease it on the other. The difference between the two readings is used to calculate torque, because the radius of the driven drum is known. Once we knew the spring balance we can determine the torque by equation.

$$T = (D + t_b) \times 9.81 \times S \quad (8)$$

Where D = Drum Dia., t_b = Belt thickness, S = Spring Balance

Then the output is calculated by

$P = (2\pi NT)/60$

To determine the efficiency we have to determine I/P power by the following formula

Input power = $P_{I/P} = \rho\ Q\ h$ (9)

Where ρ = Density of water, Q = flow of fluid m^3/s, h = Water column height

But $P_{Line} = \rho \times h$ (10)

$P_{I/P} = P_{Line} \times Q$ (11)

Hydraulic Efficiency = $Power_{O/P} / Power_{I/P}$ (12)

By Considering 1 Case for sample calculations of efficiency

$Q = 0.25$ lit/s = $2.5 \times 10^{-4}\ m^3/s$

$P_{Line} = 0.76$ bar = $0.76 \times 10^5\ N/m^2$

Hydraulic Efficiency = $2.5 \times 10^{-4} \times 0.76 \times 10^5$

= 19 %

V. CONCLUSION

Study and analysis of this work come to conclusion that Number of discs, spacing between discs and surface finish of discs affects the performance of turbine significantly This work was carried out to study performance of disc turbine operating on water medium, however previous studies and experimentation carried out with air and steam medium. Rotor speed increases with number of discs up to a certain level due to increasing area of contact of jet water and wall and it leads to the increase in friction force and boundary layer effect. For wide spacing between the discs it works as impulse turbine only. For appropriate spacing between discs it works with impulse force and also boundary layer effect. For minimum spacing equipment vibration also increases for high speed compare to maximum gap, Hence vibration analysis became important factor. Analysis showed that the losses occurring in the nozzle are large and hence this needs to be tackled for improving the overall efficiency of the Tesla disc turbine.

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Influence of Current Flow Rate on Tensile Strength of SS-316 MS-2062 Weld Joint in MIG Welding

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***Abstract*: *This work was carried out in order to study the mechanical* behavior of welded joints of SS 316 with MS 2062. Welding input parameters play a very significant role in determining the quality of a weld joint. It has been observed that when current flow rate of inert gas (co_2) was increased the tensile strength got influenced. This experimental work helped in determining the welding input parameters that lead to the desired weld quality.**

***Keywords:* Gas flow rate, inert gas, tensile strength, SS 316, MS2062, weld joint**

I. INTRODUCTION

Gas metal arc welding (GMAW), sometimes referred to by its subtypes metal inert gas (MIG) welding or metal active gas (MAG) welding, is a welding process in which an electric arc is formed between a consumable wire electrode and the work piece metal(s), which heats the work piece metal(s), causing them to melt, and join. Along with the wire electrode, a shielding gas is fed through the welding gun, which shields the process from contaminants in the air.[2]Generally, the quality of a weld joint is directly influenced by the welding input parameters during the welding process; therefore, welding can be considered as a multi input multi-output process. Unfortunately, a common problem that has faced the manufacturer is the control of the process input parameters to obtain a good welded joint with the required bead geometry and weld quality with minimal detrimental residual stresses and distortion. Traditionally, it has been necessary to determine the weld input parameters for every new welded product to obtain welded joint with the required specifications. To do so, requires a time-consuming trial and error development effort, with weld input parameters chosen by the skill of the engineer or machine operator. Then welds are examined to determine whether they meet the specification or not. Finally the weld parameters can be chosen to produce a welded joint that closely meets the joint requirements. Also, what is not achieved or often considered is an optimized welding parameters combination, since welds can often be produced with very different parameters. In other words, there is often a more ideal welding parameters combination, which can be used if it can only determined.[1]

II. Mechanical properties

In any welding process, the input parameters have an Influence on the joint mechanical properties. By varying the input process parameters combination the output would be different welded joints with significant variation in their mechanical properties. Accordingly, welding is usually done with the aim of getting a welded joint with excellent mechanical properties. To determine these welding combinations that would lead to excellent mechanical properties. Different methods and approaches have been used to achieve this aim. The following is a review of some articles that utilized these techniques for the purpose of optimizing the welding process in order to achieve the desired mechanical properties of the welded joint.

III. Austenitic stainless steel:-

Austenitic Stainless Steel, such as the type 300 series, contains sufficient amounts of chromium to guarantee corrosion resistance, along with nickel to ensure the austenitic phase at room temperature. 304, 308, 309, 310, 316, 320, 321, 347 etc are comes under the austenitic steels category. The basic composition of traditional stainless steel includes 18% chromium and 8% nickel alloy, but can also includes alloys of molybdenum, titanium, niobium, copper and nitrogen. Austenitic stainless steels have high ductility, low yield strength and relatively high ultimate tensile strength, when compare to typical carbon steel. Because of their excellent corrosion resistance, better creep rupture strength at high temperature, and impact resistance at low temperature, austenitic stainless steels are often used in industrial plants, chemical processing, food production, marine hardware, furnaces, heat exchangers, gas turbines and cryogenic vessels. [3, 7, 8, 10]

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Austenitic stainless steels exhibits considerably higher thermal expansion than other stainless steels and the thermal conductivity is generally lower than that of carbon steel. Such characteristics cause a serious thermal series in applications with temperature fluctuations, heat treatment of complete structures and on welding. [4, 5, 6]

IV. Stainless steel 316 (Properties & applications):-

In metallurgy, stainless steel, also known as inox steel or inox from French "inoxyable", is defined as a steel alloy with a minimum of 10.5 or 11% chromium content by mass. Stainless steels does not corrode, rust or stain with water as ordinary steel does , but despite the name it is not fully stain proof. It is also called corrosion-resistant steel or CRES. When steel grades and the alloy types are not detailed, particularly in the aviation industry. There are different grades and surface finishes of stainless steel to suit the environment the alloy must endure. Stainless steel differs from carbon steel by the amount of chromium present. Unprotected carbon steel rusts readily when exposed to air and moisture. This iron oxide film is active and accelerates corrosion by forming more iron oxide. Stainless steel contains sufficient chromium to form a passive film of chromium oxide, which prevents further surface corrosion and blocks corrosion from spreading into the metals internal structure.[3, 11, 13, 14,15]

The common applications are of stainless steels are given below:-

1. Oil & petroleum refining equipment
2. Food processing equipment
3. Pulp and paper processing equipment
4. Soap & photographic handling equipment
5. Textile industry equipment
6. Architectural equipment
7. Pharmaceutical processing

2.2.1 Mechanical properties of stainless steel 316:-

Hardness, Rockwell B	79
Tensile strength, Ultimate	558 Mpa
Tensile strength, Yield	290Mpa
Elongation at Break	50%
Modulus of Elasticity (Tensile)	193 Gpa
Modulus of Elasticity (Torsion)	77 Gpa

V. SA-2062 (Properties & application):

This standard was formerly known as IS-226. Now IS-2062 has replaced this specification. Mild steel is the most common form of steel because its price is relatively low whole it provide material properties that are acceptable for many applications. Low carbon steels contain approximately 0.05-0.015% carbon and mild steel contains 0.16 to 0.29% carbons; therefore, it is neither brittle nor ductile. It has relatively low tensile strength, but it is cheap and malleable; surface hardness can be increased through carburizing. The density of mild steel is approximately 7.85g/m^3 and modulus of elasticity is 210 Gpa. [16, 17, 18]

VI. Experimental work

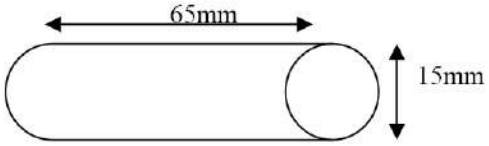
In this experimental study firstly, work piece of stainless steel-316 and mild steel-2062 of following cylindrical dimensions were prepared before MIG welding.

The dimensions for SS-316 are:

Number of work pieces: 09

Length of work piece: 65mm

Diameter of work piece: 15mm



The dimensions for MS-2062 are:

Number of work pieces: 09

Length of work piece: 65mm

Diameter of work piece: 15mm

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After preparing the required above dimensions work pieces, one end of the each work piece was 45^0 taper turned on lathe machine, then after SS-316 and MS-2062 designated work pieces were welded on MIG welding setup with required parameters as discussed in conclusion. [19, 20, 21]

CONCLUSION

To study the influence of process parameter (gas flow) on the weld joint of SS-316 and MS-2062 and to get the optimum values for this parameter, the prepared work pieces were welded on the experimental setup of MIG welding by making other process parameters like current, voltage and current flow rateat constant, consequently, for each variation in gas flow parameter 3specimen's were generated.

Observations in Mechanical analysis as below:

MIG WELDING SETUP USED: WELDING SET MODEL (SOHAL 202-XL) WIRE MATERIAL: copper coated steel WIRE DIAMETER: .08mm

Other Process Parameters were at constant value

WIRE SPEED RATE: 4metre/ min. INERT GAS: CO_2 CURRENT VARIATION: (80-150amp.)

SPECIMENS	CURRENT FLOW RATE	TENSILE STRENGTH
1st	80-100AMP	209.3 Mpa
2nd	80-100AMP	225 Mpa
3rd	80-100AMP	216 Mpa

Mean value of tensile strength (recorded):216.7MPa

SPECIMENS	CURRENT FLOW RATE	TENSILE STRENGTH
1^{st}	100-120AMP	443.6Mpa
2^{nd}	100-120AMP	502.6 Mpa
3^{rd}	100-120AMP	346 Mpa

Mean value of tensile strength (recorded):430.7MPa

SPECIMENS	CURRENT FLOW RATE	TENSILE STRENGTH
1^{st}	120-150AMP	519.5Mpa
2^{nd}	120-150AMP	502.1Mpa
3^{rd}	120-150AMP	532..4Mpa

Mean value of tensile strength (recorded): 518MPa

The above mechanical analysis give an conclusion about the mechanical behavior of weld joint with the variable gas flow parameter to achieve the optimum value for this process parameter. The optimum mean value of tensile strength that is: 518Mpa achieved in this analysis for current flow rate10litre/min, gives us a helpful study for optimizing the process parameters regarding SS-316, MS-2062 weld joint in MIG welding process.[9, 10, 11, 12]

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Use of Alumina Slag as a Strengthener for Changing the Properties of Aluminium

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Abstract: **In industrial field number of material are used as per their special properties for number of application. Aluminium is used in industry due its light weight, low melting point and long time performance. Metal matrix composites are used mostly in space ships, aerospace, automotive, nuclear, biotechnology, electronic and sporting goods industries, but due to their high cost, experiments are usually done to decrease the cost of the composites. The Alumina Slag material during production of alumina from bauxite by the Bayer's process comprises of oxides of iron, titanium, Aluminium and silica along with some other minor constituents. Different avenues of Alumina Slag utilization are more or less known but none of them have so far proved to be economically feasible or commercially viable. It is normally agreed that micro hardness and resistance to wear of MMCs is formed by strengthener and also the wear properties are improved extraordinarily by introducing hard inter metallic compound into the aluminium matrix. The reinforcing materials are generally SiC, Al2O3, TiO2 etc and are costly. In the present investigation a comparative study on sharp wear behavior of Aluminium metal matrix composite reinforced with alumina Slag, SiC and Al_2O_3 has been carried out.**

Keywords: **Alumina Slag, SiC, MMC.**

I. INTRODUCTION.

A composite material is a material composed of two or more constituents. The constituents are combined at a microscopic level and are not soluble in each other. Generally, a composite material is composed of strengthener (fibers, particles/particulates, flakes, and/or fillers) embedded in a matrix (metals, polymers). The matrix holds the strengthener to form the desired shape while the strengthener improves the overall mechanical properties of the matrix. When designed properly, the new combined material exhibits better strength than would each individual material. The most primitive man-made composite materials are straw and mud combined to form bricks for building construction [1, 2].

II. METAL MATRIX COMPOSITES:

Metal matrix composites (MMCs), like all composites; consist of at least two chemically and physically distinct phases, suitably distributed to provide properties not obtainable with either of the individual phases. Generally, there are two phases either a fibrous or particulate phase in a metallic matrix. For e.g. Al2O3 fiber reinforced in a copper matrix for superconducting magnets and SiC particle reinforced with in the Al matrix composites used in aero space, automotive and thermal management applications. For many researchers the term metal matrix composites is often equated with the term light metal matrix composites (MMCs). Substantial progress in the development of light metal matrix composites has been achieved in recent decades, so that they could be introduced into the most important applications. In traffic engineering, especially in the automotive industry, MMCs have been used commercially in fiber reinforced pistons and Aluminium crank cases with strengthened cylinder surfaces as well as particle strengthened brake disks. These innovative materials open up unlimited possibilities for modern material science and development; the characteristics of MMCs can be designed into the material, custom-made, dependent on the application [3].

III. MATRIX

The matrix is the monolithic material into which the strengthener is embedded, and is completely continuous. This means that there is a path through the matrix to any point in the material, unlike two materials sandwiched together. In structural applications, the matrix is usually a lighter metal such as Aluminium, magnesium, or titanium, and provides a compliant support for the strengthener. In high temperature applications, cobalt and cobalt-nickel alloy matrices are common [3].

IV. MATRIX MATERIAL

The most common matrix materials used in composite are as follows:

- Aluminium matrix
- Copper Matrix
- Titanium Matrix

V. STRENGTHENER

The role of the strengthener in a composite material is fundamentally one of increasing the mechanical properties of the neat resin system. All of the different particulates/ fibers used in composites have different properties and so affect the properties of the composite in different ways. The desirable properties of the strengtheners include:

- High strength
- Ease of fabrication and low cost
- Good chemical stability
- Density and distribution

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VI. ALUMINA SLAG AS STRENGTHENER

It is the caustic insoluble Alumina Slag residue generated by alumina production from bauxite by the Bayer's process at an estimated annual rate of 66 and 1.7 million tons, respectively, in the World and India [1]. Under normal conditions, when one ton of alumina is produced nearly a ton of Alumina Slag is generated. This Alumina Slag material has been accumulating at an increasing rate throughout the world. The disposal/utilization of Alumina Slag has been an acute problem and a clear cut solution is not available till date. Different avenues of Alumina Slag utilization are more or less known but none of them have so far proved to be economically viable or commercially feasible. However, a survey of literature on utilization of Alumina Slag published so far, it is revealed that use of Alumina Slag is restricted only for recovery of some metal values like Titanium, Vanadium and Zinc; making of ceramics etc. It has also been used for making cement, bricks, pigments and glazed sewer pipes etc.

Figure- Alumina Slag as strengthener

Research and development work on Alumina Slag utilization that are under process in India are shown in table no.3. Going through the available information on the utilization of Alumina Slag (density 3.05 g/cm3) [6], it is seen that use of Alumina Slag as strengthener material for preparation of MMC has not been explored till date [1].

VII. SILICON CARBIDE AS STRENGTHENER

Silicon carbide (SiC), also known as carborundum, is a compound of silicon and carbon with chemical formula SiC. It was originally produced by a high temperature electro-chemical reaction of sand and carbon. Silicon carbide is an excellent abrasive and has been produced and made into grinding wheels and other abrasive products for over one hundred years. Today the material has been developed into a high quality technical grade ceramic with very good mechanical properties [28]. It is used in abrasives, refractories, ceramics, and numerous high-performance applications. The material can also be made an electrical conductor and has applications in resistance heating, flame igniters and electronic components, floor tiles etc. Structural and wear applications are constantly developing. Silicon carbide is composed of tetrahedral of carbon and silicon atoms with strong bonds in the crystal lattice. This produces a very hard and strong material.

Figure- Silicon Carbide (SiC)

VIII. ALUMINIUM OXIDE AS STRENGTHENER

The chemical formula of Aluminium oxide is Al2O3. It is commonly referred to as alumina, or corundum in its crystalline form, as well as many other names, reflecting its widespread occurrence in nature and industry. Alumina (Al2O3) is the most cost effective and widely used material in the family of engineering ceramics. The raw materials from which this high performance technical grade ceramic is made are readily available and reasonably priced, resulting in good value for the cost in fabricated alumina shapes.

Figure- Alumina (Al2O3)

With an excellent combination of properties and an attractive price, it is no surprise that fine grain technical grade alumina has a very wide range of applications. Its most significant use is in the production of Aluminium metal, although it is also used as an abrasive due to its hardness and as a refractory material due to its high melting point. A lot of work has been done on Aluminium based metal matrix composite with different types of strengtheners, different sizes and manufactured techniques either by stir casting or by spray casting technique and then subjected to study the wear behavior. Alloy composition and its condition influence the wear rate. With increase in weight % of strengthener in the matrix the wear resistance of composite increases. The hardness will also increase with increase in weight % of strengthener.

IX. PROPOSED WORK

The problem is associated with the study of Wear behavior of Al-Alumina Slag, SiC and Al2O3 metal matrix composites (MMCs) of Aluminium alloy of grade 6061 with addition of varying percentage composition of Alumina Slag, SiC and Al2O3 by stir casting technique. The wear behavior and the change in physical and mechanical properties were

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taken into consideration. For the achievement of the above, an experimental set up was prepared to facilitate the preparation of required MMCs. The aim of the experiment was to study the effect of variation of the percentage composition to predict the wear rate as well as to measure the micro hardness. The experiment was carried out by preparing the samples of different percentage composition by stir casting technique.

X. STRENGTHENER MATERIAL

Alumina Slag, silicon carbide (SiC) and Alumina (Al2O3) was used as strengthener material. Initially Alumina Slag was received in solid form like small stones then these solid particles were crushed and grinded in the mixer grinder in order to achieve the required particle size of Alumina Slag i.e. range varies between 103-150 µm. This is achieved with the help sieve shaker. SiC and Al203 was already in the form of powder whose size varies between 60– 90 µm and 30- 50 µm. The reinforced particles of different size were shown in the Table.

Table - Particle size range of Alumina Slag, SiC and Al2O3

Reinforcement	Particle size range (µm)
Alumina Slag	103-150
Silicon Carbide (SiC)	60-90
Alumina (Al_2O_3)	30-50

XI. RESULTS AND DISCUSSIONS

- Micro Hardness Measurement:

A micro hardness tester MVH-1is used for the micro hardness measurement. The surface being tested generally requires a metallographic finish and it was done with the help of 100, 220, 400, 600 and 1000 grit size emery paper. Load used on Vicker's micro hardness tester was 200 grams at 10X optical zoom with dwell time 20 seconds for each sample.The result of Vicker's Micro hardness test for alloy 6061 without strengthener and the wt.% variation of different strengtheners such as SiC, Al2O3 and Alumina Slag in Al alloy 6061 MMCs (Sample No. 2-13) are shown in Table.

Table - Micro hardness Measurement

Sample No.	Sample Name (Al alloy 6061+)	Mean Micro Hardness No. (VHN)
1	Pure (Base Alloy)	49.7431675
2	2.5% Sic	57.30065
3	5% SiC	65.7694
4	7.5% SiC	92.7731
5	10% SiC	100.206025
6	2.5% Al_2O_3	90.45515
7	5% Al_2O_3	99.4015
8	7.5% Al_2O_3	109.699925
9	10% Al_2O_3	110.8675
10	2.5 % Alumina Slag	60.2283575
11	5% Alumina Slag	76.6930125
12	7.5% Alumina Slag	114.2908
13	10% Alumina Slag	104.01875

Bar Charts showing the trend of micro hardness of alloy and different MMCs

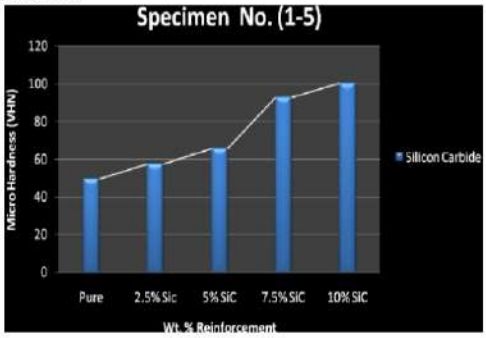

Figure- Comparison the Micro hardness of alloy and MMCs with wt. % variation of SiC

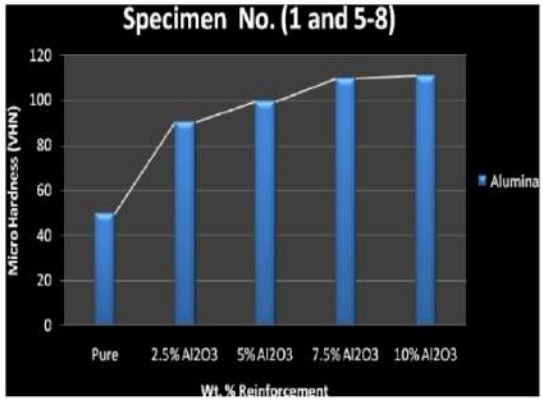

Figure - Comparison the Micro hardness of alloy and MMCs with wt. % variation of Al2O3

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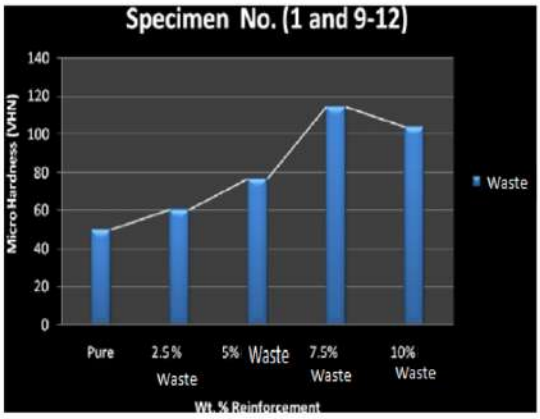

Figure - Comparison the Micro hardness of alloy and MMCs with wt. % variation of Alumina Slag

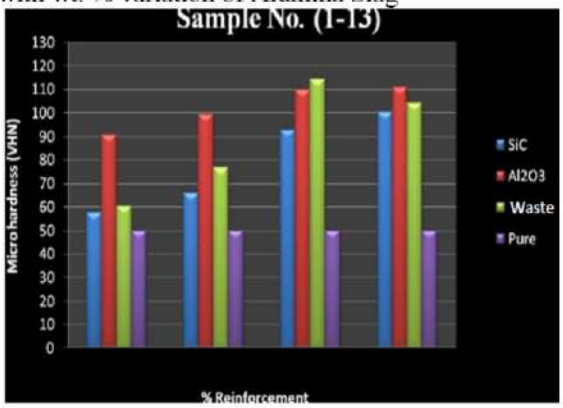

Figure - Comparison the Micro hardness of alloy and all different MMCs

Result and discussion of Micro-hardness number of samples (1-13):Figure shows the micro hardness of Al alloy and Al based MMCs reinforced with SiC, Al2O3 and Alumina Slag. It is observed that hardness of alumina and Alumina Slag reinforced composite is more than that of SiC reinforced composite. It can be attributed to the higher hardness of Alumina Slag and alumina compared to SiC particles.

Hardness of composite depends on the hardness of the strengthener and the matrix. As the Coefficient of thermal expansion (CTE) of ceramic particles (SiC: 4.03µm/m°C, Al2O3: 8.103µm/m°C) is less than that of Aluminium alloy 6061 (24.3µm/m°C), an enormous amount of dislocations are generated at the particle–matrix interface during solidification process, which further increases the matrix hardness. The higher the amount of particle–matrix interface, the more is the hardening due to dislocations. Smaller ceramic particle reinforced composite have more particle–matrix interface as in case of alumina strengthener compared to larger particle reinforced (Alumina Slag, SiC) composite for same amount. Hence, the hardness of the composite increases with the decrease in particle size and increase the volume fraction of the strengthener. These results are analogous to Abrasive wear of zircon sand and alumina reinforced Al–4.5 wt% Cu alloy matrix composites – A comparative study observed by Sanjeev Das, Siddhartha Das and Karabi Das[14].

From the graphs it is clear that as the strengthener percentage increases the micro hardness also increases. But in the case of Alumina Slagstrengthenerthe value of micro hardness increases upto 7.5 wt. % then decreases. The reason for this may be either the improper mixing due to high viscosity of molten composites or poor interfacial bonding between the particle– matrix interfaces.From the Figure it is clearly shows that the maximum value of micro hardness number amongst the MMCs for sample number 9 (Al alloy 6061 + 7.5% Alumina Slag) which is approximately double from the sample number 1 (Al alloy 6061 + 2.5% SiC) and minimum value of micro hardness number amongst the MMCs for ample number 1 (Al alloy 6061 + 2.5% SiC) which is still higher than sample number 13 (Al alloy 6061).

XII. CONCLUSION:

The conclusions drawn from the present investigation are as follows: Aluminium based metal matrix composites have been successfully fabricated by stir casting technique with fairly uniform distribution of Alumina Slag, Silicon carbide and Aluminium oxide particulates. For synthesizing of composite by stir casting process, stirrer design and stirrer position, stirring speed and time, particles preheating temperature, particles incorporation rate etc. are the important process parameters.The results confirmed that stir formed Al alloy 6061 with Alumina Slag, SiC and Al2O3 reinforced composites is clearly superior to base Al alloy 6061 in the comparison of micro hardness i.e. the micro hardness increases after addition of SiC, Al2O3 and Alumina Slag particles in the matrix.Dispersion of SiC, Alumina Slag and Al2O3 particles in Aluminium matrix improves the wear resistance of the composites.It is found that wear rate tends to decrease with increasing particles wt. percentage (2.5- 10%), which confirms that silicon carbide; Alumina Slag and alumina addition is beneficial for reducing the wear rate of MMCs.

XIII. FUTURE WORK

Same metal matrix composites can be manufactured by using other manufacturing techniques like spray casting etc. and results can be compared with stir casting technique.In this study Alumina Slag, SiC and Al2O3 particles of sizes 103-150, 60- 90 and 30-50 microns have been used. This can further be extended by varying the particle size and then effect of particle size on the wear behavior of the composite can be studied.Heat treatment of the MMCs at different temperature range and quenching media like water, oil and brine solution etc. can be used to achieve better results.

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Research Work on Composite Material Using Wood Dust Reinforced With Epoxy Matrix

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Abstract-**The use of wood dust filled polymer composites have been considerably studied both from a scientific and commercial point of view over the last decades as these materials are particularly attractive for their reduced environmental impact and the globally pleasant aesthetical properties wood dust are attractive fillers for thermoplastic polymers, mainly because of their low cost , low density and high specific properties .they are biodegradable and non-abrasive during processing etc. although there are several reports in the literature which discuss the mechanical behavior of wood/polymer composites , however, very limited work has been done on the effect of wood dust types on mechanical behavior polymer composites against this background , the present research work has been undertaken, with an objective to explore the potential of wood dust types as a reinforcing material in polymer composites and to investigate its effect on the mechanical behavior of the resulting composite . The present work "RESEARCH WORK ON COMPOSITE USING WOOD DUST REINFORCED WITH EPOXY MATRIX" thus aim to develop this new class of natural fiber based polymer composites with wood saw dust and to analyze their mechanical behavior by experimentation. Finally the morphology of fractured surface is examined using scanning electron microscopy.**

Keywords:**Composites,Epoxy Matrix,Wood Dust**

INTRODUCTION

A lot of research work has been done by the researchers in this field. Natural fibers are potential alternatives for artificial fibers. The composite materials exist long before we came to know about its whereabouts and most importantly its significance. Wood is a composite of cellulose fibers in a matrix of lignin. The most primitive man-made composite materials were straw and mud combined to form bricks used for structural purposes. Silk has been an important fabric in the textiles industry due to its luster and superb mechanical properties.. Light, strong and corrosion-resistant, composite materials are being used in an increasing number of products as more manufactures discover the benefits of these versatile materials. A composite is a material made from two or more different constituent materials having different physical or chemical properties which do not merge in the finishing structure i.e. the individual constituents retain their properties. Performance of fibre composites [1]. Now a day natural fiber composites have gained increasing interest due to their eco-friendly properties. In an advanced society like ours we all depend on composite materials in some aspect of our lives. The strength and lightness of composites has made them particularly attractive for transportation. Composites have made airplanes lighter, more economical, and more affordable and solved problems such as cracking and metal fatigue. Composites are not just useful in making things fly. Cars of the future must be safer, more economical, and more environmentally friendly, and composites could help achieve all three. Although composites such as GRP have been used in the manufacture of automobile parts since the 1950s, most cars are still made from steel. High-temperature ceramic-matrix composites are also making possible cleaner-burning, more fuel-efficient engines for both cars and trucks. Composites are increasingly used in place of metals in machine tools. Being lighter and stronger, they can offer better performance than metals at high temperatures and do not develop potentially dangerous weaknesses such as fractures and fatigue. Effect of acetylation and propionylation surface treatment on natural fibers [10] Further, the need of composite for lighter Construction materials and more seismic resistant structures has placed high emphasis on the use of new and advanced materials that not only decreases dead weight but also absorbs the

Fig-1 Jet Air Plane

Shock & vibration through tailored microstructures. Composites are now extensively being used for rehabilitation/ strengthening of pre-existing structures that have to be retrofitted to make them seismic resistant, or to repair damage caused by seismic activity. Unlike conventional materials (e.g., steel), the properties of the composite material can be designed considering the structural aspects. The design of a structural component using composites involves both material and structural design. be tailored to almost

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any specific engineering requirement. Whilst the use of composites will be a clear choice in many instances, material selection in others will depend on factors such as working lifetime requirements, number of items to be produced (run length), complexity of product shape, possible savings in assembly costs and on the experience & skills the designer in tapping the optimum potential of composites.

CHARACTERISTICS OF COMPOSITES

It is not only the single most important parameter influencing the properties of the composites, but also an easily controllable manufacturing variable used to alter its properties. Composites consist of one or more discontinuous phases embedded in a continuous phase. The discontinuous phase is usually harder and stronger than the continuous phase and is called the 'reinforcement' or 'reinforcing material', whereas the continuous phase is termed as the 'matrix'. Properties of composites are strongly dependent on the properties of their constituent materials, their distribution and the interaction among them. The composite properties may be the volume fraction sum of the properties of the constituents or the constituents may interact in a synergistic way resulting in improved or better properties. Apart from the nature of the constituent materials, the geometry of the reinforcement (shape, size and size distribution) influences the properties of the composite to a great extent. The concentration distribution and orientation of the reinforcement also affect the properties. The shape of the discontinuous phase (which may by spherical, cylindrical, and rectangular cross-sanctioned prisms or platelets), the total size and size distribution (which controls the texture of the material) and volume fraction determine the interfacial area, which plays an important role in determining the extent of the interaction between the reinforcement and the matrix. Concentration, usually measured as volume or weight fraction, determines the contribution of a single constituent to the overall properties of the composites.

PROPERTIES OF COMPOSITES

The following are some of the properties of composite materials for which they are widely used:

- Volume fractions of the composites play a significant role in determining properties. It is regarded as the most important parameter for determining the properties of the composites.
- Homogeneity is also an important characteristic that determines the extent to which a material may differ in physical and mechanical properties from the average properties of the material.
- The isotropy of the system is affected by the orientation of the reinforcement of the matrix in the composites.
- The strength of the fibers and matrix interface significant in determining the properties of the composites.
- The interfacial bond strength must be sufficient enough for the load to be transferred from the matrix to the fibers
- The interface must not be so strong that it does not fail for improved toughness of the composites.

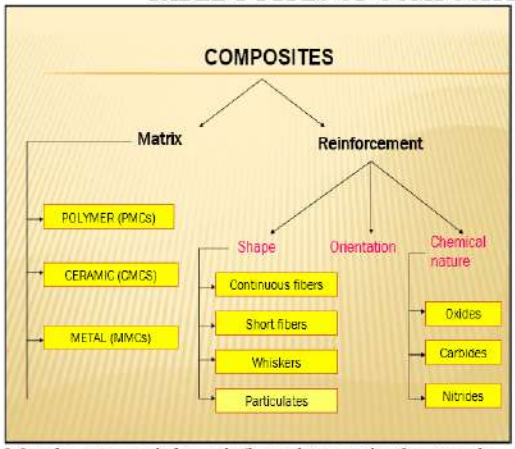
Broadly, composite materials can be classified into three groups on the basis of matrix material. They are:

(a) Metal Matrix Composites (MMCs)
(b) Ceramic Matrix Composites (CMCs)
(c) Polymer Matrix Composites (PMCs)

METAL MATRIX COMPOSITE (MMC)

Metal matrix composites, as the name implies, have a metal matrix. Examples of matrices in such composites include aluminum, magnesium and titanium. The typical fiber includes carbon and silicon carbide.

TABLE-1 TYPES OF COMPOSITES



Metals are mainly reinforced to suit the needs of design. For example, the elastic stiffness and strength of metals can be increased, while large co-efficient of thermal expansion, and thermal and electrical conductivities of metals can be reduced by the addition of fibers such as silicon carbide.

CERAMIC MATRIX COMPOSITE (CMC)

The advantages of CMC include high strength, hardness, high service temperature limits for ceramics, chemical inertness and low density. Naturally resistant to high temperature, ceramic materials have a tendency to become brittle and to fracture. Ceramic matrix composites have ceramic matrix such as alumina, calcium, alumina silicate reinforced by silicon carbide.

POLYMER MATRIX COMPOSITE (PMC)

The reason for these being most common is their low cost, high strength and simple manufacturing principles. Due to the low density of the constituents the polymer composites often show excellent specific properties. The most common advanced composites are polymer matrix composites. These composites consist of a polymer thermoplastic or thermosetting reinforced by fiber (natural carbon or boron). These materials can be fashioned into a variety of shapes and sizes. They provide great strength and stiffness along with resistance to corrosion.

CLASSIFICATION OF COMPOSITES

Composite materials can be classified on the basis of different attributes in various ways. In general there are two phases in a composite material. One is the primary phase called matrix this keeps the secondary phase, the reinforcement undamaged from the external forces. Based on the type of secondary phase the composites are broadly classified into three categories. They are as follows:

- Fiber reinforced composite material
- Flake reinforced composite material
- Particle reinforced composite material

COMPONENTS OF COMPOSITE MATERIAL

Matrix Materials: The primary phase having a continuous character is called matrix. Matrix is usually more ductile and less hard phase. It holds the dispersed phase and shares a load with it. Matrix is

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composed of any of the three material types polymers, metals or ceramics. The matrix forms the bulk form of the part or the product. Most of the materials when they are in a fibrous from show very good strength properties. In order to achieve these properties the fibers must be bonded by suitable matrix. The matrix separates one fiber from the other in order to prevent wear and abrasion. It also prevents the formation of new surface flaws and holds the fibers in place. A good matrix is one which possesses the ability to deform easily under applied load, transfer the load into the fibers and distribute the stress concentrations evenly. The natural fibers are embedded in a biopolymer matrix system which serves the purpose of holding the fibers together thereby stabilizing the shape of the composite structure. This helps to transmit the shear forces between the mechanically high quality fibers, and to protect them against radiation and external forces. Natural fibers they can replace glass in fibre reinforced plastics [9] Polymers are classified into two categories namely thermo sets and thermoplastics. Both these varieties are suitable for use as matrix in the bio composites. There are large numbers of ways of modifying the matrices. So it is essential that the materials for matrix are chosen according to the requirements. The criteria for choosing a suitable matrix system for high performance construction materials are the temperature in which it is to be used, amount of mechanical loading under consideration, manufacturing technology followed, etc. An important criterion for the selection of matrix is its adequately low viscosity for a good impregnation of the reinforcing fibers.

FUNCTIONALLY GRADED COMPOSITES

Functionally graded material (FGMs) is a kind of multiphase material, functionally graded materials of particle-reinforced composite [6]. The material parameters change continuously along the thickness to meet the different requirements of the components' different parts, and achieve the purpose of optimizing the structure (Gupta et al, 2005). FGM is widely used in aerospace, nuclear reactors, internal combustion engines and other fields (Noda et al, 1998).In the technical world the concept of FGM was first proposed around 1984-85 when Japanese researchers studied advanced materials for aerospace applications working on a space plane project. The body of the space plane will be exposed to a very high temperature environment of about 1700°C with a temperature gradient of approximately 1000°C between inside and outside of the space plane. There was no uniform material able to endure such conditions. It requires a high wear resistance outside (enamel) and a ductile inner structure for reasons of fatigue and brittleness. Further it requires a translucent outer area and a specific set of color nuances for reason of aesthetics.

REINFORCEMENT

The secondary phase is embedded in the matrix in a discontinuous form. The dispersed phase is usually harder and stronger than the continuous phase and is called reinforcement. It serves to strengthen the composites and improves the overall mechanical properties of the matrix.

The main purpose of the reinforcement in composites is primarily improving the mechanical properties of the neat resin system. The varieties of fibers used in composites have different properties and therefore impart different properties to the composites.

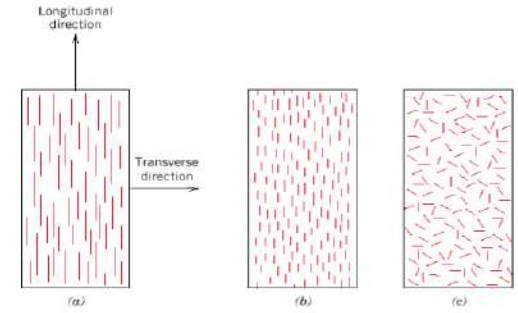

Fig-2 Fiber Alignment

NEED OF FUNCTIONALLY GRADED MATERIALS

The most light weight composites materials which have high ratios of strength to weight and stiffness to weight have been used successfully used in aircraft industry and other engineering applications. But inspite of their good properties sometimes these composite materials are incapable to use under high temperature conditions. If we talk about metals, they are used in engineering field for many years on account of their excellent strength and toughness but in high temperature conditions the strength of the metals get reduced as was in the case of composite materials. Ceramic materials would be an option as they have excellent characteristics of heat resistance but are limited in use due to their low toughness. That is why keeping in view all those points a new class of composite materials has been formed known as Functionally Graded Materials. Basically FGM is an inhomogeneous component made from different phases of material constituents generally ceramics and metals. The ceramic part gives good thermal resistance characteristics and the metal constituents provide stronger mechanical performance while reducing the possibilities of catastrophic fracture.

Applications of Functionally Graded Materials

The overview of important applications of FGM is shown in Fig. and also given as under,

*Rocket engine components, Space plane body
*Cutting tools, shafts, rollers, turbine blades, engine components
*Nuclear reactor components, first wall of fusion reactor, fuel pellet
*Optical fibers, lens
*Artificial skin implant, drug delivery system
*Heat exchanger, heat pipe, slurry pump, reaction vessel
*Thermoelectric generators, thermionic convertor, solar cell
*Building material, sports goods

EPOXY RESINS

Epoxy is a copolymer; that is, it is formed from two different chemicals. These are referred to as the "resin" and the "hardener". The resin consists of monomers or short chain polymers with an epoxide group at either end. Most common epoxy resins are produced from a reaction between epichlorohydrin and bisphenol-A, though the latter may be replaced by similar 45 chemicals. The hardener consists of polyamine monomers, for exp. triethylenetetramine (TETA). When these compounds are mixed together, the amine groups react with the epoxide groups to form a covalent bond. Each NH group can react with an epoxide group, so

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that the resulting polymer is heavily cross linked, and is thus rigid and strong.

PROPERTIES

a. Excellent adhesion to different materials.
b. High resistance to chemical and atmospheric attack.
c. High dimensional stability.
d. Free from internal stresses.
e. Excellent mechanical and electrical properties.
f. Odorless, tasteless and completely nontoxic.
g. Negligible shrinkage.

LITERATURE REVIEW

This chapter outlines some of the recent reports published in literature on mechanical behavior of natural fiber based polymer composites with special emphasis on wood/polymer composites. Composite materials are created by combining two or more components to achieve desired properties which could not be obtained with the separate components. During the last few years, a series of works have been done to replace the conventional synthetic fiber with natural fiber composites. For instant, hemp, sisal, jute, cotton, flax and broom are the most commonly wood saw dust used to reinforce polymers. In addition, wood saw dust like sisal, jute, coir, oil palm, bamboo, wheat and flax straw, waste silk and banana have proved to be good and effective reinforcement in the thermo set and thermoplastic matrices. Composites made from non-traditional materials obtained directly from agro-wastes such as coir fiber, coconut pith, jute sticks, ground nut husk, rice husk, reed, and straw became one of the main interests of researchers. The properties of natural-fiber reinforced composites depend on a number of parameters such as volume fraction of the wood saw dust, fiber aspect ratio, fiber-matrix adhesion, stress transfer at the interface, and orientation. Most of the studies on natural fiber composites involve study of mechanical properties as a function of fiber content, effect of various treatments of wood saw dust, and the use of external coupling agents. Both the matrix and fiber properties are important in improving mechanical properties of the composites. The tensile strength is more sensitive to the matrix properties, whereas the modulus is dependent on the fiber properties. To improve the tensile strength, a strong interface, low stress concentration, fiber orientation is required whereas fiber concentration, fiber wetting in the matrix phase, and high fiber aspect ratio determine the fracture properties. In short-fiber-reinforced composites, there exists a critical fiber length that is required to develop its full stressed condition in the polymer matrix. Fiber lengths shorter than this critical length lead to failure due to debonding at the interface at lower load. On the other hand, for fiber lengths greater than the critical length, the fiber is stressed under applied load and thus results in a higher strength of the composite. For, good impact strength, an optimum bonding level is necessary. The degree of adhesion, fiber pullout, and a mechanism to absorb energy are some of the parameters that can influence the impact strength of a short-fiber-filled composite. The properties mostly vary with composition as per the rule of mixtures and increase linearly with composition.

OBJECTIVES OF THE RESEARCH WORK

Fabrication of wood dust filled epoxy based composites. Evaluation of mechanical properties of the composites such as tensile strength, flexural, hardness, impact strength etc. To study the effect of wood dust type and mechanical properties of composites.

RAW MATERIALS USED

The wood dust used in preparation of composite is EPOXY. It is a thermosetting polymer. Because of its high strength, low viscosity and low flow rates, it allows good wetting of fibers and prevents misalignment of fibers during processing. Following are the most outstanding characteristics of epoxy for which it is used.

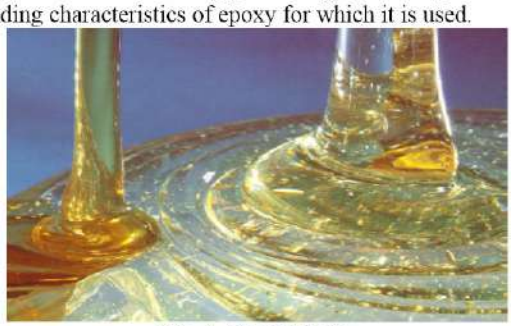

Fig.-3. Epoxy Resin

WOOD SAW DUST

Sawdust or wood dust is a by-product of cutting, grinding, drilling, sanding, or otherwise pulverizing wood with a saw or other tool; it is composed of fine particles of wood. Sisal fibre and its composites: a review of recent developments [11]

Fig.4. Wood Saw Dust

A major use of sawdust is for particleboard; coarse sawdust may be used for wood pulp Sawdust has a variety of other practical uses, including serving as a mulch, as an alternative to clay cat litter, or as a fuel. Until the advent of refrigeration, it was often used in icehouses to keep ice frozen during the summer. It has been used in artistic displays, and as scatter. It is also sometimes used to soak up liquid spills, allowing the spill to be easily collected or swept aside. As such, it was formerly common on barroom floors. It is used to make Cutler's resin. Mixed with water and frozen, a slow-melting, much stronger form of ice polymers to produce composites with the nature of the constituent materials, the geometry of the reinforcement (shape, size and size distribution) influences the properties of the composite to a great extent. Discontinuous phase. The concentration distribution and orientation of the reinforcement also affect the properties.

The shape of the (which may by spherical, cylindrical, or rectangular cross-sanctioned prisms or platelets), the size and size distribution (which controls the texture of the material) and volume fraction determine the interfacial area, which plays an important role in determining the extent of the interaction between the reinforcement and the matrix. Concentration, usually measured as volume or weight fraction, determines the contribution of a single

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constituent to the overall properties of the composites. It is not only the single most important parameter influencing the properties of the composites, but also an easily controllable manufacturing variable used to alter its properties.

PREPARATION OF COMPOSITE

Epoxy LY 556 resin, chemically belonging to the epoxide family is used as the matrix material. Wood dust was supplied by a local vendor.

The maximum particle size was 500 μm. The wood dust is dried before manufacturing in a vacuum oven for 24 h at 80oC in order to remove moisture. The epoxy resin and the hardener are supplied by Ciba Geigy India Ltd. The fabrication of the composites is

carried out through the hand lay-up technique. The low temperature curing epoxy resin (Araldite LY 556) and corresponding hardener (HY951) are mixed in a ratio of 10:1 by weight as recommended. Three different types of composites have been fabricated with three different types of wood dust such as teak, sal and rubber wood. Each composite consisting of 20wt.% of wood dust and 80wt.% of epoxy resin improved properties. In average, the cocoon production is about 1.Million tones worldwide, and this is equivalent to 400,000 tones of dry cocoon .Hardener In the present work Hardener (araldite) is used.

Fig.5. Sample Preparation

CALCULATION

For the preparation of composites with different compositions of saw dust and polymer, an estimate of volume of saw dust and polymer was made. The following calculations show the different compositions of epoxy saw dust composites. Size of the Sample = 35x28x6 mm

TESTING OF MECHANICAL PROPERTIES OF COMPOSITE

The study of mechanical properties such as tensile strength, flexural strength, impact strength and hardness of untreated fiber reinforced (randomly distributed in the epoxy matrix) composite have been conducted as per ASTM standard. Improved or better properties. Apart from

SCOPE FOR FUTURE WORK

There is a very wide scope for future scholars to explore this area of research. This work can be further extended to study other aspects of such composites like effect of wood content, wood orientation, loading pattern, wood treatment

Table 2. Composite Results

SN	Tests	Test Method Standard	Unit	Test Result
1	Tensile strength	Astm d-638	Mpa	3.58
2	Izod impact strength	Astm d-256	Kj/m2	3.93
3	Shore hardness	Astm d-240	Shore	64
4	Flexural strength	Astm d-790	Mpa	4.83
5	Filler content	CIPET std,	%	0.74

on mechanical behavior of wood dust filled polymer composites and the resulting experimental findings can be similarly analyzed.

CONCLUSION

- From the analysis of the results and discussion given above, the following conclusions can be made as follows:
- This work shows that successful fabrication of a wood dust filled epoxy composites with different types of wood is possible by simple hand lay- up technique.
- It has been noticed that the mechanical properties of the composites such as micro-hardness, tensile strength, flexural strength, impact strength etc. of the composites are also influenced by the wood types.
- The fracture surfaces study of wood dust filled epoxy composite after the tensile test, flexural test and impact test has been done. From this study it has been concluded that the poor interfacial bonding is responsible for low mechanical properties.

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An Experimental Investigation to Find Effect on The Strength of Aluminum by Adding Sic and Alumina

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***Abstract*—In industrial field number of material are used as per their different properties for number of application. Aluminum is used in industry due its light weight, low melting point and long time performance. Some Ceramics are used with aluminum to make composite for better life performance. In this experimental work 'Silicon' and 'Alumina' are mixed with Aluminum to know performance and to know change in strength of this new reinforced composite. Different sample of Aluminum with 'Silicon' and 'Alumina' are prepared by stir casting process by changing the weight percentage of these reinforcements. After this series of test like Hardness Test, Tensile Test, are performed to know the behavior of material. Results shows that as weight of percentage of reinforcement increases the effect on Mechanical properties such that Hardness, Yield Strength, Ultimate Strength increase but at the same time elongation decrease and the behavior of material change from ductile to brittle.**

***Index Terms*—Component, formatting, style, styling, insert.** *(key words)*

I. Introduction

The aim involved in designing metal matrix composite materials is to combine the desirable attributes of metals and ceramics. The addition of high strength, high modulus refractory particles to a ductile metal matrix produce a material whose mechanical properties are intermediate between the matrix alloy and the ceramic reinforcement. [Aluminum is the most abundant metal in the Earth's crust, and the third most abundant element, after oxygen and silicon. It makes up about 8% by weight of the Earth's solid surface. Due to easy availability, High strength to weight ratio, easy machinability, durable, ductile and malleability Aluminum is the most widely used non-ferrous metal in 2005 was 31.9 million tones.

A. Advantages of Aluminium

- Light Weight, Strong and Long-lasting.
- Highly Corrosion Resistant.
- Excellent Heat and Electricity Conductor.
- Good Reflective Properties.
- Completely Impermeable and Odorless.
- Totally Recyclable.

II. COMPOSITE MATERIALS

Composites are materials in which two phases are combined, usually with strong interfaces between them. They usually consist of a continuous phase called the matrix and discontinuous phase in the form of fibers, whiskers or particles called the reinforcement. Considerable interest in composites has been generated in the past because many of their properties can be described by a combination of the individual properties of the constituent phases and the volume fraction in the mixture. Composite materials are gaining wide spread acceptance due to their characteristics of behaviour with their high strength to weight ratio. The interest in metal matrix composites (MMCs) is due to the relation of structure to properties such as specific stiffness or specific strength. Like all composites, aluminum matrix composites are not a single material but a family of materials whose stiffness, density and thermal and electrical properties can be tailored. Composites materials are high stiffness and high strength, low density, high temperature stability, high electrical and thermal conductivity, adjustable coefficient of thermal expansion, corrosion resistance, improved wear resistance etc. The matrix holds the reinforcement to form the desired shape while the reinforcement improves the overall mechanical properties of the matrix. When designed properly, the new combined material exhibits better strength than would each individual material.

III. Reinforcements

- Silicon Carbide as Reinforcement: Silicon Carbide is the only chemical compound of carbon and silicon. It was originally produced by a high temperature electro-chemical reaction of sand and carbon. Silicon carbide is an excellent abrasive and has been produced and made into grinding wheels and other abrasive products for over one hundred years. Today the material has been developed into a high quality technical grade ceramic with very good mechanical properties.
- Highly Alumina as Reinforcement: Aluminium oxide, commonly referred to as alumina, possesses strong ionic interatomic bonding giving rise to its desirable material characteristics. It can exist in several crystalline phases which all revert to the most stable

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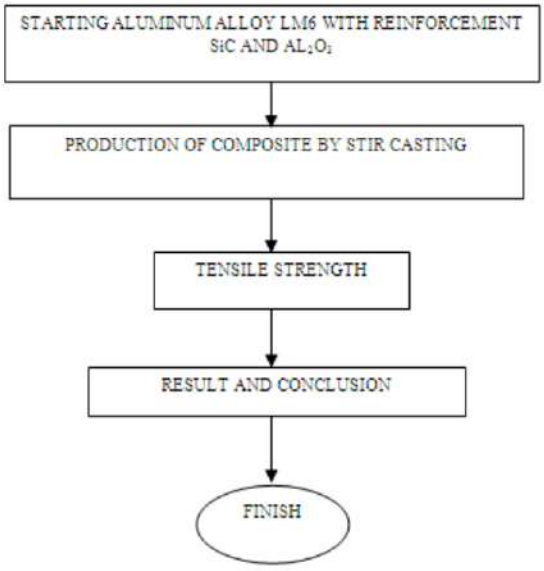
hexagonal alpha phase at elevated temperatures. This is the phase of particular interest for structural applications and the material available from Accurate. Alpha phase alumina is the strongest and stiffest of the oxide ceramics. Its high hardness, excellent dielectric properties, refractoriness and good thermal properties make it the material of choice for a wide range of applications. High purity alumina is usable in both oxidizing and reducing atmospheres to 1925°C.Weight loss in vacuum ranges from 10^{-7} to 10^{-6} g/cm^2 sec over a temperature range of 1700° to 2000°C.

IV. Tensile Strength

Before Tensile properties dictate how the material will react to forces being applied in tension. A tensile test is a fundamental mechanical test where a carefully prepared specimen is loaded in a very controlled manner while measuring the applied load and the elongation of the specimen over some distance. Tensile tests are used to determine the modulus of elasticity, elastic limit, elongation, proportional limit, and reduction in area, tensile strength, yield point, yield strength and other tensile properties. The main product of a tensile test is a load versus elongation curve which is then converted into a stress versus strain curve. Since both the engineering stress and the engineering strain are obtained by dividing the load and elongation by constant values (specimen geometry information), the load-elongation curve will have the same shape as the engineering stress-strain curve. The stress-strain curve relates the applied stress to the resulting strain and each material has its own unique stress-strain curve.

V. Experimental Procedure



Tensile tests were used to assess the mechanical behavior of the composites and matrix alloy. The composite and matrix alloy rods were machined to tensile specimens with a diameter of 6mm and gauge length of 30 mm. Ultimate tensile strength (UTS), often shortened to tensile strength (TS) or ultimate strength, is the maximum stress that a material can withstand while being stretched or pulled before necking, which is when the specimen's cross-section starts to significantly contract.

As shown in below Figure number 5.1, 5.2, 5.3 results predict that as the reinforcement wt. % Yield Strength is increases. This happens may be due to dispersion of SiC & Alumina which create hindrance to dislocation motion. To move this defect (plastically deforming or yielding the material), a larger stress must be applied. This may results increase in tensile strength of reinforced LM6 alloy.

VI. Tensile Strength Results

TABLE I. Tensile Strength Results

Alloy (LM6)	Yield Strength N/mm²	UTS N/mm²	Elongation (%)
Pure	65	180	9
2.5% SiC	78	220	7.5
5% SiC	85	245	5.5
7.5% SiC	112	250	3.2
10% SiC	150	310	2.1
2.5 % Al_2O_3	75	190	8.1
5 % Al_2O_3	88	201	6.5
7.5 % Al_2O_3	105	250	3.9
10 % Al_2O_3	140	290	2.8
2.5% SiC +2.5 % Al_2O_3	100	240	6.8
5% SiC + 5 % Al_2O_3	170	270	4.5
7.5% SiC +7.5 % Al_2O_3	190	320	3.1
10 % SiC + 10 % Al_2O_3	220	370	1.4

VII. Yield Strength Comparison

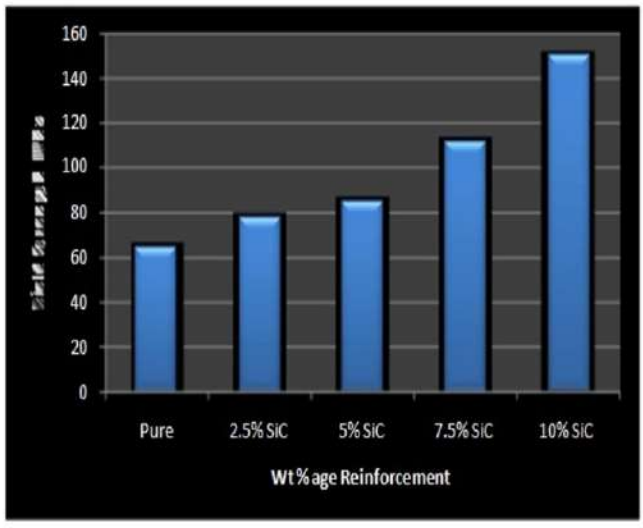


Fig. 1. Comparison the Yield Strength with wt. % variation of SiC.

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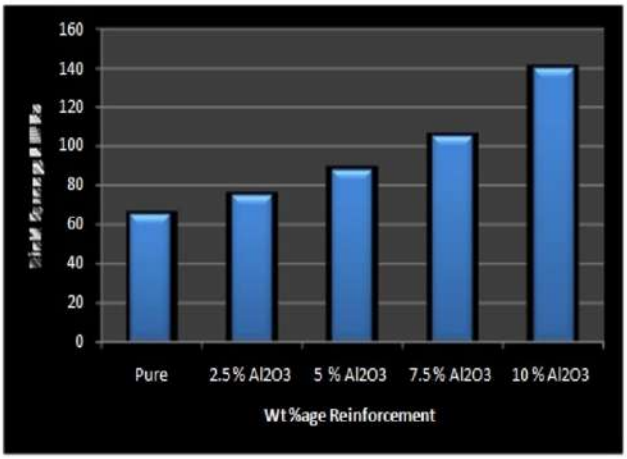

Fig. 2. Comparison the Yield Strength with wt. % variation of Al_2O_3.

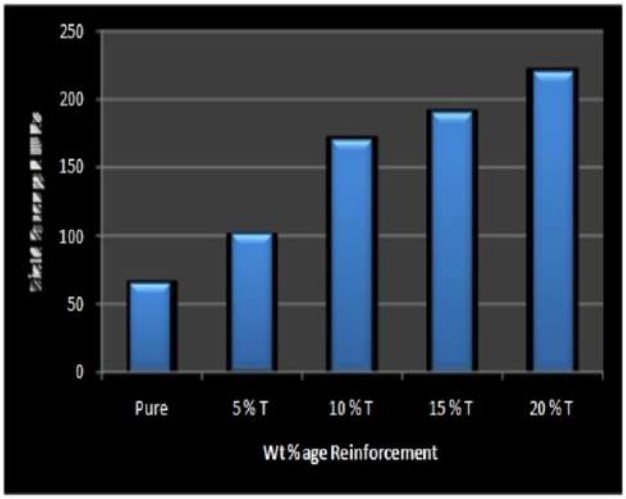

Fig. 3. Comparison the Yield Strength with wt. % variation of Al_2O_3 & Sic.

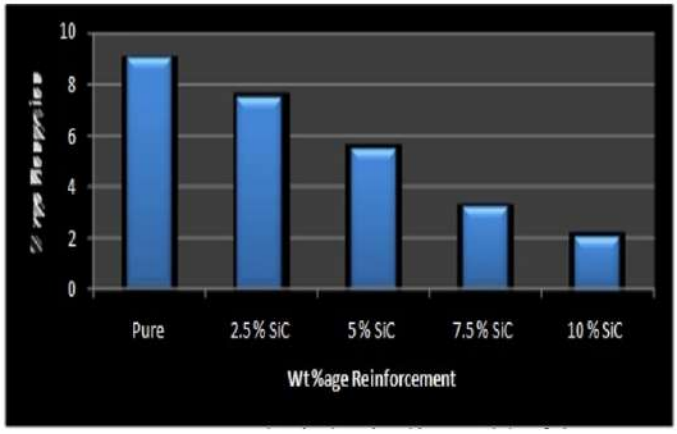

Fig. 4. Comparison of the Ultimate Tensile Strength with wt. % variation of Sic.

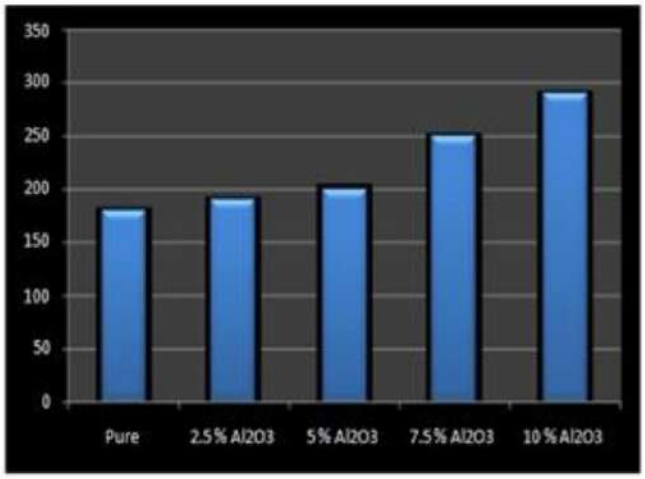

Fig. 5. Comparison of the Ultimate Tensile Strength with wt. % variation of Al2O3.

As shown in Chart (Figure number 5.4, 5.5, 5.6), results predict that as the reinforcement wt.% UTS also increases. This happens may be due to dispersion of SiC & Alumina which create hindrance to dislocation motion. This may results increase in tensile strength of reinforced LM6 alloy.

VIII. Conclusion

The conclusions drawn from the present investigation are as follows:

- The results confirmed that stir formed Al alloy LM 6 with SiC/Al_2O_3 reinforced composites is clearly superior to base Al alloy LM 6 in the comparison of tensile strength, Impact strength as well as Hardness.
- It is found that elongation tends to decrease with increasing particles wt. percentage, which confirms that silicon carbide and alumina addition increases brittleness.
- Aluminium matrix composites have been successfully fabricated by stir casting technique with fairly uniform distribution of SiC & Al_2O_3 particles
- It appears from this study that UTS and Yield strength trend starts increases with increase in weight percentage of SiC and Al_2O_3 in the matrix.

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To Compare the Wear Rates of Cr_3C_2-$Nicr_2$ Coated MSEN-8 with Bare MSEN-8

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***Abstract*—A lappet hook is part of ring frame of a spinning machine in a textile mill. The lappet hook imparts twist to the yarn. The lappet hook helps to wind the yarn on the bobbin. High contact pressure (upto 35 N/square mm) is generated between the thread and surface of lappet hook during winding, mainly due to centrifugal force. This pressure leads to degradation of internal surface of the hook, which significantly affects its working life. The objective of this study was to enhance the working life of the hook in order to decrease the idle time required to reinstate the lappet hook on the spindle periodically during spinning. The objective was carried out by means of thermal spray coatings, where the effect of the coatings on the extent of wear and the wear characteristics of the rings were examined. Detonation gun sprayed coatings, namely $Cr_3C_2NiCr_2$, was compared in this study on MSEN8 of the lappet hook. The objective was carried out by means of hard coatings, where the effect of the coatings on the extent of wear and the wear characteristics of the lappet hook were examined. The study compared thermal spray coatings, namely D-GUN sprayed $Cr_3C_2NiCr_2$ on MSEN8. Wear tests were performed on Pin-On-Disc apparatus using ASTM G99 Standard for the uncoated and coated samples of high tensile steel. The result of coating experimental wear data generated, of the worn samples is used to analyze the wear behavior of coated as well as uncoated high tensile steel. The results show that Cr_3C_2-$NiCr_2$ coatings have been successfully deposited on MSEN8 grade of high tensile steel by Detonation Spray Process. The coated MSEN8 has shown significantly less wear loss as compared to bare MSEN8. The cumulative volume loss for detonation sprayed coatings increases with increase in load. The $Cr_3C_2NiCr_2$-MSEN8 coating-substrate combination has shown minimum wear.**

***Index Terms*—Component, formatting, style, styling, insert.** *(key words)*

I. Introduction

Wear is erosion or sideways displacement of material from its "derivative" and original position on a solid surface performed by the action of another surface. Wear is related to interactions between surfaces and more specifically the removal and deformation of material on a surface as a result of mechanical action of the opposite surface.

Wear is a process of removal of material from one or both of two solid surfaces in solid state contact, occurring when two solid surfaces are in sliding or rolling motion together. The rate of removal is generally slow, but steady and continuous under normal conditions, the wear-rate normally changes through three different stages:

Primary stage or early run-in period, where surfaces adapt to each other and the wear-rate might vary between high and low. Secondary stage or mid-age process, where a steady rate of ageing is in motion. Most of the components operational life is comprised in this stage. Tertiary stage or old-age period, where the components are subjected to rapid failure due to a high rate of ageing.

II. Methods to Control Wear

There are many types of wear, but there are only four main types of wear systems (tribosystems) that produce wear and six basic wear control steps. The four basic tribosystems are: Relatively smooth solids sliding on other smooth solids, Hard sharp substances sliding on softer surfaces, Fatigue of surfaces by repeated stressing (usually compressive),Fluids with or without suspended solids in motion with respect to a solid surface. Various design features can also considered reducing wear .The various traditional techniques applied to materials to deal with wear produced in the preceding tribosystems include: Separate conforming surfaces with a lubricating film. Lubrication is the most important factor for wear consideration. The main objective of lubrication is to reduce the severity of friction and wear in addition to performing other functions. Make the wearing surface hard through the use of hard facing, diffusion heat treatments, hard chromium plating, or more recently developed vapor deposition techniques or high-energy processes. Make the wearing surface resistant to fracture. Many wear processes involve fracture of material from a surface; thus toughness and fracture resistance play a significant role in wear-resistant surfaces. The use of very hard materials such as ceramics, cemented carbides, and hard chromium can lead to fracture problems that nullify the benefits of the hard surface.

III. Coatings

Coating is a covering that is applied to the surface of an object, usually referred to as the substrate. In many cases coatings are applied to improve surface properties of the substrate, such as appearance, adhesion, wetability, corrosion resistance, wear resistance, and scratch resistance. It can also be defined as a layer of material, formed naturally or deposited artificially on the surface of an object made of another

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material, with an aim of obtaining required technical or decorative properties. It is a fact of life that many components are deemed to be worn out when their surfaces have degraded beyond a predetermined limit. However, the useful life of many components may be extended by coating with a material tailored to resist the particular environment in which the component is working. Coatings can vary from a few to several hundred microns and be deposited by different means.

IV. Thermal Spray Technology

Before Thermal spraying techniques are coating processes in which melted (or heated) materials are sprayed onto a surface. Characteristics of Thermal Spray Coatings:

Hardness: Thermal spray coatings are often used because of their high degree of hardness. Their hardness and erosion resistance make them especially valuable in high-wear applications. The hardness and density of thermal spray coatings are typically lower than for the feedstock material from which the coatings were formed. In the case of thermal spray metallic coatings, the hardness and density of the coating depend on the thermal spray material, type of thermal spray equipment, and the spray parameters. Thermal spray coatings may have very high adhesion. Special coatings, used for wear resistance, that are applied by thermal spray processes with very high particle velocity can have greater tensile adhesions.

V. Formulation of Problem

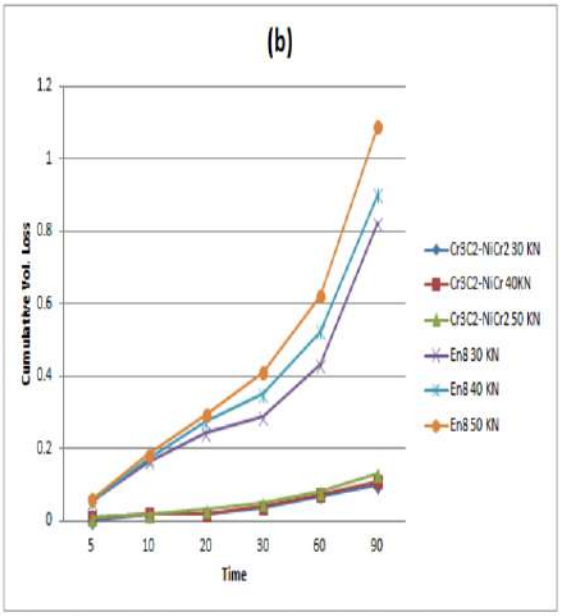
Degradation of materials by wear is a very common problem e.g. in wear of Rings, lappet hooks, traveler in case of textile machinery, bearings etc. So wear problem of Lappet Hook (MSEN-8) selected as case study in this thesis work. Due to abrasive wear of Lappet hook, they require frequent repair and replacement; it increases the idle time of the machine to reinstate it, which ultimately results in production loss. It has been decided to use surface coatings on their surfaces to solve the problem. After a comprehensive literature review, Detonation spray coating technique was selected to deposit coatings (viz; Cr_3C_2-$NiCr_2$) on this material. It has been learnt from the literature that these coatings can provide better resistance to wear.

VI. Experimental Procedure

Selection of the substrate material for the present study has been made after consultation with engineer. To know the composition and grade of the substrate material, it (substrate material) was sent to laboratory test for spectroscopic analysis test at Central Tool Room, Ludhiana, Punjab. After getting the report, it was found that the grade of steel was MSEN-8, which is used for the manufacturing of lappet hook. The substrate material (MSEN-8) which was used to prepare small cylindrical pins having circular cross-section of diameter equal to 5mm and length equal to 30mm. A total of 8 pins were prepared. The pins were prepared on lathe machine and their end faces (to be coated) were ground on cylindrical grinding machine. Grinding was followed by polishing with 1/0, 2/0, 3/0, and 4/0 grades polishing papers.

Wear Behavior of Cr_3C_2-$NiCr_2$ coatings v/s MSEN-8:

The samples of coating i.e. Cr_3C_2-$NiCr_2$ on MSEN-8 were subjected to wear on Pin-On-Disc wear test rig at normal loads of 30N, 40N and 50N respectively. Three samples of MSEN-8 substrate were also subjected to wear on Pin-On-Disc wear test rig at the same loads. Figures 1.a shows the graphical representation of Cumulative volume loss for Chromium carbide Nickel carbide (Cr_3C_2-$NiCr_2$) and MSEN-8 with time. Figure 1.b shows the cumulative volume loss with increase in load for bare MSEN-8. Figure 1.c shows cumulative volume loss with increase in load for Chromium carbide Nickel carbide (Cr_3C_2-$NiCr_2$) on MSEN-8. It is observed from the results (Figure 1.a) that the coating; the coating Chromium carbide Nickel carbide (Cr_3C_2-$NiCr_2$) have shown better wear resistance as compared to MSEN-8 substrate material The wear rate of Cr_3C_2-$NiCr_2$ is very little as compared to bare MSEN-8, which is shown by a flat curve between CVL and time in Figure 1.a.



Figures 1.a Cumulative volume loss for WC-Co & MSEN-8

The CVL for bare MSEN-8 is comparatively high as compared to Cr_3C_2-$NiCr_2$ coatings. The wear volume loss was also calculated from the weight loss and density of the coatings as well as substrate material for all the investigated cases. These data were reported in the form of plots showing the cumulative wear volume loss v/s cumulative time for all the cases.

Volume = mass/density

Wear Volume Loss= $(\delta w/9.81)/\rho$

Where δw is the weight loss in, g

and ρ is the density of material, g/mm^3

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MATERIAL (MSEN-8)	LOAD kN	TIME (min)	INITIAL WT (gm)	FINAL WT (gm)	CUM VOL. LOSS (mm^3)
1	30	5	5.1430	5.1401	0.053
	30	5	5.1401	5.1388	0.053
	30	10	5.1388	5.1368	0.1648
	30	10	5.1368	5.1356	0.2433
	30	15	5.1356	5.1344	0.2904
	30	15	5.1344	5.1320	0.4317
	30	30	5.1320	5.1220	0.824
2	40	5	5.0461	5.0455	0.053
	40	5	5.0455	5.0440	0.053
	40	10	5.0440	5.0433	0.173
	40	10	5.0433	5.0420	0.2733
	40	15	5.0420	5.0365	0.3504
	40	15	5.0365	5.0315	0.5217
	40	30	5.0315	5.0321	0.902
3	50	5	5.1560	5.1548	0.059
	50	5	5.1548	5.1530	0.059
	50	10	5.1530	5.1520	0.183
	50	10	5.1520	5.1503	0.294
	50	15	5.1503	5.1420	0.41
	50	15	5.1420	5.1365	0.623
	50	30	5.1365	5.1280	1.09

Figure 1.b Cumulative Volume loss for MSEN-8

Cr_3C_2-$NiCr_2$	LOAD	TIME (min.)	INITIAL WT.(gm)	FINAL WT.(gm)	Cumu. Wt Loss(gm)
1	30	5	5.1317	5.1315	0.076923
	30	5	5.1315	5.1311	0.153846
	30	10	5.1311	5.1308	0.115385
	30	10	5.1308	5.1305	0.115385
	30	15	5.1305	5.1300	0.192308
	30	15	5.1300	5.1296	0.153846
	30	30	5.1296	5.1290	0.230769
2	40	5	4.9485	4.9482	0.115385
	40	5	4.9482	4.9480	0.076923
	40	10	4.9480	4.9478	0.076923
	40	10	4.9478	4.9474	0.153846
	40	15	4.9474	4.9469	0.192308
	40	15	4.9469	4.4965	173.2308
	40	30	4.4965	4.4953	0.461538
3	50	5	5.2580	5.2577	0.115385
	50	5	5.2577	5.2575	0.076923
	50	10	5.2575	5.2571	0.153846
	50	10	5.2571	5.2568	0.115385
	50	15	5.2568	5.2566	0.076923
	50	15	5.2566	5.2557	0.346154
	50	30	5.2557	5.2544	0.5

Figure 1.c Cumulative volume loss for Cr_3C_2NiCr coated MSEN-8

VII. Conclusions

- Detonation Sprayed Cr_3C_2-$NiCr_2$ coatings have successfully been deposited on MSEN8 grade of high tensile steel.
- The detonation sprayed $Cr_3C_2NiCr_2$ coated on MSEN-8 specimens showed significantly lower cumulative volume loss as compared to uncoated MSEN-8 substrate.
- Cumulative volume loss for detonation sprayed Cr_3C_2-$NiCr_2$ coated as well as uncoated MSEN-8 specimen's increases with increase in load.
- The cumulative volume loss for $Cr_3C_2NiCr_2$ coating was observed to be minimum in the present study.

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Working Principle of Vibrating Structure MEMS Gyroscope

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Abstract— **Vibrating structure gyroscopes are MEMS (Micro-machined Electro-Mechanical Systems) devices that are easily available commercially, affordable, and very small in size. Fundamental to an understanding of the operation of a vibrating structure gyroscope is an understanding of the Coriolis force. In a rotating system, every point rotates with the same rotational velocity. As one approaches the axis of rotation of the system, the rotational velocity remains the same, but the speed in the direction perpendicular to the axis of rotation decreases. Thus, in order to travel in a straight line towards or away from the axis of rotation while on a rotating system, lateral speed must be either increased or decreased in order to maintain the same relative angular position (longitude) on the body. The act of slowing down or speeding up is acceleration, and the Coriolis force is this acceleration times the mass of the object whose longitude is to be maintained. The Coriolis force is proportional to both the angular velocity of the rotating object and the velocity of the object moving towards or away from the axis of rotation.**

***Keywords*—MEMS, Gyroscope, Coriolis force.**

I. Introduction

MEMS, the acronym of "Micro-Electro-Mechanical Systems", is generally considered as devices and systems integrated with mechanical elements, sensors, actuators, and electronic circuits on a common silicon substrate through microfabrication technology. MEMS are made up of components between 1 to 1000 micrometers in size (i.e. 0.001 to 1 mm) and MEMS devices generally range in size from several micrometers (one millionths of a meter) to several millimeters. They usually consist of a central unit that processes data, the microprocessor and several components that interact with the outside such as micro sensors and micro actuators.

II. Traditional Gyroscope

A gyroscope is a device for measuring or maintaining orientation, based on the principles of angular momentum. The device is a spinning wheel or disk whose axle is free to take any orientation. This orientation changes much less in response to a given external torque than it would without the large angular momentum associated with the gyroscope's high rate of spin. Since external torque is minimized by mounting the device in gimbals, its orientation remains nearly fixed,

Regardless of any motion of the platform on which it is mounted. Figure-1 is a traditional gyroscope.

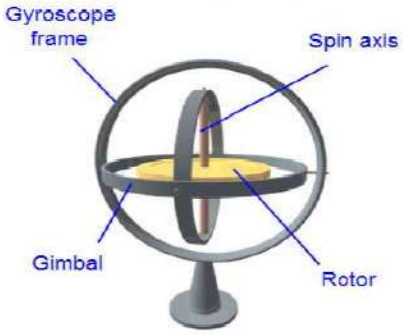

Figure-1 A traditional gyroscope

A conventional gyroscope is a mechanism comprising a rotor journaled to spin about one axis, the journals of the rotor being mounted in an inner gimbal or ring, the inner gimbal being journaled for oscillation in an outer gimbal which in turn is journaled for oscillation relative to a support. The outer gimbal or ring is mounted so as to pivot about an axis in its own plane determined by the support. The outer gimbal possesses one degree of rotational freedom and its axis possesses none. The inner gimbal is mounted in the outer gimbal so as to pivot about an axis in its own plane, which axis is always perpendicular to the pivotal axis of the outer gimbal. The axle of the spinning wheel defines the spin axis. The inner gimbal possesses two degrees of rotational freedom and its axis possesses one. The rotor is journaled to spin about an axis which is always perpendicular to the axis of the inner gimbal. So, the rotor possesses three degrees of rotational freedom and its axis possesses two.

III. MEMS Gyroscope Operating Principle: Coriolis Effect

In non-vector terms: at a given rate of rotation of the observer, the magnitude of the Coriolis acceleration of the object is proportional to the velocity of the object and also to the sine of the angle between the direction of movement of the object and the axis of rotation. The vector formula for the magnitude and direction the Coriolis acceleration is

$$\vec{a}_c = -2\,\vec{\Omega} \times \vec{v}\,, \qquad \text{(Eqn1.1)}$$

Where $\vec{v}$ is the velocity of the particle in the rotating system, and $\vec{\Omega}$ is the angular velocity vector which has magnitude equal to the rotation rate ω and is directed along the axis of

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rotation of the rotating reference frame, and the × symbol represents the cross product operator. The formula implies that the Coriolis acceleration (figue-2) is perpendicular both to the direction of the velocity of the moving mass and to the frame's rotation axis. The equation may be multiplied by the mass of the relevant object to produce the Coriolis force:

$$\vec{F}_c = -2m\vec{\Omega}\times\vec{v}\,, \qquad \text{(Eqn1.2)}$$

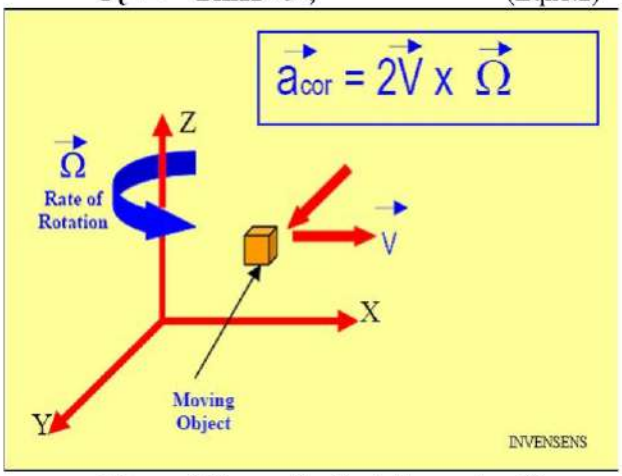

Figure-2 Frame for Coriolis acceleration
(Source: Invensens)

The angular velocity $\vec{\Omega}$ is the characteristic of the rotating body that we intend to indirectly measure; as such an artificial velocity must be imposed on the microgyrscope's proof mass in order to create a resultant Coriolis force that can be directly measured. It is unreasonable to impose a constant velocity on the proof mass since it would soon leave the confines of the system; an oscillating velocity can be used instead. The Coriolis force will also be oscillatory in nature as a result, and thus the forcing frequency of the gyroscope will ideally coincide with the sensing resonant frequency. In other words, ideally the frequency of the imposed proof mass velocity must match the natural frequency in which the proof mass will readily oscillate in the sensing direction. If the proof mass is not excited at the correct frequency then the displacement in the sensing direction will be significantly reduced. The process for designing a mechanical system that has the same or similar driving and sensing resonant frequencies is called mode matching and is an important constraint for micro-gyroscopes.

IV. VIBRATING STRUCTURE GYROSCOPES

Vibrating structure gyroscopes contain a micro-machined mass which is connected to an outer housing by a set of springs. This outer housing is connected to the fixed circuit board by a second set of orthogonal springs as shown in figure-3.

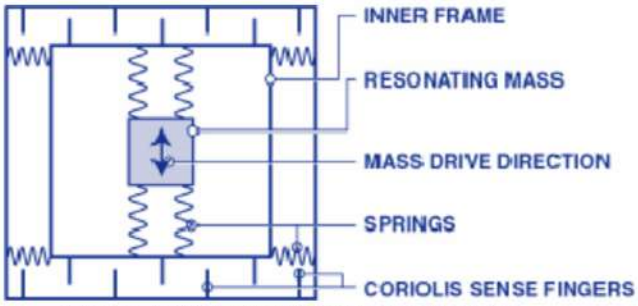

Figure-3 Vibrating structure gyroscope

The mass is continuously driven sinusoidally along the first set of springs. Any rotation of the system will induce Coriolis acceleration in the mass, pushing it in the direction of the second set of springs. As the mass is driven away from the axis of rotation, the mass will be pushed perpendicularly in one direction, and as it is driven back toward the axis of rotation, it will be pushed in the opposite direction, due to the Coriolis force acting on the mass as shown in figure-4(a).

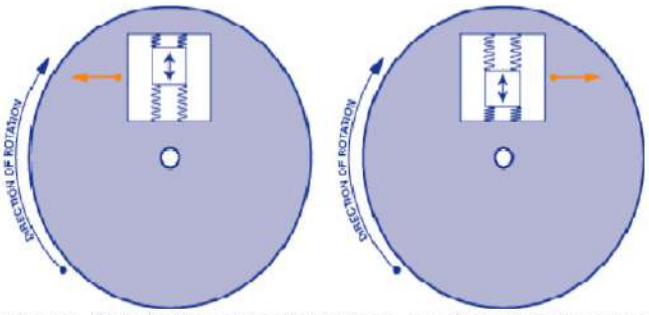

Figure-4(a) Action of coriolis force on vibrating structure gyroscope (drive mode)

The Coriolis force is detected by capacitive sense fingers that are along the mass housing and the rigid structure. As the mass is pushed by the Coriolis force, a differential capacitance will be detected as the sensing fingers are brought closer together. When the mass is pushed in the opposite direction, different sets of sense fingers are brought closer together; thus the sensor can etect both the magnitude and direction of the angular velocity of the system as shown in figure-4(b).

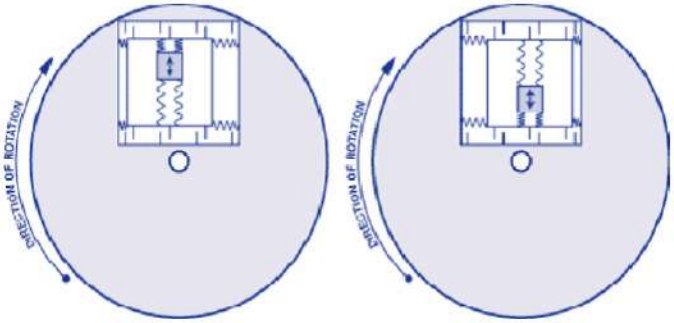

Figure-4(b) Action of coriolis force on vibrating structure gyroscope (sense mode)

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A. Specifications

A MEMS gyroscope sensor has the following basic specifications:

- Measurement range
- Number of sensing axes
- Nonlinearity
- Working temperature range
- Shock survivability
- Bandwidth
- Angular Random Walk (ARW)
- Bias
- Bias Drift
- Bias Instability

Measurement range – This parameter specifies the maximum angular speed with which the sensor can measure, and is typically in degrees per second (°/sec).

Number of sensing axes – Gyroscopes are available that measure angular rotation in one, two, or three axes. Multi-axis sensing gyros have multiple single-axis gyros oriented orthogonal to one another. Vibrating structure gyroscopes are usually single-axis (yaw) gyros or dual-axis gyros, and rotary and optical gyroscope systems typically measure rotation in three axes.

Nonlinearity – Gyroscopes output a voltage proportional to the sensed angular rate. Nonlinearity is a measure of how close to linear the outputted voltage is proportional to the actual angular rate. Not considering the nonlinearity of a gyro can result in some error in measurement. Nonlinearity is measured as a percentage error from a linear fit over the full-scale range, or an error in parts per million (ppm).

Working temperature range – Most electronics only work in some range of temperatures. Operating temperatures for gyroscopes are quite large; their operating temperatures range from roughly -40°C to anywhere between 70 and 200°C and tend to be quite linear with temperature. Many gyroscopes are available with an onboard temperature sensor, so one does not need to worry about temperature related calibrations issues.

Shock Survivability – In systems where both linear acceleration and angular rotation rate are measured, it is important to know how much force the gyroscope can withstand before failing. Fortunately gyroscopes are very robust, and can withstand a very large shock (over a very short duration) without breaking. This is typically measured in g's (1g = earth's acceleration due to gravity), and occasionally the time with which the maximum g-force can be applied before the unit fails is also given.

Bandwidth – The bandwidth of a gyroscope typically measures how many measurements can be made per second. Thus the gyroscope bandwidth is usually quoted in Hz.

Angular Random Walk (ARW) - This is a measure of gyro noise and has units of deg/hour$^{1/2}$ or deg/sec$^{1/2}$. It can be thought of as the variation (or standard deviation), due to noise, of the result of integrating the output of a stationary gyro over time. So, for example, consider a gyro with an ARW of 1°/sec$^{1/2}$ being integrated many times to derive an angular position measurement: For a stationary gyro, the ideal result - and also the average result - will be zero. But the longer the integration time, the greater will be the spread of the results away from the ideal zero. Being proportional to the square root of the integration time, this spread would be 1° after 1 second and 10° after 100 seconds.

Bias - The bias, or bias error, of a rate gyro is the signal output from the gyro when it is NOT experiencing any rotation. Even the most perfect gyros in the world have error sources and bias is one of these errors. Bias can be expressed as a voltage or a percentage of full scale output, but essentially it represents a rotational velocity (in degrees per second). Again, in a perfect world, one could make allowance for a fixed bias error. Unfortunately bias error tends to vary, both with temperature and over time. The bias error of a gyro is due to a number of components:

- calibration errors
- switch-on to switch-on
- bias drift
- effects of shock (g level)

Individual measurements of bias are also affected by noise, which is why a meaningful bias measurement is always an averaged series of measurements.

Bias Drift - This refers specifically to the variation of the bias over time, assuming all other factors remain constant. Basically this is a warm-up effect, caused by the self heating of the gyro and its associated mechanical and electrical components. This effect would be expected to be more prevalent over the first few seconds after switch-on and to be almost non-existent after (say) five minutes.

Bias Instability - Bias Instability is a fundamental measure of the 'goodness' of a gyro. It is defined as the minimum point on the Allan Variance curve, usually measured in °/hr. It represents the best bias stability that could be achieved for a given gyro, assuming that bias averaging takes place at the interval defined at the Allan Variance minimum [3] .

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Effect of Heat Treatment on Microstructure and Mechanical Properties of S40C Steel

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Abstract— **Investigations were carried out to study the effects of heat treatment on the mechanical properties of plain carbon steel. The steel was heat treated by following processes such as annealing, normalizing, hardening & tempering. Engineering materials, mostly steel, are heat treated under controlled sequence of heating and cooling to alter their physical and mechanical properties to meet desired engineering applications. In this study, the effect of heat treatment (annealing, normalizing, hardening, and tempering) on the microstructure and some selected mechanical properties of steel were studied. The steel samples were heat treated in an electric furnace at different temperature levels and holding times; and then cooled in different media. The mechanical properties (tensile yield strength, ultimate tensile strength, Young's modulus, percentage reduction, percentage elongation, toughness and hardness) of the treated and untreated samples were determined using standard methods and the microstructure of the samples was examined using metallographic microscope equipped with camera.**

I. INTRODUCTION

Heat treatment is a combination of timed heating and cooling applied to a particular metal or alloy in the solid state in such ways as to produce certain microstructure and desired mechanical properties (hardness, toughness, yield strength, ultimate tensile strength, Young's modulus, percentage elongation and percentage reduction). Annealing, normalizing, hardening and tempering are the most important heat treatments often used to modify the microstructure and mechanical properties of engineering materials particularly steels. Annealing is the type of heat treatment most frequently applied in order to soften iron or steel materials and refines its grains due to ferrite-pearlite microstructure; it is used where elongations and appreciable level of tensile strength are required in engineering materials [1, 2]. In normalizing, the material is heated to the austenitic temperature range and this is followed by air cooling. This treatment is usually carried out to obtain a mainly pearlite matrix, which results into strength and hardness higher than in as received condition. It is also used to remove undesirable free carbide present in the as-received sample [3]. Steels are normally hardened and tempered to improve their mechanical properties, particularly their strength and wear resistance. In hardening, the steel or its alloy is heated to a temperature high enough to promote the formation of austenite, held at that temperature until the desired amount of carbon has been dissolved and then quench in oil or water at a suitable rate. Also, in the harden condition, the steel should have 100% martensite to attain maximum yield strength, but it is very brittle too and thus, as quenched steels are used for very few engineering applications. By tempering, the properties of quenched steel could be modified to decrease hardness and increase ductility and impact strength gradually. The resulting microstructures are bainite or carbide precipitate in a matrix of ferrite depending on the tempering temperature. Steel is an alloy of iron with definite percentage of carbon ranges from 0.15-1.5% [4], plain carbon steels are those containing 0.1-0.25% [5]. Therefore, this present study aims to experimentally examine the effect of heat treatment on mechanical properties of S40C steel.

II. EXPERIMENTAL PROCEDURE

The rolled plates of S40C steel were used as base material for the present study. Samples were subjected to different heat treatment: annealing, normalizing, hard and tempering.

- **Annealing process:**- The sample was kept in furnace at temperature of 710^0 C for one hour then furnace cooling is provided for approximately 16 hours by keeping the furnace switched off .
- **Normalising:** - The samples were normalized by keeping the samples at 890^0 C in the furnace for one & half hour.
- **Hardening & tempering:**- The sample was initially heated at 860^0 C for one hour then quenched into water. After this the sample become fully hard and brittle, due to stresses entrapped in the material because of fast cooling. These stresses are relieved or removed by tempering process by keeping the sample at the temperature of 600^0 C for one hour, then cooling is done in still air.
- **As rolled:** - The sample was taken as rolled without any heat treatment process.

Spectroscopic test gives the chemical composition as follows:-

Table 1 CHEMICAL COMPOSITION OF SAMPLES:-

S. No	Element	Percentage
1.	C	0.407
2.	Mn	0.84
3.	S	0.021

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4.	P	0.021
5.	Si	0.208
6.	Ni	0.042
7.	Cr	0.224
8.	Mo	0.012
9.	V	0.0014
10.	Al	0.022
11.	Cu	0.051
12.	Sn	0.0070
13.	B	0.0008
14.	Ca	0.0004
15.	W	0.0049
16.	Co	0.0065
17.	Nb	0.0010
18.	Ar	0.0049

Mechanical properties of the treated and untreated samples were determined using standard methods. For hardness testing, oxide layers formed during heat treatment were removed by stage-grinding and then polished. Average Brinell Hardness Number (BHN) readings were determined by taking two hardness readings at different positions on the samples, using a Brinell hardness tester.

III. Result & Discussion

The effect of heat treatment (Annealing, Normalising, Hard & Tempered) on mechanical properties (Ultimate tensile strength, Percentage elongation and hardness) of the treated and untreated samples are shown in Table 2 and Table 3. The ultimate tensile strength of untreated or as rolled sample was 702.26N/mm^2, elongation 20.182, hardness 183BHN were obtained.

Comparing the mechanical properties of annealed sample with the untreated sample, annealed sample showed lower tensile strength (661.489 N/mm2), hardness (161 BHN) and increase in reduction in percentage elongation (20.921). The decrease in tensile strength and hardness can be associated with the formation of soft ferrite matrix in the microstructure of the annealed sample by cooling.

The mechanical properties of the normalized specimen were found to be 717.682 N/mm^2, 181 BHN, 22.919% for tensile strength, hardness and percentage elongation, respectively. The increase in tensile strength and hardness as compared to annealed and untreated sample was due to proper austenising temperature at 890^0 C and higher cooling rate, which resulted in decrease in elongation, which was lower than those obtained for untreated and annealed samples due to pearlitic matrix structure obtained during normalisation of S40C steel.

The mechanical properties of the hard and tempered sample revealed that it had the highest value of tensile strength 805.32 N/mm^2, and highest hardness (229 BHN) was obtained. The specimen was austenised at 860° C for one hour and then water quenched. The stresses are relieved by tempering process by keeping the sample at the temperature of 600^0 C for one hour, and then cooled in still air.

The variability in ultimate tensile strength, percentage elongation and hardness of treated and untreated S40C steel are shown in Figures 1 to 3, respectively.

Table 2 Ultimate Tensile strength and Percentage Elongation of Heat treated and untreated S30C Steel.

Heat treatment	Ultimate Tensile Strength (N/mm^2)	Percentage Elongation
Annealing	661.489	20.921
Normalising	717.682	22.919
Hard & Temper	805.32	16.259
Untreated	702.36	20.182

Table 3 Hardness of Heat treated and untreated S30C Steel.

Heat treatment process	Brinell hardness no.
Annealed	161
Normalised	181
Hard & temper	229
As rolled	183

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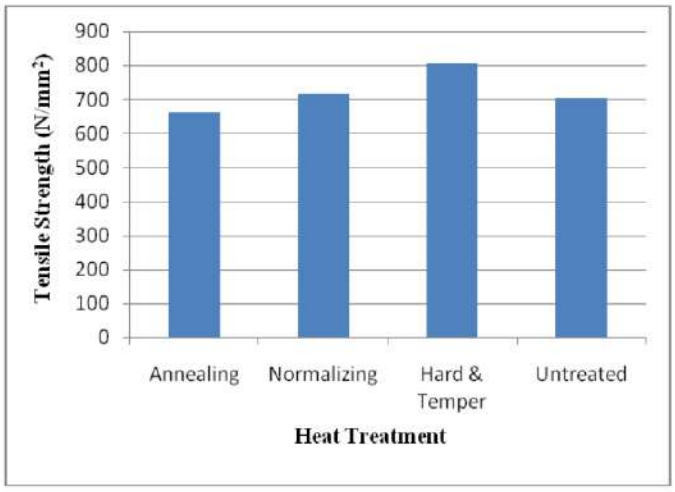

Fig. 3.1 Ultimate Tensile strength of treated and untreated samples of S30C steel

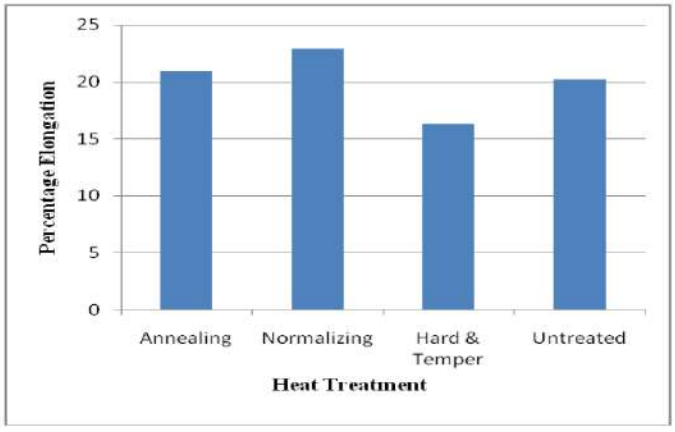

Fig. 3.2 Percentage Elongation of treated and untreated samples of S30C steel

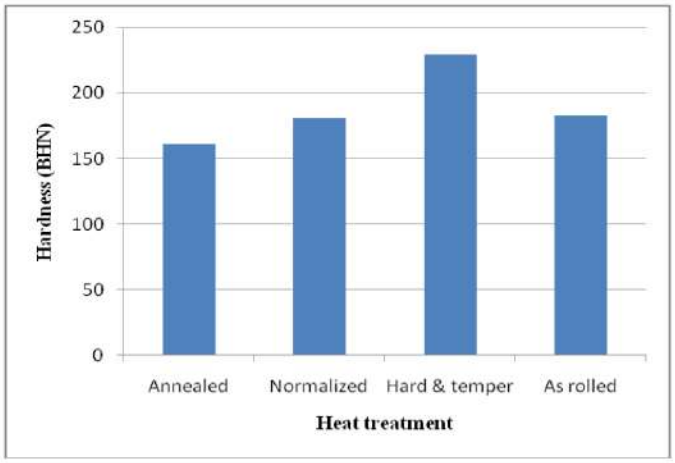

Fig. 3.3 Hardness of treated and untreated samples of S30C steel

Microstructure Of As Rolled Sample:-

As shown in figure 3.4 the micro structure of as rolled material has pearlite–ferrite structure with sharp boundaries which differentiate the pearlite and ferrite. The dark black colour represents the pearlite and white portion represent the ferrite

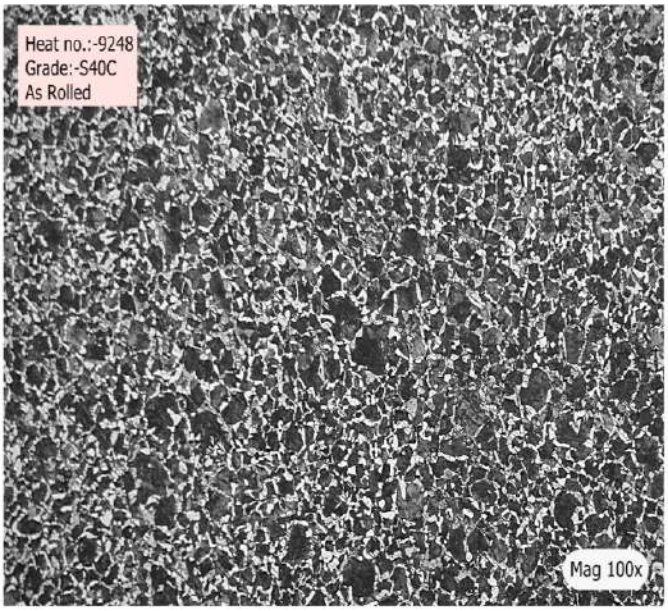

Fig. 3.4 Microstructure of As Rolled Sample

Microstructure of Normalized Sample:-

The microstructure of normalized material as shown in Fig 3.5 has pearlite–ferrite in uniformly mixed form. There are no sharp boundaries which separate the pearlite and ferrite.

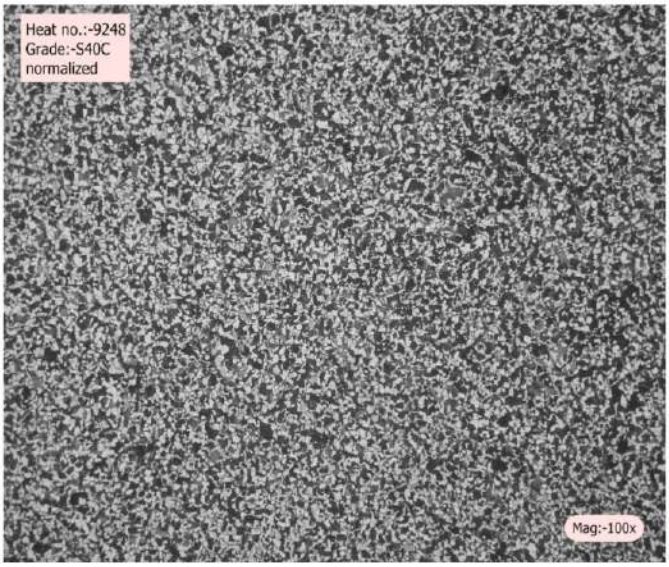

Fig. 3.5 Microstructure of As Normalised Sample

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Microstructure Of Annealed Sample:-

The microstructure of Annealed material has maximum quantity of ferrite and has pearlite in the form of layers or bands around the ferrite as shown in Fig. 3.6. In this state the material is totally free from the stresses and highly ductile in nature.

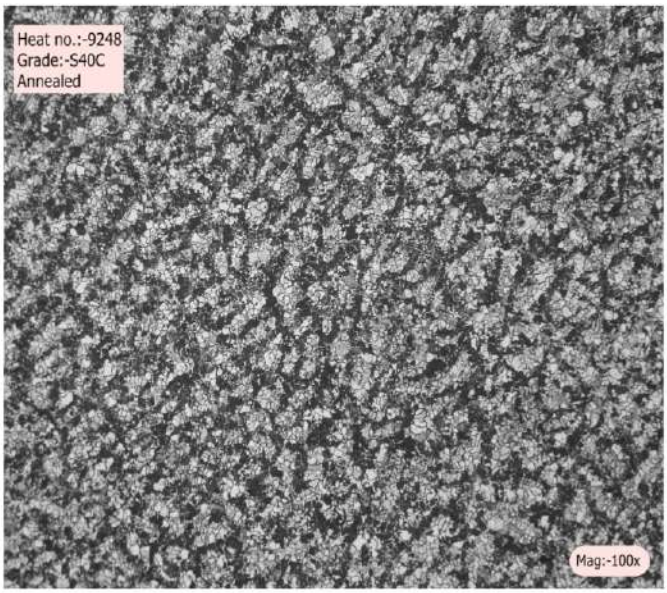

Fig. 3.6 Microstructure of Annealed Sample

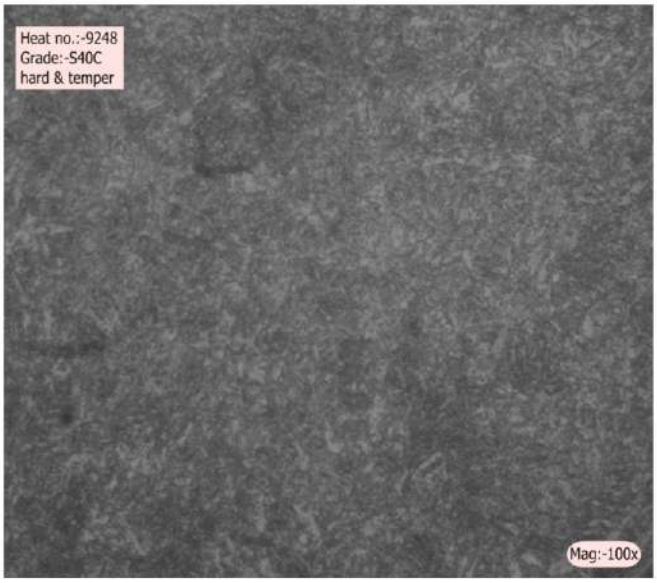

Fig. 3.7 Microstructure of Hard & Tempered Sample

Microstructure of Hard & Temper Sample:-

The microstructure of hard & tempered material has no pearlite and ferrite as shown in Fig 3.7. Due to fast cooling the pearlite & ferrite completely transformed into martensite. The martensite is very hard and brittle in nature. The microstructure of hard and tempered specimen looks like pigeon wings.

IV. Conclusions

In this investigation an attempt has been made to study the effect of heat treatment on microstructure and mechanical properties of S30C Steel. From this investigation, the following important conclusions are derived:

(i) The mechanical properties of S30C Steel can be altered through various heat treatments. The results obtained confirmed improvement in mechanical properties that can be obtained by subjecting S30C steel to different heat treatments investigated in this study.

(ii) The Hard & Tempered Specimen had highest ultimate tensile strength and Hardness as compared to other specimen.

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An Overview of Thermal Spraying Techniques Used to Deposit Hydroxyapatite Coatings

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***Abstract*—Biocompatible ceramic coatings on metals were introduced to take advantage of the bioactive properties of the ceramic and the mechanical properties of the metallic substrate. These coatings are currently being used in both orthopedic and dental implants which are subjected to loading, and have been found to enhance early bony in growth for better stabilization of the implants. The various methods of applying these coatings include Thermal spraying methods (plasma spraying, HVOF etc), ion beam sputtering, electrophoretic deposition, and pressing and sintering. An attempt has been made in this paper to give an overview of the thermal spraying methods that are being used to deposit hydroxyapatite coatings.**

Keywords: **Hydroxyapatite, Plasma Spraying, HVOF, Biocompatibility**

I. INTRODUCTION

The predominant purpose of biomaterials is to produce a part or facilitate a function of the human body in a safe, reliable, economical, and physiologically acceptable manner. A prerequisite for any synthetic material implanted in the body is that it should be biocompatible. In addition, the implanted material is expected to withstand applied physiological forces without undergoing any dimensional changes, without any fracture or fatigue and most important that it should be resistant to corrosion when implanted in physiological environment of the body [1].Among the biomaterials explored recently, Hydroxyapatite (HA) attracts the most attention throughout the world. The stability and the mechanical performances of the prosthesis are considered to be the most significant factor pertaining to the failure of the implant, apart from infection. Therefore, studies on the microstructure and mechanical properties of HA materials have received considerable attention. Much effort has been diverted in recent years towards the development of optimum processing methods to deposit HA onto metallic substrates while minimizing its inherent mechanical property limitations [2].Hydroxyapatite (HA), $Ca_{10}(PO_4)_6$ $(OH)_2$, is a bioactive material that has been applied in many prosthetic applications, mainly as a porous material for optimal bone ingrowth . Clinical tests have proved that HA is compatible with the tissue of vertebrates, making it an attractive bio-implant material. However, the bending strength and fracture toughness of this bioceramic is inferior to that of human bones. It can be used only for applications where no important, stress needs to be borne. One solution to this problem is to use HA as a surface coating on a bio-inert metallic substrate, e.g. titanium, Ti-6Al-4V, and stainless steel 316L [3].Hydroxyapatite (HA) is widely used as implant material in clinical applications owing to its identified biocompatibility. Studies have shown that when thermally sprayed, mostly by direct current (dc) plasma, HA coatings on titanium alloy substrate were capable of forming bioactive fixation with surrounding bony tissues. However, it is severely limited by the intrinsic poor mechanical properties of HA material, which can lead to instability and unsatisfactory duration of the implant in the presence of body fluids and local loading. [4] There are a variety of surface coating techniques that can deposit HA-based coatings, these ranging from the conventional press-and-sinter method to more elegant approaches such as ion beam sputtering, electrophoretic deposition and r.f.-magnetron sputtering. Thermal spray techniques such as plasma spraying are commonly preferred because of their efficiency and relative economy [3].This paper presents an overview of the thermal spraying techniques such as plasma spraying, HVOF etc.

II. THERMAL SPRAY PROCESSES AND TECHNIQUES

Thermal spray is a generic term for a group of coating processes used to apply metallic or nonmetallic coatings. These processes are grouped into three major categories: flame spray, electric arc spray, and plasma arc spray. These energy sources are used to heat the coating material (in powder, wire, or rod form) to a molten or semi molten state. The resultant heated particles are accelerated and propelled toward a prepared surface by either process gases or atomization jets. Upon impact, a bond forms with the surface, with subsequent particles causing thickness buildup and forming a lamellar structure. The thin "splats" undergo very high cooling rates, typically in excess of 106 K/s for metals. A major advantage of thermal spray processes is the extremely wide variety of materials that can be used to produce coatings. Virtually any material that melts without decomposing can be used. A second major advantage is the ability of most thermal spray processes to apply coatings to substrates without significant heat input. [5]

III. FLAME SPRAY PROCESSES

Flame spraying includes low-velocity powder flame, rod flame, and wire flame processes and high-velocity processes such as HVOF and the detonation gun (D-Gun) process.

IV. FLAME POWDER.

In the flame powder process, powdered feedstock is aspirated into the oxyfuel flame, melted, and carried by the flame and air jets to the work piece. Particle speed is relatively low (<100 m/s), and bond strength of the deposits is generally lower than the higher velocity

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processes. Substrate surface temperatures can run quite high because of flame impingement. [5]

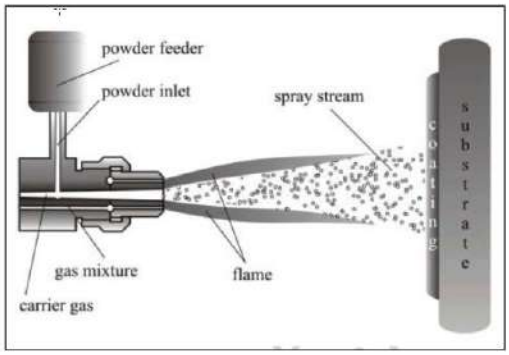

Fig.1. Powder flame spraying. [6]

V. WIRE FLAME.

In wire flame spraying, the primary function of the flame is to melt the feedstock material. A stream of air then atomizes the molten material and propels it toward the work piece. Substrate temperatures often range from 95 to 205 °C (200 to 400 °F) because of the excess energy input required for flame melting. In most thermal spray processes, less than 10% of the input energy is actually used to melt the feedstock material. [5]

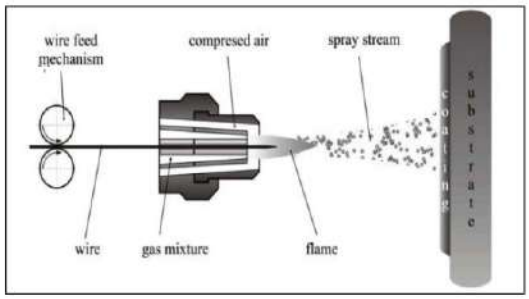

Fig.2. Wire Flame spraying. [6]

VI. HIGH-VELOCITY OXYFUEL SPRAYING (HVOF)

In HVOF, a fuel gas (such as hydrogen, propane, or propylene) and oxygen are used to create a combustion jet at temperatures of 2500 to 3100 °C . The combustion takes place internally at very high chamber pressures, exiting through a small-diameter (typically 8 to 9 mm) barrel to generate a supersonic gas jet with very high particle speeds. The process results in extremely dense well bonded coatings, making it attractive for many applications. Either powder or wire feedstock can be sprayed, at typical rates of 2.3 to 14 kg/h [5]

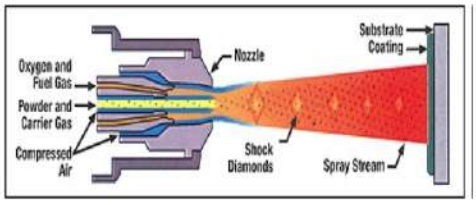

Fig.3 HVOF [7]

VII. DETONATION GUN.

In the detonation gun process, pre-encapsulated "shots" of feedstock powder are fed into a 1 m long barrel along with oxygen and a fuel gas, typically acetylene. A spark ignites the mixture and produces a controlled explosion that propagates down the length of the barrel. The high temperatures and pressures that are generated blast the particles out of the end of the barrel toward the substrate. Very high bond strengths and densities as well as low oxide contents can be achieved using this process.[5]

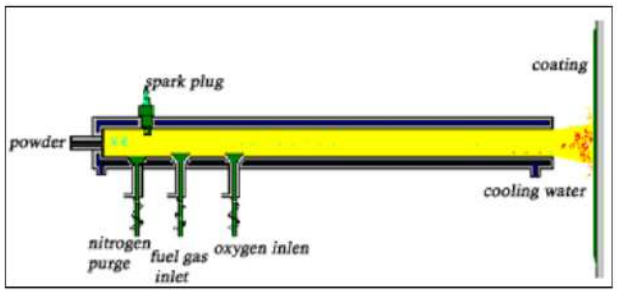

Fig.4. Detonation gun process. [8]

VIII. PLASMA SPRAYING

Thermal spraying allows one to solve many problems of wear, corrosion, thermal cycling, etc., by using a thin layer of a specific material (coating) sprayed on the component surface without degrading the mechanical properties of the substrate. Plasma spraying has extended drastically the capabilities of the thermal spray coatings by accommodating materials with very high melting points, such as ceramics, cermets, refractory alloys and super alloys, and it is now a permanent part of the mechanical engineering discipline.[9]. Plasma spraying is part of thermal spraying which is a group of processes in which finely divided metallic and non metallic materials are deposited in a molten or semi-molten state on a prepared substrate to form a spray deposit . In this process the substrate can be kept at relatively low temperature by specific cooling devices. The thermal plasma heat source (direct current (dc) arc or radio frequency (RF) discharge) with temperatures over 8000K at atmospheric pressure allows the melting of any material. However, to avoid too low a deposition efficiency, the melting temperature must be at least 300K lower than the vaporization or decomposition temperature. Powered materials are injected within the plasma (RF discharges) or the plasma jet (dc arcs) where particles are accelerated and melted, or partially melted, before they flatten and solidify onto the substrate (forming lamellae or splats), the coating being built by the layering of splats [10]

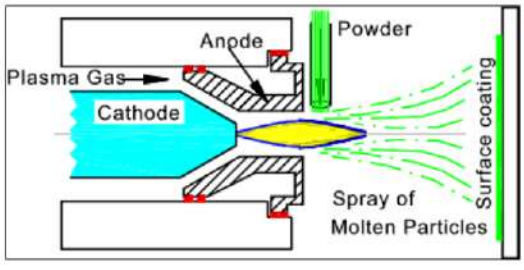

Fig.5. Plasma spraying process. [11]

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IX. CONCLUSION

1. Plasma spraying is the most popular technique to deposit the HA coatings.
2. Other thermal spraying techniques like HVOF,WIRE Flame spraying , detonation gun spraying and powder flame spraying etc have also attracted researchers for depositing HA coatings on bioimplants.

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A Review of EDM Processes with Current Research Issues

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***Abstract*—Electrical discharge machining (EDM) process is one of the most important and cost effective non conventional methods which is capable to machine intricate features with high dimensional accuracy in electrically conductive and semi conductive materials irrespective of hardness and toughness of these materials. EDM process which removes the material from work piece surface without making the contact between tool electrode and work piece has been continuously evolving from macro to micro-scale applications. Both the macro EDM and micro EDM have great potential and a lot of research work is carried out in past decades to improve process efficiency, quality of machined parts and equipment used. This paper presents a review on various types and of EDM process including EDM performance measures and current research issues in these areas.**

***Keywords*—EDM, Micro-EDM, Dry EDM, Powder mixed EDM, Hybridized EDM.**

I. Introduction

With the growth of electronics and automation and discovering of new hard and difficult to machine materials, the domain of unconventional technologies arrives in the top of manufacturing processes. Electrical Discharge Machining (EDM) which is able to copy the shape of tool electrode on the work piece surface is apparent to be a simple process but actually it involves many phenomena during the process. EDM is a non conventional machining process which uses thermo electric energy produced from a series of electrical discharges between two approaching surfaces of tool electrode and work piece material to erode minute material from both tool work piece surfaces. Attempts were made first time in 1930s to machine metals and diamonds with electrical discharges. V.E. Matulaitis and H.V. Harding of Elox US [1] developed "Disintegrators" where intermittent arc discharges were produced between tool electrode and work piece when connected to DC power supply. These intermittent arcs occurring in air were used to remove broken taps from cemented carbide and high speed steel materials. AEG made equipment in which arc discharges were initiated by making short mechanical contact like in welding process. These arcs were interrupted by retraction vibrating the tool electrode. These arc discharges occurring at high frequencies produced a lot of heat and hence erodes diamond at appropriate places. These processes more precisely known as "Arc Machining" [1] were not very precise due to excessive overheating of the machining area. This problem of overheating restricts the use of "arc machining" process in precision machining. Researchers tried to produce electrical discharges in controlled discharge conditions so that this process is used in precision machining. In 1943, Moscow University soviet scientist B. R. Lazarenko published a research paper "To invert the effect of wear on electric power contacts" in which he explored the idea of minimization of wear produced by capacitor generated discharge [2]. This idea started the development of Electrical Discharge Machining [3]. In 1950s, relaxation type generators were used in which resistance–capacitance charging condensers stores and define discharge energy. With these circuits, it became possible to make a simple servo control circuit to automatically find and hold a given gap between electrodes and moreover to control pulse times. Further the used of semiconductors enhanced the applicability of duty cycles and hence material erosion rate of EDM process. With the advent and use of computers technology with EDM process the concept of Computer Numerical Control EDM further accelerates the use of this process in industry. A lot of research has been carried out by the researchers to improve machining characteristics of this process. These achieved improvements make the earlier unrealistic EDM process to be a most commonly using non conventional manufacturing process. Today, many automotive, aerospace, defense and micro system industrial components, as well as moulds and dies are manufactured using electrical discharge machining process.

This paper presents a review on various types and verities of EDM process including EDM performance measures and current research issues in EDM.

II. Types of EDM Processes

A number of EDM process configurations are currently employed in industry, involving die sinking EDM, wire- cut EDM, Micro EDM, Dry EDM, Powder mixed EDM etc.

A. Die Sinking EDM process

In EDM setup, two metal parts (tool electrode and work-piece material) are submerged in dielectric fluid and are connected to a source of direct current. The power supply may be switched on and off automatically depending on the values of selected parameters using machine tool controller. When

the current is switched on, an electric tension is created in the inter electrode gap. With the help of servo motor mechanism, when tool and work piece surfaces are brought together to a certain predefined minimum gap (spark gap) the electrical tension is discharged and a spark jumps across. Due to this a lot of heat is generated which raises the temperature to 6000 – 7000 K [4,5,6,7] in inter electrode gap. Due to this substantial amount of heat is generated which melts material at the surface of each work piece and tool electrode. Early EDM equipment used relaxation type pulse generators with capacitor discharges but modern die sinking EDM equipment uses transistor type pulse generators. In sinking EDM, work piece can be shaped up as per the requirement, either by providing 3D movement to the tool electrode like in milling process or by replicating the shaped tool electrode similar to the shape required on work piece or a combination of the above. The servo feed control system is used to keep the working gap at a proper width. In order to remove debris particles and decomposition products, the dielectric liquid is flushed in the inter-electrode gap.

B. Wire-cut EDM process

In this process a wire of 0.02 to 0.33mm in diameter is used as electrode to cut complicated shapes in work piece. Mostly plain brass wire or coated wires, such as zinc coated brass or coated steel wires, tungsten wires, molybdenum wires are used as tool electrodes. In WEDM set up current is generally applied to wire in tension through both the lower and upper feeding brushes which helps to raise discharge current quickly. It helps to reduce the tendency of wire to break down due to joule heating. In WEDM, de-ionized water is mostly used as dielectric liquid. WEDM is capability to produce much complex shapes with a high degree of accuracy, independently of the mechanical properties of the material such as hardness, brittleness, toughness etc. WEDM can machine from common materials (copper, graphite, aluminum, and tool steel) to exotic space age alloys (Inconel, titanium carbide and conductive ceramics). During machining thin and fragile work piece no damage & distortion of work-piece occurs as minimal clamping pressure is applied to hold the work piece. Moreover as the tool electrode does not touch the work piece, physical pressure imparted on work-piece is zero. This results in stress free machining operation.

C. Micro EDM process

In recent years, numerous research and developments in EDM process have focused on the production of micro-features. Although micro-EDM is also based on the principle of spark erosion it is not merely an adoption of the EDM process for machining at micron level. Micro EDM process significantly differs from EDM process as far as fabrication method of micro-sized tools, gap control and flushing techniques are concerned [8-10]. Today, all types of conductive materials such as: metals, metallic alloys, graphite, or even some ceramic materials, of whatsoever hardness can be machined by micro-EDM with high precision [11]. Currently used five different types of micro-EDM are [12]:

- Die-sinking micro-EDM: Micro electrode is used to produce its mirror image in a conductive work piece.
- Micro-wire cut EDM: In this type a wire of diameter ≤ 0.02 mm is employed to cut a work piece.
- Micro-EDM drilling: In this type an electrode of diameter between 5 – 10 mm is employed to 'drill' micro-holes in a conductive work piece.
- Micro-EDM milling: Electrode of diameter (5–10 mm) is used to machine the materials.
- Micro-EDG: In this process a sacrificial electrode of bigger diameter is reduced to micron level so that it may be used in micro-EDM.

The discharge energy is of the order of 10^{-6} to 10^{-7} J in micro-EDM process [15]. Most research in the field of Micro-EDM is concentrated around process mechanism, tooling, surface integrity, tool wear, etc. Because of high melting point and high tensile strength tungsten is considered to be predominant material in micro-EDM [16,17]. Good repeatability of micro EDM makes it a best means for achieving high-aspect-ratio micro-features [18,19].

D. Dry EDM process

During machining with the regular use of hydrocarbon based oils such as kerosene oil, etc. the risk of workers health is crucial. These hydro-carbon oils decompose and release harmful vapors and toxic fumes which causes breathe and lung diseases to the workers. Dry EDM is an environment-friendly technique as there is no use of mineral oil-based dielectric liquid which are harmful for environment. In 1985 Ramani and Cassidenti [23] proposed a first attempt in dry EDM, they uses argon and helium gas as a dielectric. Kunieda et al. [24] reported that improved MRR by introducing oxygen gas into the inter-electrode gap in water based dielectric medium and also explained that the reduction of probability of attachment of debris by flushing increases the MRR. Planetary motion employed to tool electrode reduces short circuiting hence lowers TWR.

E. Powder Mixed EDM Process (PMEDM)

In this method, suitable electrical conductive material in fine abrasive powder form is mixed in dielectric fluid and flushed in the inter electrode gap at appropriate velocity. Under the application of voltage (80–320V) between the electrode and the work piece facing each other with a gap of 25–50 μm, a strong electric field of the order of 10^5–10^7 V/m is produced. Due to this the energized powder particles act as conductors and come close to each other and arranged in certain definite form like a chain structure. This structure bridges the spark gap between the tool electrode and work piece surface and hence reduces the insulating strength of dielectric fluid. Faster sparking takes place in the inter electrode gap which erodes more material from work piece surface. This results in better material erosion rate. One of the noticeable effects of suspended powder additives is that sparking is uniformly distributed among the powder particles. This results in shallow craters on surface of work piece and hence improved surface finish. The powder characteristic's

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such as concentration and size of powder particles influences the performance of dielectric fluid.

III. EDM Research Areas

Ho and Newman [25] categorized major EDM research areas in following three categories:

- EDM performance measures (MRR, TWR, SQ)
- EDM process Variables
- Electrode design and manufacture

A. EDM performance measures

Maximization of material removal rate, minimization of tool wear rate and satisfactory SQ is the main concern of researchers as far as optimum performance of EDM process is concerned. This section describes each performance measures and the methods for their improvement.

1) Material Removal Rate (MRR):

MRR is a process of erosion of material from work piece in form of debris. The major contributing factors to change MRR: change in discharge current, arc voltage, spark duration, [26]. Kuneida and Muto [27] replaced a single discharge system by multi-electrodes discharge system in which more than one electrode are connected in a series to increase the discharge current, which results in increased MRR. Marafona and Wykes [28] experimented by increasing the carbon content on the tool surface for the improvement in MRR. Singh and Ghosh [29] proposed a thermo-electric model for the calculation of the electrostatic force and also obtained the stress distribution as a result during discharge inside the metal. It was observed that material removal mechanism can be altered by reversing the polarity of sparking [30]. Gadalla and Tsai [31] studied the removal of material of the composite of tungsten carbide. It was recognized that the removal of material to the melting and evaporation of Co followed by low electrically conductive WC gains. Lee and Lau [32] found that promotion of abrupt temperature gradients from normal melting and evaporation is due to the physical and mechanical properties. Roethel et al. [33] determines the change in the thermally influenced zone and also suggested a mass transfer mechanism of tool electrode material. Pandey and Jilani [34] modeled thermally damaged surface layer and plasma channel growth. It was observed that confinement within a re-solidified layer is due to the change in chemical composition of material [33].

2) Tool Wear Rate (TWR):

TWR is a process of erosion of material from tool electrode surface due to sparking in inter electrode gap. Many researchers tried to decrease the TWR by conducting various experiments without effecting MRR. Mohri et al. [35] found that carbon precipitation from hydro-carbon dielectric affects the TWR during sparking. Marafona and Wykes [36] adjusted the settings of the process parameters by which they provided a wear inhibitor carbon layer on the surface of tool electrode prior to normal conditions of EDM process. Improvement on the TWR was enhanced by carbon inhibitor layer's thickness. Yu et al. [37] applied an overlapping to-and-fro motion in machining method which compensated the longitudinal tool wear and provided a uniform wear of tool electrode. Bleys et al. [38] controlled the downward feeding machine movement to compensate the wear of tool electrode by evaluating the tool length reduction on the basis of pulse analysis. Dauw et al. [39] studied pulse characteristics based on discharge voltage fall time to evaluate the measurement of tool wear.

3) Surface Quality:

The material is removed in EDM process due to repeatedly occurring spark discharges, a surface layer of specific roughness is being created on the surface of the work piece and shows different metallographic microstructure and micro hardness. The detail study of the different surface layers produced by EDM shows the various physical and chemical changes. The upper most layer i.e a white layer crystallizes from the dielectric cooled at high speed. The Pulse energy and the pulse duration are responsible for the depth of this upper melted zone. Beneath the upper most layers there is chemically affected layer with possible change in the phase and the average chemical composition. There is next layer which is deformed plastically with micro and macro strains characterized by the presence of phase changes, twinning and slip. Kruth et al. [40] studied the effects on the surface and subsurface of the work piece metal by EDM and proposed that the three layers are created on top of the unaffected work piece metal.

B. EDM process parameters

Van Tri [41] categorized the parameters into five groups; Dielectric fluid (type of dielectric, temperature, pressure, flushing system), Machine characteristics (servo system and stability stiffness, thermal stability and accuracy), Tool (material, shape, accuracy), Work-piece, Adjustable parameters (discharge current, gap voltage, pulse duration, polarity, charge frequency, capacitance). However Wang & Yan [42,43] classified EDM Process parameters into two categories; electrical parameters and non electrical parameters. Discharge voltage, Peak current, pulse duration and pulse interval, electrode gap, polarity, and pulse wave form are major electrical process parameters. Injection flushing pressure of dielectric fluid, work-piece rotation, and electrode rotation are major non-electrical process parameters.

1) Effect of Electrical Parameters:

Research efforts in this area shows considerable effects of electrical parameters on the performance of EDM process. Grey relational analysis, Taguchi approach using orthogonal array and signal-to-noise (S/N) ratio, fuzzy logic technique are some of the techniques opted by the researchers to compute the effect of process parameters on the performance measures. Past work emphasized that EDM pulses (open, spark, arc, off or short pulses) have appreciable effect performance measures of the process [44]. Several authors claimed that the fuzzy logic control implements a control strategy which is helpful to maintain the desired machining process [45]. Some researchers [46-48] worked for regulating the cycle time of periodical retraction of electrode to avoid the undesirable arcing during EDM process.

2) Effect of Non-Electrical Parameters:

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Non-electrical parameters also play a crucial role in delivering optimal performance of EDM process. Important non electrical parameters are dielectric flushing, work piece rotation and tool electrode rotation

a) Dielectric Flushing: Lonardo and Bruzzone [49] suggested experimentally that MRR and TWR were affected by flushing during the roughing operation. Optimal flushing rate in the inter electrode gap is desirable to minimize the crack density and recast layer during EDM process [50].

b) Work-piece Rotation: Rotating the work piece at certain speed also affects the EDM performance [25]. Kunieda and Masuzawa [51] suggested a change in the basic structure of EDM machine by providing horizontal EDM (HEDM) instead of conventional vertical axis EDM, in which the main machining axis is horizontal. This facilitates the rotary motion to the work piece which helps in improving the erosion efficiency and accuracy of the sparking process by the flushing of debris from the inter electrode gap.

c) Tool electrode Rotation: Rotating tool electrode improves flushing through inter electrode gap and hence MRR and SR [52-54]. Many researchers used rotary electrical discharge machining, along with different flushing techniques, on different composite materials and studied their effect on MRR, TWR and SR [42,43,52,55,56]. Tubular, solid and hollow electrodes of different materials were used in experimentation. Shih and Shu [57] reported lower electrode wear rate and higher MRR during Electrical discharge grinding of AISI D2 tool steel using a rotary disk copper electrode mounted on horizontal spindle. Ghoreishi and Atkinson [58] studied the effects of axial vibration along with the rotation of electrode on the material removal and electrode wear noticed the improved material removal rate for a specified surface finish. Guu and Hocheng [59] reported increase in MRR and improvement in surface finish with increase in rotation of electrode during EDM of rotating cylindrical AISI D2 tool steel work piece. Yan et al. [60] demonstrated a novel vibro-rotary EDM process using magnetic abrasion finishing technique for improving SKD 11 tool steel work surface quality. Improved surface finish with lesser micro-cracks and recast layer was observed when vibrations were introduced on the rotating work piece.

C. Electrode design and Manufacture

Various factors related to electrode design and manufacturing methods also alters the EDM performance measures. Surface finish, dimensional accuracy, geometry of the electrode and electrode material properties such as thermal conductivity, machinability, wear resistance affect EDM performance measures [61,62].

1) Manufacturing of tool electrode with Rapid tooling:

Rapid Prototyping (RP) technology which encompasses a group of manufacturing techniques of adding the material layer by- layer to the shape of the physical part is developed to reduce the product development time and the cost of tooling [61]. Lower manufacturing lead time and market constrains converts RP technology to Rapid Tooling (RT), to build prototype tools directly, as opposed to prototype products directly from the CAD model. The three broad classifications of the RT techniques are direct (RP-based process to manufacture tooling inserts directly), indirect (RP process to generate a pattern from which the tooling inserts are made) and patterns for casting (uses RP patterns to produce final metal parts) [63]. Production of prototype, patterns through RP techniques consists of steps as (a) CAD model preparation (b) STL translation (c) Slicing and production of technological program (d) Additive manufacturing (e) Post-processing of the prototype. Stereo-Lithography, Laser Sintering, Laminated Object Manufacturing, Fused Deposition Modeling, 3D Printing, Thermo Jet Printing etc. are some of the common RP techniques used to produce prototypes. Though both of these techniques use laser beam, Stereo-Lithography gives better dimensional accuracy (±0.15 mm) and surface finish. On the other hand LS gives better mechanical strength of prototypes especially when it uses metal powders [61].

a) Electrodes from non-conductive materials: Rapid EDM electrode manufacture of non-conductive prototypes can be categorized as Positive metal-coated parts and negative metal-coated parts. RP part metallization uses a positive or a negative RP prototype to manufacture an electrode. Further Metallization of parts in RP is divided in two stages as: First stage metallization in which 10 – 50lm metal coat is applied to change the non conductive part to conductive and Second stage metallization in which more than 180 lm thickness metal coat is applied to enhance electrode performance and properties.

b) Electrodes from conductive materials: Selective laser sintering (SLS) which uses compound metal and binder powders is the most efficient RP technique for producing metal parts. Indirect metal laser sintering and direct metal laser sintering are the methods under this technique. In the last decades researchers carried out a lot of research work in rapid EDM electrode manufacture using conductive materials to enhance the performance of RP techniques and RT electrodes [61].

2) Electrode design by use of computer assistance:

The availability of modern CAD/CAM software and CAPP techniques made the designers to create any 3 D cavity in the work piece by giving that shape to the tool electrode.

IV. HYBRIDIZED EDM

In general, EDM process is known for its low material removal rate. In the past decades a number of studies reported the effects of EDM combined with ultrasonic machining (USM). An application of tool electrode vibration vibrating at ultrasonic frequency is helpful to provide extra motion to dielectric fluid carrying generated debris. Vibrating tool electrode at ultrasonic frequency forces the dielectric fluid in the inter electrode gap to move up and down, changing the contact angles of dielectric fluid side surface of tool electrode and wall of drilled hole, so-called wetting effect of ultrasonic vibration. This weakens the boundary between the bubbles and the dielectric [64]. As a result viscous resistance in the discharge gap is reduced and the bubbles are broken and removed easily. The net effect is improved machining

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efficiency. In micro EDM, a combination of ultrasonic vibrations and planetary tool movement is able to make micro holes with aspect ratio as high as 29. Guo et al. [65] reported that the use of ultrasonic vibration improves the dielectric circulation and causes large pressure change which promotes the debris removal rate in the discharge gap. Hitoshi et al. [66] reported enhanced machining rates using EDM with ultrasonic vibration as compare to without ultrasonic vibration. Zhang et al. [67] made an arrangement and applied gas through the internal hole of a thin-walled pipe electrode and confirmed enhanced material erosion rate with amplitude of ultrasonic actuation. Gao et al. [68] compared conventional micro EDM and ultrasonic assisted micro EDM. Eight times more efficiency of ultrasonic assisted micro-EDM was reported when conducted experiments on stainless material with tungsten electrode. Prihandana et al. [69] reported enhanced flushing effect when the vibration was introduced on the work piece. It was observed that MRR increased due to high amplitude combined with high frequency.

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A Review of Various Techniques to Improve MRR in Sinking Electrical Discharge Machining

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***Abstract*— Electrical Discharge Machining (EDM) is a well established non-conventional machining process for manufacturing simple and complex geometries from hard and difficult to cut materials. Since the inception of EDM process, researchers are trying to improve material removal rate (MRR) of this process. In this paper a review of research work to improve material removal rate by using different methods in sinking EDM is reviewed and the results on the performance of process are presented. At the end, scope for future research work in this area is presented.**

***Index Terms*—EDM, MRR, MRR improvement techniques**

I. Introduction

EDM is a non-traditional machining method based on vaporization of minute particles of current conductive materials (electrodes) when an electric discharge takes place between electrode and work-piece. In 1770, Joseph Priestly an English scientist discovered the erosive effect of electrical discharges. In 1943, at Moscow University soviet scientists B. R. Lazarenko and N. I. Lazarenko exploited the destructive properties of electrical discharge and inverted the effect of metal removal from electric circuit breakers. In 1950s, relaxation type generators (resistance–capacitance charging condensers to store and define discharge energy) were used. With these circuits, it became possible to make a simple servo control circuit to automatically find and hold a given gap between electrodes and moreover to control pulse times. In 1960s semiconductor switched static pulse generators enhanced the applicability of duty cycles and hence material removal rate by the process. In 1980s, the efficiency of EDM process is further enhanced when Computer Numerical Control (CNC) in EDM came into picture. In the last two decades, a lot of research is carried out by researchers to enhance the productivity of this process. Under the monitoring of adaptive control systems, modern EDM machine tools are able to work round the clock. This process can be successfully employed to machine any electrical conductive material irrespective of its hardness, shape or strength. Many automotive and aerospace components, as well as moulds and dies are manufactured using electrical discharge machining. Moreover, no direct contact between the electrode and the work-piece in EDM results a stresses free machining process.

II. EDM Process Parameters

Wang & Yan [1, 2] classified EDM Process parameters into two categories; electrical parameters and non electrical parameters. Discharge voltage, Peak current, pulse duration and pulse interval, electrode gap, polarity, and pulse wave form are major electrical process parameters. Injection flushing pressure of dielectric fluid, work-piece rotation, and electrode rotation are major non-electrical process parameters. However, Van Tri [3] categorized the parameters into five groups:

- Dielectric fluid; type of dielectric, temperature, pressure, flushing system
- Machine characteristics; servo system and stability stiffness, thermal stability and accuracy
- Tool; material, shape, accuracy
- Work-piece

Adjustable parameters; discharge current, gap voltage, pulse duration, polarity, charge frequency, capacitance and tool materials.

III. Important Machine Settings

A. Duty factor

One complete cycle time is the sum of pulse on time and pulse off time. Duty factor is the ratio of pulse duration by total cycle time. It is generally expressed in percentage.

B. Pulse frequency

Total number of cycles produced in the inter electrode gap in one second is termed as pulse frequency. Finer surface finish is obtained at higher pulse frequency setting.

C. Average current

During one complete cycle, the value of maximum amperage is called peak current, while average amperage in the inter electrode gap is termed as average current. Itis calculated by multiplying peak current by duty factor.

IV. Performance Measures in EDM

Major performance measures in EDM are:

- Material Removal Rate
- Tool Wear Rate
- Surface Roughness

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V. EDM Working Process

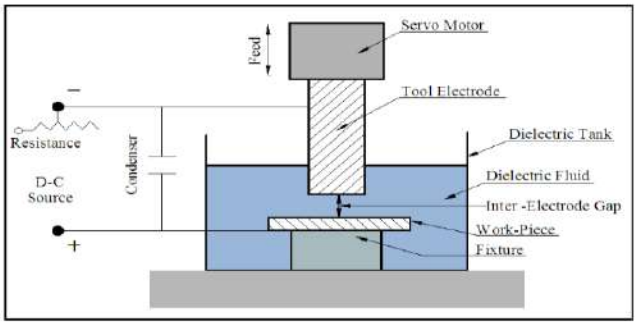

Fig. 1. Electrical Discharge Machining Setup.

Figure 1 shows EDM setup. The MRR mechanism of EDM process makes the use of electrical energy converted into thermal energy through a series of discrete electrical discharges occurring between the nearest surfaces of tool electrode and work piece material [4]. In Electrical Discharge machining setup, two metal parts (tool electrode and work-piece material) are submerged in dielectric fluid and are connected to a source of power supply. The power supply may be switched on and off automatically depending on the values of selected parameters using machine tool controller. When the power supply (current) is switched on, an electric tension is created in the gap between the tool and work-piece surface. With the help of servo motor mechanism, when tool and work piece surfaces are brought together to a certain definite gap the electrical tension is discharged and a spark jumps across. A lot of thermal energy is generated by plasma channel which raises the temperature to 20,000 [5] in inter electrode gap. Due to this substantial amount of heat is generated which melts material at the surface of each work piece and tool electrode. When the pulsating power supply occurring at the rate of approximately 20,000–30,000 Hz [6] is turned off, the plasma channel breaks down. Due to this the temperature suddenly drops and implores the plasma channel and flushes the molten material from the inter electrode gap. S Kalpajian et al. [7] reported that 10^{-6} to 10^{-4} mm^3 volume of material is removed per discharge. Further depending upon specific conditions, 2 to 400 mm3/min is typical material removal rate (MRR) of EDM process.

A. MRR Mechanism

As discussed earlier MRR is most important performance measure EDM process. It depends upon various process parameters like pulse electrical parameters (duration, tool electrode material, work piece material, discharge voltage, discharge current, electrode polarity, type of current impulse and non-electrical parameters (type and speed of dielectric flushing, rotation of tool/work-piece etc.).The metal is removed from both work-piece and tool electrode during EDM process. Material is removed by a series of rapidly recurring current discharges (Sparks) in the inter electrode gap. MRR is generally expressed as the weight of material removed from work-piece over a period of machining time in minutes. The volume of material removed can be calculated based on measurements of depth and width of the slots made in work-piece surface due to action of successive discharges in inter electrode gap. This volume is divided by the measured time for EDM to give the MRR. MRR may be expressed in mm^3/min or g/min. Since the inception of EDM process, researchers are trying continuously to improve MRR through different innovative methods viz. Powder mixed EDM, Vibration of work piece, micro holes machining, rotary and vibro-rotary vibrations, EDM milling process, ultrasonic vibration, EDM with water and dry EDM process etc. This paper presents review on above said techniques carried out to improve MRR.

VI. Methods of Improving MRR

A. Powder Mixed Dielectric

In this method, suitable electrical conductive material in fine abrasive powder form is mixed in dielectric fluid and flushed in the inter electrode gap at appropriate velocity. The electrically conductive powders play vital role in EDM process by reducing breaking down strength of dielectric fluid and increase the spark gap between work-piece and tool electrode. The powder characteristic's such as concentration and size of powder particles influences the performance of dielectric fluid. From the published literature it has been observed that researchers reported the set of different combinations of electrically conductive abrasive powders and work piece materials. Gao et al. [8, 9] proposed powder mixed near dry electrical discharge machining (PMND-EDM) to further improve the machining efficiency and the surface quality. Bai et al. [10, 11] did research on the breakdown mechanism of the three phase dielectric medium. It was observed that peak current, pulse on time and flow rate of the powder–liquid mixtures enhances the MRR of PMND-EDM significantly. B. Jabbaripoura et al. [12] investigated the output characteristics of material removal rate (MRR), surface roughness by using powder mixed electrical discharge machining (PMEDM) of TiAl by adding different powders such as aluminum, chrome, silicon carbide, graphite and iron. It was reported that aluminum particles with the size of 2 μm enhances MRR by 54%. Jeswani M.L [13] reported the effect addition of fine graphite powder into kerosene oil as dielectric. As the result of the experiment the MRR increased by 60% and reduction in tool wear ratio about 28%. Erden and Bilgin [14] studied the effect of mixing of (Cu, Al, Fe, C) powders as dielectric in kerosene oil for machining of copper–steel and brass–steel pairs. The MRR was found to increase with the concentration of powder particle obtained due to the decrease in time lags at high impurity concentrations. Yu et al. [15] investigated the effects of concentration of aluminum powder on machining of tungsten carbide (WC). The result of experiments shows higher MRR and discharge gap. Tzeng et al. [16] observed that the size of abrasives, density, concentration of abrasives, thermal conductivity and electrical resistivity of powders affect the machining performance. When appropriate amount of various powder additives (Cr, Cu, SiC and Al) were mixed in the dielectric fluid, increased MRR and decreased TWR was reported. Kansal H.K., et al.

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[17] proposed optimum process conditions with graphite powder for rough machining phase using the Taguchi method and reported that the addition of an appropriate concentration of the powder additive into the dielectric results improvement in MRR. Yan and Chen [18, 19] studied the effect of suspended silicon carbide (SiC) and aluminum powders (Al) in the dielectric fluid during EDM of Ti–6Al–4V and SKD11 steels. Improvement in MRR was considerably reported as results. Ming et al. [20] studied the effect of addition of conductive inorganic particles in EDM dielectric and reported increased MRR, lower TWR and improved work-piece surface qualities. Tani et al. [21] investigated the machining characteristics of Silicon Nitride (Si_3N_4) ceramics by adding various powder additives into the dielectric fluid and concluded that MRR increased considerably while the surface finish not improved so much. Rozenek et al. [22] compared the characteristics of machining by using kerosene dielectric fluid and mixture of de-ionized water with different powders at different concentrations on hard material. It was proposed that the addition of powder additives in the dielectric fluid influences both MRR and TWR. Wong Y.S., et al. [23] investigated that graphite powder particles enhances machining rate of SKH-54 tool steel. Chow H.M., et al. [24] investigated that addition of both aluminum and silicon carbide powder into kerosene oil increases gap distance between tool electrode and work piece material thus increases material removal rate. Kansal H.K., et al. [25] investigate the effect of silicon powder mixed into the dielectric fluid of EDM on machining characteristics of AISI D2 steel and reported the appreciably enhancement of material removal rate of AISI D2 steel. Kansal H.K., et al. [26] develops an axis symmetric two-dimensional model for PMEDM using the finite element method to predict the thermal behavior and material removal mechanism in PMEDM process. Chiang K.T., [27] proposes mathematical models for the modeling and analysis of the effects of Machining parameters on the performance characteristics in the EDM process ofAl2O3+TiC mixed ceramic. It was concluded that discharge current and the duty factor affects significantly the value of MRR. The discharge current and the pulse on time also have statistical significance on both the value of the electrode wear ratio and the surface roughness. Dvivedi A., et al. [28] investigated the effect of pulse-on (T_{on}), pulse-off (T_{off}), pulse current (I_p), gap control setting and flushing pressure on EDM of cast Al 6063-SiCp MMC by using Taguchi's technique to obtain an optimal setting of the EDM process parameters. It was found that MRR increases with increasing I_p and T_{on} up to an optimal point. The effect of current was predominant on MRR as compared to other parameters. Kung K.Y., et al. [29] analyzed MRR and electrode wear ratio in PMEDM of cobalt-bonded tungsten carbide by suspending aluminum powder in dielectric fluid and reported that the powder particles disperses and makes the discharging energy dispersion uniform.

B. Dry EDM process

In the Last decades EDM has played remarkable and important role as nonconventional machining method in production technology. In 1985 NASA reported a new technique of dry EDM to drill holes by using a tubular copper electrode in helium and argon gas as dielectric medium [30]. Dry EDM is a technique in which gaseous dielectric is used in place of some liquid dielectric. Liquid dielectric is replaced and substituted by a gas flowing at high velocity through the tool electrode into the inter-electrode gap. The flow of high velocity gas into the gap facilitates removal of debris and prevents excessive heating of the tool and work-piece at the discharge spots. It is essential to provide rotation or planetary motion to the tool electrode to maintain the stability of dry EDM process. At high velocity the gas is supplied through the rotating tubular tool electrodes in the discharge gap. This continuous flow of fresh gas in the inter electrode gap act as dielectric medium and helps to remove debris particles away from the gap. Dry EDM is an environment-friendly technique as there is no use of mineral oil-based dielectric liquid which is harmful for environment; dry EDM produces no waste and toxic fumes. Joshi et al. [31] used pulsating magnetic field to constrain plasma expansion around the plasma in dry EDM. It was reported that use of such magnetic field helps improve MRR by 130%. Govindan and Joshi [32] proposed a mechanical shield around the plasma for exerting a back pressure on the plasma column thereby confining plasma expansion and improving MRR. Attempts were made to model the material removal phenomena analytically in single spark in dry EDM by Kadam [33] as well as liquid EDM, Lin and Lee [34], Heinz et al. [35] have been met with limited success. Saha and Choudhury [36] investigated the rotation of the electrode on dry EDM process. It was observed that duty factor, air pressure and spindle speed have a significant effects on MRR and SR. Kunieda et al. [37] reported that improved MRR by introducing oxygen gas into the inter-electrode gap in water based dielectric medium and also explained that the reduction of probability of attachment of debris by flushing increases the MRR. Planetary motion is employed to the tool electrode which reduces short circuits hence zero tool electrode wear can be achieved. It was suggested that the supply of oxygen excites the oxidation and improves MRR. Kunieda et al. [38] proposed and explained three distinct modes of material removal; normal mode, quasi-explosion mode and explosion mode. The MRR during quasi-explosion mode was found to be as high. Kunieda et al. [39] conducted experiment by mounting work-piece on piezoelectric actuator (natural frequency of 500MHz) and observed reduction in arching probability and improvement in MRR. Zhanbo et al. [40] conducted experiments and proposed the possibilities of dry EDM process for 3D surface machining. It was observed that the optimum conditions exists for achieving maximum MRR and minimum TWR by changing the parameters e:g (gas pressure, pulse interval and rotational speed of tool electrode, depth of cut and pulse duration etc.). Zhang et al. [41, 42] introduced ultrasonic vibration process associated with dry EDM. Mathematical model including process parameters (open voltage, discharge current, pulse duration and pulse interval) was developed for MRR. It was experimentally found that the higher MRR can be achieved by decreasing wall thickness of tool electrode and optimizing process parameters and amplitude of ultrasonic vibration.

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Kunieda, et al. [43] conducted experiments and proposed that MRR can be increased by increasing the wire winding speed and decreasing the depth of cut while using dry EDM process for precision wire EDM. Kao et al. [44] carried out the experiments by using a copper electrode wire with stationary air or with an assisting air jet on dry WEDM process. Experiments were conducted on different work-piece materials and significant effect of parameters i.e. (work-piece thickness, melting temperature and heat capacity) on the machinability of materials was observed. It was also reported that the use of air flow could improve the MRR. Effect of duty factor, pulse-on time, air flow rate and work-piece thickness on MRR, groove width, debris deposition was analyzed and concluded that the MRR could be improved by the use of air flow. Tao et al. [45] experimentally investigates the dry and near dry EDM process. Parametric study was done to investigate the effect of discharge current, pulse-duration, pulse interval, gap voltage and open circuit voltage. It was found that copper tool and oxygen gas dielectric with a high current and low pulse off time were suitable for rough machining with a high MRR. Yu et al. [46] reported that MRR of dry EDM milling is about six times more than that of oil EDM milling while machining cemented carbide materials.

C. Ultrasonic vibration assisted EDM

Benefits of vibrating tool electrode at ultrasonic frequency in EDM machine tool are assessed by various researchers since mid-1980s. Shabgard et al. [47] investigated the combined effect of electrical discharge machining (EDM) with ultrasonic vibrations to improve the machining efficiency by using graphite as tool electrode and AISIH13 tool steel as work piece. Discharge peak current and pulse duration were changed to explore their effect on the material removal rate (MRR), relative tool wear ratio (TWR) and surface roughness. It was also reported that ultrasonic assisted EDM (US-EDM) was effective in achieving higher material removal rate (MRR).Yu et al. [48] investigated the effects of ultrasonic waves on EDM process. It was reported that ultrasonic waves and cavitation played an important role in improving the flushing and machining efficiency during USEDM. V. Srivastava et al. [49] investigated the effect of ultrasonic assisted cryogenically cooled copper electrode (UACEDM) on parameters e.g. (material removal rate, tool wear rate and surface roughness) during machining of M2 grade high speed steel. It was reported that material removal rate and sparking was modified in UACEDM process because of the ultrasonic vibrating motion of the electrode. P. J. Liew et al. [50] applied Ultrasonic vibration to dielectric fluid by a probe-type vibrator to assist micro EDM of deep micro-holes in SiC ceramic material. It was reported that best machining performance is obtained when carbon nano-fibers are added into the vibrated dielectric fluid. Guo Z. N., et al. [51] studied and concluded that the use of ultrasonic vibration improves the dielectric circulation which promotes the rate of debris removal by creating large pressure change in the inter electrode gap. This improves MRR by enhancement of molten metal ejection from the surface of the work piece. Zhixin et al. [52] obtained higher MRR during EDM of ceramics materials by developed an ultrasonic vibration pulse electro-discharge machining technique. Ogawa et al. [53] confirmed more machining rates in micro-holes by using EDM with ultrasonic vibration as compare to without ultrasonic vibration. Thoe et al. [54] observed that using ultrasonic vibration during EDM enhances MRR of the work piece. Zhang et al. [55] applied gas through the internal hole of a thin-walled pipe electrode and reported increase in MRR with amplitude of ultrasonic actuation and other electrical parameters (discharge current, open voltage, pulse duration etc.). Gao et al. [56] conducted experiments on stainless material with tungsten electrode and found eight times more efficiency of ultrasonic assisted micro-EDM than that of simple micro-EDM. Prihandana et al. [57] conducted experiments by vibrating the work piece. It was found that flushing effect increased when the vibration was introduced on the work piece. MRR was reported increased due to high amplitude combined with high frequency. Ghoreishi et al. [58] conducted experiments by providing low and high frequency forced axial vibration to the tool electrode, providing rotation to the electrode and combination of these two (vibro-rotary) and reported 35% more MRR in vibro-rotary EDM as compare to vibration EDM and by 100% more MRR in semi finishing operation. Xu et al. [59] conducted experiments and compared results (MRR) in traditional EDM in gas and tool electrode assisted ultrasonic vibration in gas medium EDM for cemented carbide work-piece. It was reported that ultrasonic vibration assisted machining yield more MRR for particular discharge pulse on time.

D. EDM with water

In order to promote green EDM, some researchers tried to use water as dielectric fluid instead of using hydrocarbon oil because hydrocarbon oil as dielectric decomposes and releases harmful vapors. Most of these studies reported that use of water as dielectric also influences MRR of the EDM process. Y. Zhang et al. [60] investigated the EDM performance with W/O emulsion dielectric. It was found that the machining efficiency can be improved comparing with the traditional kerosene based dielectric and the environmental impact can be alleviated by using this new dielectric. Y. Zhang et al. [61] investigated material removal characteristics of the EDM process using various dielectrics as the working fluids e.g. (gaseous dielectrics, air and oxygen, and liquid dielectrics, de-ionized water, kerosene and water-in-oil (W/O)). It was reported that the higher material removal efficiency in liquid dielectrics, especially in W/O emulsion was observed due to the higher pressure above the discharge point. Jeswani [62] investigated and compared the performances of distilled water and kerosene as dielectric fluid and reported that at high pulse energy range more MRR and lower wear ratio by the use of distilled water than that of kerosene. Moreover, better surface finish was achieved while machining accuracy was poor with distilled water. Tariq et al. [63] compared the performance of mixture of 75% distilled water and 25% tap water, tap water and distilled water as dielectric in EDM. It was reported that erosion rates was best when tap water is used. Moreover there is possibility of achieving zero copper tool electrode wear at negative polarity. Konig et al. [64] conducted investigations

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and concluded that erosion process in water-based dielectric media possesses higher thermal stability and increase in MRR. Chen et al. [65] conducted EDM of Ti-6A1-4V by using distilled water and kerosene as dielectrics and observed that more material erosion rate of Ti-6A1-4V work piece in distilled water than that in kerosene oil. Soni et al. [66] studied the effect of rotation of tool on MRR, and also compared rotary tool EDM with stationary tool EDM by using rotation of copper-tungsten tool electrode for titanium work-piece. It was concluded that that a higher MRR can be achieved by better flushing of debris from the discharge gap. While the surface finish was quite poor with a rotating tool.

Some researchers tried to investigate the effect of additives mixed water and used as dielectric. Leao et al. [67] reported that some researchers have studied the feasibility of adding ethylene glycol, polyethylene glycol 200, polyethylene glycol 400, polyethylene glycol 600, dextrose and sucrose in order to improve the performance of demonized water. Yan B. H. et al. [68] Reported the feasibility of adding urea solution to water used as dielectric. It was reported that adding urea into the dielectric, MRR increased with an increase in peak current. Moreover MRR declined as the pulse duration increased.

E. Other techniques

To obtain higher MRR and lower energy consumption in conventional EDM, Kunieda and Muto [69] modify EDM principle by introducing the new concept of multi-spark EDM. Researcher proposed two types of tool electrode designs to set up multiple discharge points for each pulse. Mohri et al. [70] suggested an arrangement of multiple electrically insulated electrodes connected to the pulse generator through a resistor. In this arrangement, when discharge occurs in one of the inter electrode gap, the gap voltages at other electrodes are maintained at the open circuit voltage level till the surface electric charge over these electrodes is redistributed or another discharge occurs. In this way the discharge can occur at different electrodes simultaneously. Chen et al. [71] designed a new mechanism by using multi electrode system controlled by planet gear system in die sinking EDM with pipe cutting arrangement. The newly developed mechanism resulted in increase in material removal rate when machining SUS 304 work piece material. Highest MRR was reported when work piece rotates at 8 rpm. Suzuki et al. [72] and Kubota et al. [73] proposed a new method for dressing of bonded grinding wheels. In this system (twin electrode discharge system) discharge circuit was formed by connecting the pulse generator to one of two twin electrodes, the grinding wheel, and the other twin electrode serially. Researchers generated successfully two discharge points simultaneously at both the gaps for each pulse.

VII. Remarks and Future Scope

The process of EDM has brought many remarkable improvements in the machining process in recent years. Researchers try to introduce various methods for enhancing productivity of EDM process. The main attention of this review paper is to report various research works attempted by the researchers for the improvements in MRR of EDM. After comprehensive review of published literature, following remarks are concluded.

- Many researchers attempted the work in PMEDM to investigate powders of Al, SiC, Si, Cu, Graphite, Cr and other common materials by varying grain size and concentrations in dielectric fluid. Still the use of other electrical conductive powder materials and important alloying elements needs to be studied.
- Most of the research work in PMEDM is centric on commonly used steel based materials. Also, many materials like water hardened die steel; molybdenum high speed tool steel, ceramics and other difficult to cut materials have not been tried as work-piece material in PMEDM. The same may be tried in future works.
- Researchers found that non-electrical parameters like electrode rotation and work piece rotation improve the flushing in inter electrode gap and hence improve MRR. Work in this area is limited to some work-piece materials only. Effect of these non-electrical parameters needs further investigation for other work materials.
- Most of the investigations on ultrasonic vibration assisted EDM are focused on steel based materials only. Very less published work is reported on composites and harder materials like alumina and ceramics.
- The best machining rates have been achieved with tap water as the dielectric fluid. The performance of water-based dielectric may be investigated for the machining of advanced materials such as composite materials and carbides.
- Researchers mostly use copper tool electrode in ultrasonic assisted EDM. Other tool electrode materials need further investigation.
- Based on several assumptions, researchers proposed various theoretical models to describe material removal mechanism in their work. However these models are not universally applicable to all the working conditions. Case to case empirical models is better suitable to quantify MRR. There is future scope to develop universal models which may be applicable to all working conditions.

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An Improved K-means Clustering Technique in WSN

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ABSTRACT
A wireless sensor network (WSN) consists of spatially distributed autonomous sensors to monitor physical or environmental conditions and to cooperatively pass their data through the network to a Base Station. Due to the increase in the quantity of data across the world, it turns out to be very complex task for analyzing those data. Categorize those data into remarkable collection is one of the common forms of understanding and learning. This leads to the requirement for better data mining technique. These facilities are provided by a standard data mining technique called Clustering. Clustering can be considered the most important unsupervised learning technique so as every other problem of this kind; it deals with finding a structure in a collection of unlabeled data. This paper reviews six types of clustering techniques- K-Means Clustering, LEACH, HEED, TEEN and PEGASIS. K-Means clustering is very simple and effective for clustering. It is appropriate when the large dataset is used for clustering.
Keywords: WSN, cluster, k-means, LEACH, HEED, TEEN, PEGASIS, DEEC.

I. INTRODUCTION

Advances in wireless communication made it possible to develop wireless sensor networks (WSN) consisting of small devices, which collect information by cooperating with each other. These small sensing devices are called nodes and a typical node of a WSN consist of four components: a *sensor* that performs the sensing of required events in a specific field, a *radio transceiver* that performs radio transmission and reception, a *microcontroller*, which is used for data processing and a *battery* that is a power unit providing energy for operation. The size of each sensor node varies with applications. Today, wireless sensor networks are widely used in the commercial and industrial areas such as for e.g. environmental monitoring, habitat monitoring, healthcare, process monitoring and surveillance.

The nodes in WSNs are powered by batteries, it is expected that these batteries lasted for years before they can be replaced. Due to the cost and small size of the sensor nodes, they have been equipped with small batteries with limited energy source [4]. This has been a major constraint of wireless sensor nodes which limits their lifetime and affects utilization of the wireless sensor networks.

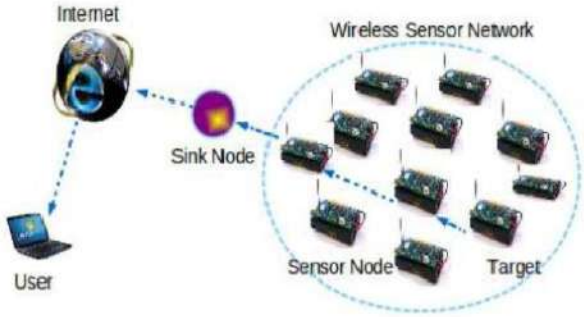

Fig1. Wireless sensor network

To extend batteries' lifetime and networks utilization, constant changing the batteries when they run out of energy may not be practical, since these nodes in most cases are many (tens to thousands of sensor nodes), recharging the weaken batteries at all time may not be feasible. Therefore, there is a need to minimize energy consumption in WSNs. The following steps can be taken to save energy caused by communication in wireless sensor networks [1].

a) To schedule the state of the nodes (i.e. transmitting, receiving, idle or sleep).
b) Changing the transmission range between the sensing nodes.
c) Using efficient routing and data collecting methods.
d) Avoiding the handling of unwanted data as in the case of overhearing.

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In many cases (e.g. surveillance applications), it is undesirable to replace the batteries that are depleted or drained of energy. Many researchers are therefore trying to find power-aware protocols for wireless sensor networks in order to overcome such energy efficiency problems as those stated above.

II. *Data clustering*

The process of grouping a set of physical or abstract objects into classes of similar objects is called clustering [9]. A *cluster* is a collection of data objects that are similar to one another within the same cluster and are dissimilar to the objects in other clusters. In each cluster, sensor nodes are given different roles to play, such as cluster head, ordinary member node, or gate way node. A cluster head (CH) is a group leader in each cluster that collects sensed data from member nodes, aggregate, and transmits the aggregated data to the next CH or to the base station [6]. Clustering is an effective technique for reducing energy consumption and extending sensor network lifetimes [3]. A clustering algorithm attempts to find natural groups of components (or data) based on some similarities. The clustering algorithm also finds the centroid of a group of data sets. The output from a clustering algorithm is basically a statistical description of the cluster centroids with the number of components in each cluster.

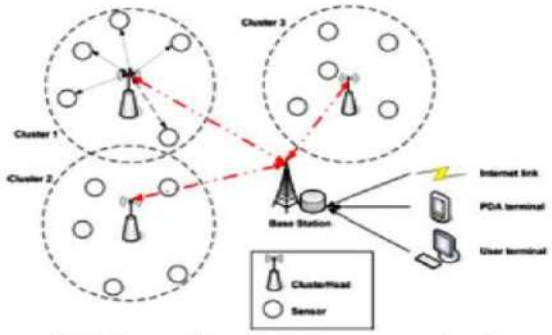

Fig2: clustered based wireless sensor network

The centroid of a cluster is a point whose parameter values are the mean of the parameter values of all the points in the clusters. Clustering algorithms are often useful in applications in various fields such as visualization, pattern recognition, learning theory, computer graphics, neural networks, Artificial intelligence and statistics. Practical applications [6] of clustering include pattern classification under unsupervised learning, proximity search, time series analysis, text mining and navigation.

a) Clustering Advantages

Clustering has numerous advantages. Some of these are:

1. Clustering reduces the size of the routing table stored at the individual nodes by localizing the route set up within the cluster (Akkaya 2005).
2. Clustering can conserve communication bandwidth since it limits the scope of inter-cluster interactions to CHs and avoids redundant exchange of messages among sensor nodes.
3. The CH can prolong the battery life of the individual sensors and the network lifetime as well by implementing optimized management strategies (Younis 2003).
4. Clustering cuts on topology maintenance overhead. Sensors would care only for connecting with their CHs (Hou 2005).
5. A CH can reduce the rate of energy consumption by scheduling activities in the cluster.

A. Data Clustering Techniques

The main target of hierarchical routing or cluster based routing is to efficiently maintain the energy usage of sensor nodes by involving them in multi-hop communication within a particular cluster. With clustering in WSNs, energy consumption, lifetime of the network and scalability can be improved. Various routing techniques are as follows:

a) *Low-Energy Adaptive Clustering Hierarchy (LEACH)* [12] is a popular clustering protocol for WSNs. It has inspired many subsequent clustering protocols. LEACH's operation is comprised of many rounds, where each round includes two phases, a setup phase and a steady phase.

i. In the setup phase, LEACH randomly selects sensor nodes as Cluster Heads (CHs), subsequently rotating roles in each round in order to evenly distribute energy dissipation to all sensor nodes of the network.

ii. In the steady-state phase, data are delivered from sensor nodes to CHs and from CHs to the BS per a TDMA/CDMA schedule.

LEACH doesn't need global information for the network, and is a distributed and adaptive approach. It achieves various benefits from balancing loads via rotation, such as reducing conflicts by TDMA schedule and saving energy through assignment of on-or-off states by time slot [5].

However, there are also disadvantages. LEACH assumes sensor nodes are homogeneous but in reality sensor node energy distribution occurs in a heterogeneous manner, especially over a period of time. The CH selection in LEACH is based on probabilities without considering residual energy of sensor nodes, and there is the possibility that CHs are overwhelmed in some areas and infrequently assigned in others. Therefore, CHs are not uniformly distributed in the network and load balancing cannot be guaranteed. Moreover, LEACH needs re-

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clustering in each round, which may diminish any energy savings gain.

b) Hybrid Energy-Efficient Distributed clustering (HEED) [8] is an energy-efficient protocol. It selects CHs periodically based on residual energy and on intra-cluster communications costs among sensor nodes. HEED is fully distributed and adaptive. CHs can be uniformly distributed throughout the network thereby balancing the load. However, like LEACH, HEED requires re-clustering each round which brings significant overhead and diminishes energy gains. Furthermore, HEED can't avoid the hot spot issue.

c) *TEEN* [15] is a cluster based hierarchical routing protocol and it is based on LEACH. Using this protocol the data can be sensed continuously but transmission of data is not done frequently. TEEN uses LEACH's approach to form clusters. Hard threshold (HT) and soft threshold (ST) are two types of threshold mode used in this algorithm. In HT mode the sensed attribute will be within the range of interest in order to send the data. In ST mode any changes in the value of the sensed attribute will be transmitted. The nodes sense their environment frequently then store the sensed value for transmission. If it satisfies the below conditions then only the node transmits the sensed value:

i. If sensed value greater than the hard threshold (HT).

ii. If sensed value is not hard threshold and greater than or equal to soft threshold (ST).

In TEEN, cluster head always waits for their time slot for data transmission. Suppose node has no data then time slot may be wasted.

d) PEGASIS [15] is a chain-based power efficient protocol performance based on LEACH protocol. All the nodes have information about all other nodes and each node has the ability of transmitting data to the base station directly. Nodes have global knowledge of the network; chain can be construed by greedy algorithms. Each node transmits and receives data from the closest node of its neighbors. In each round, the node is chosen randomly (leader) from the chain. The aggregated data are sent to the BS using leader. This algorithm eliminates the overhead of the dynamic cluster information and it reduces the number of transmissions.

e) *DEEC* [2] (Distributed Energy Efficient Cluster) is used in heterogeneous wireless sensor network. After placing the nodes, nodes are clustered based on the average energy of the network and the ratio between the residual energy of each node, the cluster heads are elected. After that sensed data must be transmitted and received between base station and cluster head. It increases the energy efficiency of network and extend lifetime also.

B. Parameters

Selecting appropriate parameter for any given WSN is another challenge. But here we wanted to put forward those parameters which are common for almost all WSN. For that most of the parameters we have chosen are related to basic hardware level.

a) Nodes Energy

W. heinzelmann *et al.* used node energy level 2J where other research has used range varying from 1J to 5 J [6] .For experiment the energy of node is varied between 1J to 3J.

b) Distance

One of the most significant factors for WSN is distance. It is appropriate to use Euclidian distance from the base station (BS) to each node. It varied from 85 m to 175 m. The higher the distance more energy is required to data interchange [6].

$$\text{Euclidian distance} = \sqrt{(x_i - x_c)^2 + (y_i - y_c)^2}$$

c) Cluster Head Selection

After the centroid positions are finalized in the clustering process, we consider nodes which are at the nearest distance and also the next nearest distance from the centroid. The node with highest energy is considered as Cluster Head. If more than one node in the two levels has the highest energy then the node nearest to the centroid is selected as cluster head

d) Latency

Clustering in WSN should take into account the latency [6]. The latency is a function of the number of communication hops between the source and the gateway (CH). Latency is also a dependent on distance. As the distance increases the latency increases and vice versa.

III. *K-means clustering*

K-means is a commonly used partitioning based clustering technique that tries to find a user specified number of clusters (k), which are represented by their centroids, by minimizing the square error function developed for low dimensional data, often do not work well for high dimensional data and the result may not be accurate most of the time due to outliers. There are two simple approaches to cluster center initialization i.e. either to select the initial values randomly, or to choose the first k samples of the data points. As an alternative, different sets of initial values are chosen (out of the data points) and the set, which is closest to optimal, is chosen [11].

Data Aggregation

In Sensor Network, data aggregation removes the redundancy among data collected by different sensors and consequently aims at load reduction over the network.

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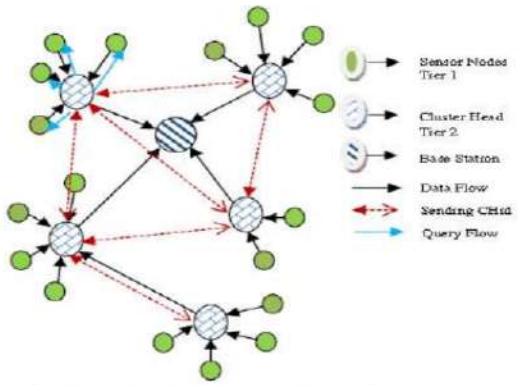

Fig3: Sensed Data forwarding with clustering and aggregation

The computational complexity of original K-means algorithm is very high, especially for large data sets. In addition the number of distance calculations increases exponentially with the increase of the dimensionality of the data.

A. The K-Means clustering Algorithm

K-means cluster algorithm was proposed by J. B. MacQueen in 1967 and then by J. A. Hartigan and M. A. Wong around 1975, which is used to deal with the problem of data clustering. It is also called the generalized Lloyd algorithm (GLA). K-means algorithm is based mainly on the Euclidian distances and cluster head selection depends on residual energies of nodes. So here the central node collects the information about the node id, position and residual energy of all nodes and stores this information in a list in the central node. After getting this information from all nodes it starts performing the clustering algorithm (k-mean) [11].

Algorithm:

1. If we want to cluster the nodes into 'k' clusters, take 'k' number of centroids initially at random places
2. Calculate the Euclidian distance from each node to all centroids and assign it to centroid nearest to it. By this 'k' initial clusters are formed .Suppose there are n nodes are given such that each one of them belongs to Rd. The problem of finding the minimum variance clustering of this nodes into k clusters is that of finding the k centroids { mj }k j = 1 in Rd such that,

$$\left(\frac{1}{n}\right)\times\Sigma\left(\min_{j} d^{2}\left(X_{i}, m_{j}\right)\right), \text{ for i} - 1 \text{ to } n$$

for i = 1 to n, where d(Xi , mj) denotes the Euclidean distance between Xi and mj. The points {j}k i = 1 are known as cluster centroids or as cluster means.

3. Recalculate the positions of centroids in each cluster and check for the change in position from the previous one

4. If there is change in position of any centroid then go to STEP 2, else the clusters are finalized and the clustering process ends

By this the clustering of nodes into 'k' number of clusters is done [11] and the cluster heads in each cluster are to be chosen as shown in Fig4.

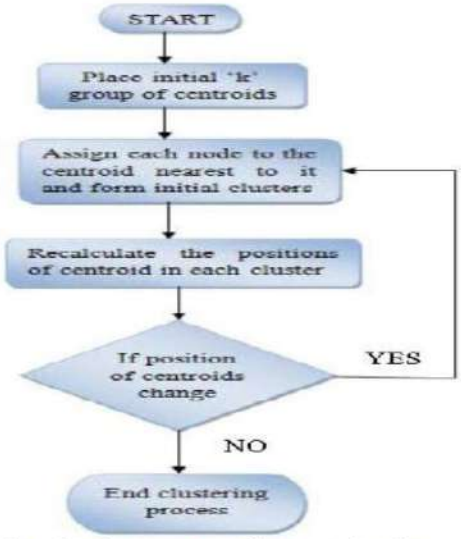

Fig4. Flow chart showing sequence of k-means algorithm

IV. Comparison between Data Clustering Techniques

Clustering techniques	Nature	Network Type	Cluster Head Election Message Overhead	Number of Hops	Probabilistic	Recommended for	Cluster Formation Message Overhead
K-means	Distributed /Centralized	Homogenous/ Heterogeneous	NO	Multi	Yes	Larger/small dataset	NO/cluster formation is easily done by choosing the centroid
LEACH	Distributed/ Centralized	Homogenous	NO	Single	Yes	Small dataset	Yes/Load balancing conflicts
HEED	Distributed	Homogeneous	NO	Multi	Yes	Small dataset	yes/HOT SPOT PROBLEM
TEEN	Distributed/adaptive approach	Homogeneous	NO	Multi	No	Small dataset	Yes/periodic way transmission
PEGASIS	Grid/chain based protocol	Heterogeneous	NO	Multi	Yes	Small dataset	NO/ eliminating the overhead of dynamic cluster formation
DEEC	Distributed/adaptive	Heterogeneous	NO	Single	Yes	Small dataset	NO/ does not require any global knowledge of energy at every election round.

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IV. Conclusion

A brief introduction about WSNs, routing techniques, clustering is presented. There are so many routing techniques developed to solve the energy consumption problem and for enhancing the lifetime of WSNs. some of them are discussed above such as LEACH, HEED, TEEN, PEGASIS and DEEC. But mostly every technique has certain limitations like various clustering techniques do not suitable for large scale networks. But K-means clustering algorithm has biggest advantage of clustering large data sets and its performance increases as number of clusters increases and the performance of K- mean algorithm is better than Hierarchical Clustering Algorithm. A comparison between different clustering techniques is also discussed.

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Artificial Neural Networks

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***Abstract*: Artificial neural networks are composed of interconnecting artificial neurons (programming constructs that mimic the properties of biological neurons). Artificial neural networks may either be used to gain an understanding of biological neural networks, or for solving artificial intelligence problems without necessarily creating a model of a real biological system. The real, biological nervous system is highly complex: artificial neural network algorithms attempt to abstract this complexity and focus on what may hypothetically matter most from an information processing point of view. Good performance or performance mimicking animal or human error patterns, can then be used as one source of evidence towards supporting the hypothesis that the abstraction really captured something important from the point of view of information processing in the brain. Another incentive for these abstractions is to reduce the amount of computation required to simulate artificial neural networks, so as to allow one to experiment with larger networks and train them on larger data sets.The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurones) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurone.**

***Keywords*: Neurons, Artificial Neural Network, Artificial Intelligence, Biological System, Hypothesis, Nervous System, Simulate, Synaptic.**

1. INTRODUCTION

An Artificial Neural Network as (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurones) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurones. This is true of ANNs as well.

1.1 Historical background

Neural network simulations appear to be a recent development. However, this field was established before the advent of computers, and has survived at least one major setback and several eras. Many important advances have been boosted by the use of inexpensive computer emulations. Following an initial period of enthusiasm, the field survived a period of frustration and disrepute. During this period when funding and professional support was minimal, important advances were made by relatively few reserchers. These pioneers were able to develop convincing technology which surpassed the limitations identified by Minsky and Papert. Minsky and Papert, published a book (in 1969) in which they summed up a general feeling of frustration (against neural networks) among researchers, and was thus accepted by most without further analysis. Currently, the neural network field enjoys a resurgence of interest and a corresponding increase in funding. The first artificial neuron was produced in 1943 by the neurophysiologist Warren McCulloch and the logician Walter Pits. But the technology available at that time did not allow them to do too much.

1.2 Why use neural networks

Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyse. This expert can then be used to provide projections given new situations of interest and answer" what if" questions.

Other advantages include:

1. Adaptive learning: An ability to learn how to do tasks based on the data given for training or initial experience.
2. Self-Organisation: An ANN can create its own organisation or representation of the information it receives during learning time.
3. Real Time Operation: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.
4. Fault Tolerance via Redundant Information Coding: Partial destruction of a network leads to the corresponding degradation of performance. However, some network capabilities may be retained even with major network damage.

1.3 The brain, neural networks and computers

Computer simulation of the branching architecture of the dendrites of pyramidal neurons.Neural networks, as used in artificial intelligence, have traditionally been viewed as simplified models of neural processing in the brain, even though the relation between this model and brain biological

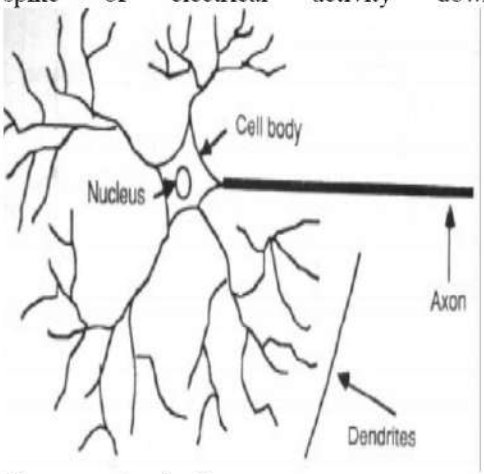
architecture is debated, as little is known about how the brain actually works. A subject of current research in theoretical neuroscience is the question surrounding the degree of complexity and the properties that individual neural elements should have to reproduce something resembling animal intelligence. Historically, computers evolved from the von Neumann architecture, which is based on sequential processing and execution of explicit instructions. On the other hand, the origins of neural networks are based on efforts to model information processing in biological systems, which may rely largely on parallel processing as well as implicit instructions based on recognition of patterns of 'sensory' input from external sources. In other words, at its very heart a neural network is a complex statistical processor (as opposed to being tasked to sequentially process and execute).Neural coding is concerned with how sensory and other information is represented in the brain by neurons. The main goal of studying neural coding is to characterize the relationship between the stimulus and the individual or ensemble neuronal responses and the relationship among electrical activity of the neurons in the ensembl It is thought that neurons can encode both digital and analog information.

2. Human and Artificial Neurones

2.1 How the Human Brain Learns?

Much is still unknown about how the brain trains itself to process information, so theories abound. In the human brain, a typical neuron collects signals from others through a host of fine structures called dendrites. The neuron sends out spikes of electrical activity through a long, thin stand known as an axon, which splits into thousands of branches. At the end of each branch, a structure called a synapse converts the activity from the axon into electrical effects that inhibit or excite activity from the axon into electrical effects that inhibit or excite activity in the connected neurones.

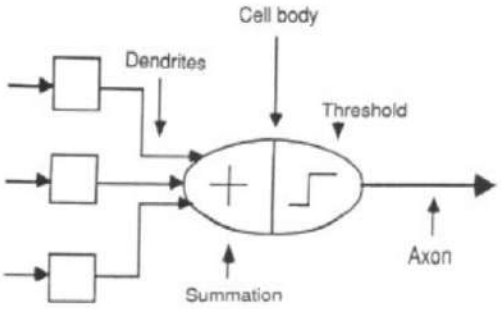
When a neuron receives excitatory input that is sufficiently large compared with its inhibitory input, it sends a spike of electrical activity down its axon..



Components of a Neuron

2.2 From Human Neurones to Artificial Neurones

We conduct these neural networks by first trying to deduce the essential features of neurones and their interconnections. We then typically program a computer to simulate these features. However because our knowledge of neurones is incomplete and our computing power is limited, our models are necessarily gross idealisations of real networks of neurones.



THE NEURON MODEL

3. Types of models

Many models are used in the field, each defined at a different level of abstraction and trying to model different aspects of neural systems. They range from models of the short-term behaviour of individual neurons, through models of how the dynamics of neural circuitry arise from interactions between individual neurons, to models of how behaviour can arise from abstract neural modules that represent complete subsystems. These include models of the long-term and short-term plasticity of neural systems and its relation to learning and memory, from the individual neuron to the system level. While initially research had been concerned mostly with the electrical characteristics of neurons, a particularly important part of the investigation in recent years has been the exploration of the role of neuromodulators such as dopamine, acetylcholine, and serotonin on behaviour and learning.

Biophysical models, such as BCM theory, have been important in understanding mechanisms for synaptic plasticity, and have had applications in both computer science and neuroscience. Research is ongoing in understanding the computational algorithms used in the brain, with some recent biological evidence for radial basis networks and neural backpropagation as mechanisms for processing data.

Computational devices have been created in CMOS for both biophysical simulation and neuromorphic computing. More recent efforts show promise for creating nano-devices for very large scale principal components analyses and convolution. If successful, these efforts could usher in a new era of neural computing that is a step beyond digital computing, because it depends on learning rather than programming and because it is fundamentally analog rather than digital even though the first instantiations may in fact be with CMOS digital devices.

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4. Applications of Neural Networks

4.1 Neural Networks in Practice

.Given this description of neural networks and how they work, what real world applications are they suited for? Neural networks have broad applicability to real world business problems. In fact, they have already been successfully applied in many industries. Since neural networks are best at identifying patterns or trends in data, they are well suited for prediction or forecasting needs including:

- Sales forecasting
- Industrial process control
- Customer research
- Data validation
- Risk management
- Target marketing

But to give you some more specific examples; ANN are also used in the following specific paradigms: recognition of speakers in communications; diagnosis of hepatitis; recovery of telecommunications from faulty software; interpretation of multimeaning Chinese words; undersea mine detection; texture analysis; three-dimensional object recognition; hand-written word recognition; and facial recognition.

4.2 Neural Networks in Medicine

Artificial Neural Networks (ANN) are currently a 'hot' research area in medicine and it is believed that they will receive extensive application to biomedical systems in the next few years. At the moment, the research is mostly on modelling parts of the human body and recognising diseases from various scans (e.g. cardiograms, CAT scans, ultrasonic scans, etc.).

4.3 Neural Networks in Business

Business is a diverted field with several general areas of specialisation such as accounting or financial analysis. Almost any neural network application would fit into one business area or financial analysis.
There is some potential for using neural networks for business purposes, including resource allocation and scheduling. There is also a strong potential for using neural networks for database mining that is, searching for patterns implicit within the explicitly stored information in databases. Most of the funded work in this area is classified as proprietary. Thus, it is not possible to report on the full extent of the work going on. Most work is applying neural networks, such as the Hopfield-Tank network for optimization and scheduling.

CONCLUSION

The computing world has a lot to gain from neural networks. Their ability to learn by example makes them very flexible and powerful. Furthermore there is no need to devise an algorithm in order to perform a specific task; i.e. there is no need to understand the internal mechanisms of that task. They are also very well suited for real time systems because of their fast responseand computational times which are due to their parallel architecture. Neural networks also contribute to other areas of research such as neurology and psychology. In this report we study on the ANN, neural network and its use.

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Cognitive Radio Network: Interface Cancellation and Management Techniques

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Absract- **In this article contains study lies on the physical-layer signal-processing schemes, which is known as Interference cancelation(IC) techniques. An opportunistic IC scheme was proposed for CR receivers to adaptively cancel the primary signals when they are decodable.The widely used IC techniques include the filter-based approach, transform-domain approach, cyclostationary-based approach, higher order statistics-based approach,joint multiuser detection and spatial processing. In this article we also highlight some of the recent information theoretic limits, models, and design of these promising networks.**

Keywords : CRN, IC, DSA,WI-FI,TFR,OFDM.

I. INTRODUCTION

In recent years, wireless technology is proliferating rapidly and vision of pervasive wireless computing and communication offers the promise of many social and individual benefits. This has inspired the development of hierarchical spectrum-sharing-systems, where secondary systems are allowed to utilized the spectrum of incumbents without causing harmful interference to primary systems. So, cognitive radios offers the promise of being a disruptive technology innovation that will enable the future wireless world. Cognitive radio networks have a DSA(Dynamic spectrum access) network a number of challenges in wireless network and challenges in wireless network and communications. This article contains various Interference cancellation techniques are successfully applied to a number of wireless systems to mitigate various types of interference in communication. In addition we also model and analyze cognitive networks in order to very intelligently design and set their operating parameters.

II. MOTIVATION AND DEFINITIONOF A COGNITIVE NETWORK

Cognitive networks are initiated by the apparent lack of spectrum under the current spectrum management policies. The right to use the wireless spectrum in the United States is controlled by the Federal Communications Commission (FCC). Most of the frequency bands useful to wireless communication have already been licensed by the FCC. However, the FCC has designated a few unlicensed bands, most notably the industrial scientific and medical (ISM) bands, over which the immensely popular Wi-Fi devices transmit. These bands are filling up fast, and, despite their popularity, the vast majority of the wireless spectrum is in fact licensed.

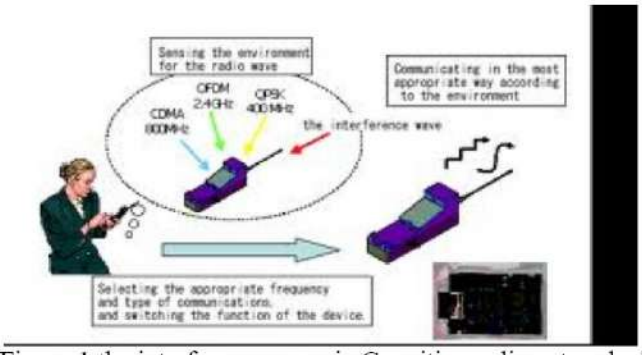

Figure-1 the interference wave in Cognitive radio networks [5]

III. FEATURES

- Cognitive networks are wireless networks that consist of several types of users: often a primary user (the primary license holder of a spectrum band) and secondary users (cognitive radios).
- Cognitive networks are initiated by the apparent lack of spectrum under the current spectrum management policies.
- Cognition may take various forms of learning and adapting to the environment.
- For such networks, the different communication possibilities explode, and to date, precise network capacity region results are lacking.
- In the interference was defined as the expected

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fraction of primary users with services disrupted by nearby CR transmitters.

- The interference from primary to CR networks can be directly measured by CR receivers with passive sensing techniques.
- The interference temperature limit characterizes the worst-case interfering scenario in a particular frequency band and at a particular geographic Location.
- In cognitive networks white spaces refer to spectra where primary signals have negligible power and can be simply treated as background noise.
- The aim of introducing IC techniques at a CR receiver is to enable it to successfully operate under higher levels of interference from primary networks.
- We address only those considered most relevant to internetwork interference cancelation in CR networks.
- This has inspired our investigation on applying IC techniques to CR networks with a special focus on mitigating the internetwork interference.
- Cognitive radio are fully programmable wireless devices that can sense their environment and dynamically adapt their transmission waveform channel acsess method, spectrum use, and networking.

IV. TECHNIQUES USED

Cognitive radio networks are wireless network that consist of several types of users: often a primary users and secondary users. The study of
Cognitive radios network and relatively new and many question have yet to be answered. Cognitive radio network have the DSA(Dynamic Spectrum Access) networks pose a number of challenges in wireless networking and communications. The first and obvious challenges is that we need radios that can operate in multiple frequency band to use since it is in most cases unrealistic that the user will be able to pick the right band. Cognitive radio network are a perfect fit to realize these functionalities:-

- Operating environment should be interpreted very broadly.
- Effective interference management is therefore essential to the coexistence of primary and Cognitive radio networks.
- Various aspects of system design from network planning.
- Radio resource management.
- Medium access control to physical layer mechanism and signal processing.
- Our interest in this study lies on the physical layer processing schemes, which commonly known as Interference cancellation(IC) techniques.

Firstly the cognitive radio network initiated by the apparent lack of spectrum under the current spectrum management policies. The right to use the wireless spectrum controlled by FCC ie Federal Communication Commission. FCC licensed the most of the frequency bands which are very useful in the wireless communication. However, the FCC has designed a few unlicensed bands, most notably the unlicensed band and industrial standard and ISM bands over which the popular WI-FI devices transmit. The general cognitive network exploits cognition at the subset of its nodes. (users). Cognition may take various forms of learning & adapting to the environment. We focus on the cognition in the form of node about extra information of wireless technology they tranmit.

1. *Achievable Rates and Capacity Region (Small Networks):-*

A communication channel is modeled as the set of conditionally probably density functions relating to input and output of the channel. Capacity is defined by the spectrum over all rates for which capacity is central to many information theoretical studies it is often the challenging to determine. Inner bounds or achievable rates, as well as outer bounds to capacity may be readily available. This is particularly in channels which are multiple transmitters and multiple receivers want to communicate independent message to two independent Receivers. Although channel capacity region is known as in the certain cases, the general capacity region despite advanced, remains a mystery.

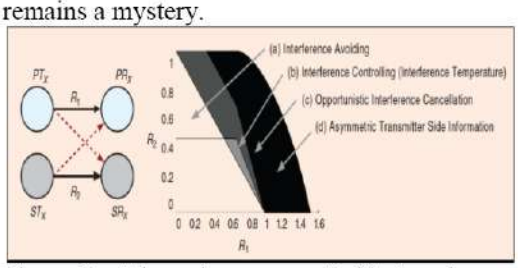

Figure-2. The primary users(white) and secondary users (grey) wish to transmit over the same channel. Solid lines denoted desired transmission, dotted lines denote interference. The achievable rate region under four different cognitive assumption and transmission schemes are shown on the right.(a)-(d) are in order of increasing cognitive abilities.[16]

2. *Simulaneous, controlled transmission [Interference Temperature]*

While white spaces filling demand that cognitive transmission be orthogonal to primary transmission, another intitutive approach to secondary spectrum licensing would involve non-orthogonal transmission. Rather than detecting white spaces, a cognitive radio would simultaneously transmit with the

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primary device. It would use its cognitive capabilities to determine at what power level it should transmit so as not to harm the primary transmission. That is primary transmission schemes may be designed to with stand a certain level of interference which cognitive radio may exploit for their own transmission.

Provided the cognitive radio knows :-

1. The maximal interference temperature level.
2. The current interference temperature level.
3. How its own transmit power will translate to received power at the primary receiver, then the cognitive radio may adjust its own transmission power so as to satisfy any interference temperature constraint the primary users.

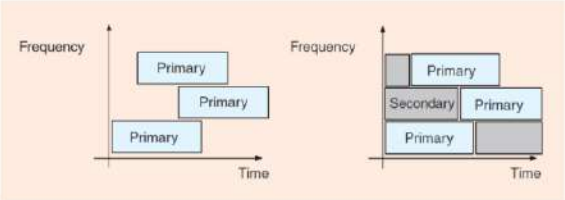

Figure-3 One of the simplest instance of cognition: a cognition senses the time/frequency white spaces and opportunistically transmit over these detected spaces.[15]

3. *Large Network : The Scaling Laws*

As single-link wireless technologies have matured over the past decadeds,it is of great interest to determine how these devices perform in large networks. These networks can contain primary and cognitive users that are adhoc (adhoc cognitive networks), or they can contain some infrastructure support for the primary users (infrastructure supported cognitive networks).

4. *Cognitive Users Model And Design*

In this section, we model and analyze cognitive networks in order to very intelligently design and set their operating parameters. Specifically, we focus on the impact of cognitive users in terms of the interference power or interference temperature generated by these cognitive user and primary user. We aim to provide only an example of this interference analysis and its application n two different network with beacon and a network with exclusive region for the primary users.

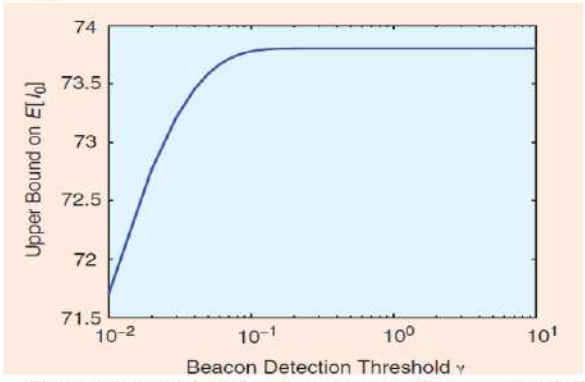

Figure-4 An upper bound on the average interference versus the beacon threshold level.[17]

5. *Interference Analysis*

Consider again an extended network in which the cognitive users are uniformly distributed with constant density. Assume a circular network shape with radius *Rn*, which increases as the number of cognitive users increases. Consider a channel with path loss and small-scale fading. The interference depends on the locations of the cognitive users, which are random, and on the random channel fading.

6. *Interference Assessment and Modeling*

Interference in the context of CR networks can be classified into two types: intra- and internetwork interference. Intranetwork interference, also known as self-interference, refers to the interference caused within one network (either a primary or CR network). Typical examples of intranetwork interference include intersymbol interference in frequency-selective channels and multi-access interference (MAI) in multiuser networks. Intranetwork interference exists to some extent in every wireless communication system, and there is a wealth of techniques established to mitigate them effectively. On the other hand, internetwork interference refers to the mutual interference between the primary and CR networks.

7. *Interference from CR to Primary Networks*

It represents the maximum amount of interference that receiver can tolerate. The interference temperature model serves as the useful tool to characterized the interference from CR to primary network. An ideal interference temperature model should account for the cumulative radio frequency energy from multiple CR transmission and sets a maximum cap on their aggregate level. CR users are then allowed to use a frequency band as long as their transmission do not violate the interference temperature limits. As a new metric to assess the interference in spectrum sharing systems, the interference temperature model has recently been proposed in [2]. Unlike traditional transmitter centric approaches that seek to regulate interference indirectly by controlling the emission power, time, or locations of interfering transmitters, the interference temperature model takes a receiver centric approach and aims to directly manage interference at the receiver through interference temperature limits. The interference temperature limit characterizes the worst-case interfering scenario in a particular frequency band and at a particular geographic location.

8. *Interference from Primary to CR Networks*

The interference from primary to CR networks can be directly measured by CR receivers with passive sensing techniques. On the basis of power-spectrum density (PSD) of the interfering primary signals, we can broadly classify the spectra into three categories: 1) black spaces are spectra occupied by high-power primary signals, which can usually be decoded by CR receivers; 2) gray spaces refer to spectra with low to

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medium power primary signals, which are too weak to be decoded satisfactorily but are still significant sources of interference to the CR network; and 3) white spaces refer to spectra where primary signals have negligible power and can be simply treated as background noise.

9. *IC at CR Receivers*

The aim of introducing IC techniques at a CR receiver is to enable it to successfully operate under higher levels of interference from primary networks. Let us consider a CR receiver operating in a given frequency band. It first performs primary signal sensing and identifies the band as a white, gray, or black space. Based on the sensing results, the CR receiver can then choose to apply corresponding IC techniques to obtain optimized performance.

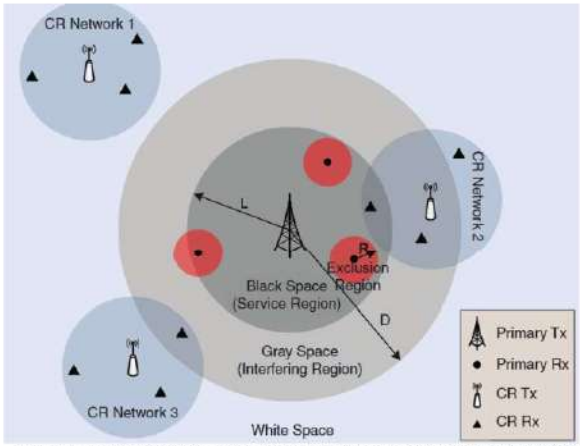

Figure -5 Coexistence of a primary network and randomly distributed CR networks with illustrations of the exclusion region, black space (service region), gray space (interfering region), and white space.[8]

10. *IC for White Spaces*

While white spaces are detected, the interference in the frequency band of interest is negligible and can be treated as noise. Therefore, no particular IC technique is needed.

11. *IC for Gray Spaces*

The key feature of gray spaces is that the band of interest suffers low- to medium-level interference from primary networks. For this type of interference, it is desirable to use a special type of IC technique called interference suppression,which suppresses the power of primary signals and thereby improves the signal-to-interference-and-noise ratio (SINR) of secondary signals.There exist various schemes of Wireless technology which contains Interference cancellation techniques are successfully applied to a number of wireless systems to mitigate various types of Interference.

i. Transform-Domain Approach

Transform-domain approaches first convert the received signal to the transform domain, remove certain transform components, and then use the inverse transform to synthesize the SOI. For example, an orthogonal frequency division multiplexing (OFDM) CR receiver can process signals in the frequency domain and remove narrowband interference by excising the interfered subbands. In practice, interference usually cannot be completely removed from the SOI using pure time- or frequency-based processing. Time–frequency analysis then provides amore powerfulmeans for signal separation and classification. Time–frequency representations (TFRs) describe signals in the form of their joint time and frequency characteristics.

ii. Receive Beam forming

In addition to the transform domain, spatial domain can also be exploited to separate the SOI and interference if they have different spatial signatures. This requires a CR receiver to be equipped with multiple antennas to perform beam forming, which applies weights on the antenna array to form a desirable reception pattern. More specifically, when the SOI and interference arrive from different directions, a multiantenna CR receiver can adaptively form different beam patterns to enhance reception in the direction of the SOI and put nulls toward the directions of the interference. In complex propagation environments, a tradeoff is often needed between SOI signal enhancement and interference suppression.

iii. Higher Order Statistics-Based Approach

Many signal-processing schemes in communication systems assume that the signals are stationary random processes and can be sufficiently characterized by the mean (first-order statistics) and covariance (second-order statistics). Incorporating higher order statistics, having orders higher than two, into signal processing can provide additional distinction on the SOI and interfering signals [13]. Signal separation using higher order statistics works better when multiple diversity copies of the received signal are available. These diversity copies can be obtained from antenna arrays or, in case of signal antenna systems, from fractionally spaced sampling or oversampling.

iv. Predistortion Filtering

In practice, one major cause of the adjacent channel interference is the transmission nonlinearity due to cascaded nonlinear components in the RF chain. High linearity is usually required for CR transmitters to ensure minimal interference to primary users. However, high linearity transmitter chains are not only more expensive but also less power efficient. One way to reduce the linearity requirement is to use pre-distortion techniques.

v. Transmit Beam forming

Similar to receive beam forming, transmit beam forming [6] and transmit pre-coding [7] can be applied to CR networks for mitigating interference to primary systems by adaptively choosing weights on the transmit antenna elements to form an emission pattern with nulls toward the directions of primary receivers. It is an effective and flexible approach to balance

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between the interference minimization for the primary users and the SINR maximization for the secondary users. Implementations of transmit beam forming are more complicated than receive beam forming since a feedback mechanism is required to inform CR transmitters about the instantaneous channel-state information (CSI).

1. IC for Black Spaces

Black spaces are usually regarded as unusable for CR users because 1) the potential deployments of primary receivers in the vicinity may prohibit CR transmissions and 2) the high-power interfering primary signals that may block CR receptions. The interference estimation and cancellation is performed in two successive steps :-

- Estimating the exact interfering signal.
- Subtracting the estimating interference from the received signal.

Therefore there are two approaches for estimating interference:

- Interference extraction.
- Interference reconstruction.

	Region	Techniques
At the CR receiver	White Space	No IC needed
	Grey space	Interference suppression
		Filter based
		Transform based
		Receive Beamforming
		Cyclostatinarity based
		Higher-order statistics based
	Black space	Interference suppression
		Interference cancellation
At the CR transmitter		Extraction and cancelation
		Reconstruction and cancelation
	All Regions	Spectrum shaping
		Predistortion filtering
		Spread spectrum
		Transmit beamforming

Figure- 6 Interference cancellation techniques for cognitive radio network

2. Interference Extraction

Extracting interference from the received signal can be achieved by suppressing the SOIs. Therefore, previously discussed interference suppression techniques can be used to suppress the SOIs and thereby extract the interfering primary signal.

3. Interference Reconstruction

In the case of digitally modulated primary signals, if a CR receiver receives a strong primary signal and knows its transmission structure (e.g., its coding and modulation schemes), it can first demodulate and decode the primary signal to recover the original primary information bits. Then, the CR receiver can reconstruct the corresponding primary signal based on the knowledge of its transmission structure and channel information.

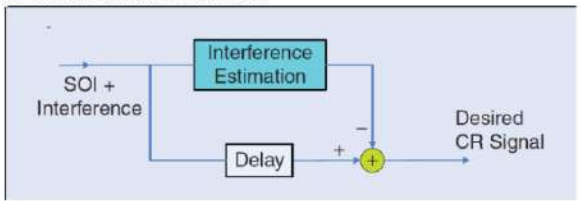

Figure-7 Desired CR signal[9]

4. IC at CR Transmitters

In this section, we consider the internetwork interference from CR transmitters to primary receivers. The CR transmissions should be well managed to guarantee that the primary services are not harmfully interfered with. It is therefore important for CR transmitters to adopt certain signal processing schemes, referred to as transmitter-side

	Filter	Transform	Beam-forming	Cyclostationarity	High-Order Statistics
Cochannel interference	No	Yes	Yes	Yes	Yes
Similar wavwform	No	No	Yes	Yes	Yes
Suppression waveform	Low	High	High	High	High
Hardware complexity	Low	Low	High	Low	High
Computation Complexity	Low	Medium	Medium	Medium	High

Figure-8 Comparison between interference suppression techniques for CR receivers

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IC techniques, to mitigate both the co-channel interference and adjacent channel interference (i.e., out-of-band interference) caused to primary receivers.

5. *Spectrum Shaping*

The focus of spectrum shaping, also referred to as pulse shaping, is on generating proper waveforms for secondary signals to minimize the power leakage into the primary bands to be protected. In the literature, spectrum-shaping techniques have been well investigated in the context of ultra wideband (UWB) systems and software-defined radios. The goal is to design adaptive pulse waveforms, which can dynamically react to the spectral environment and produce desired spectral shapes/notches. Preferably, the signal waveforms should be constructed as the linear combination of a limited number of orthogonal basis functions, also known as the core pulse wavelets. These basis functions should be bandwidth limited, time limited, orthogonal to each other, and flexible enough to form any desired shape of the power spectrum.

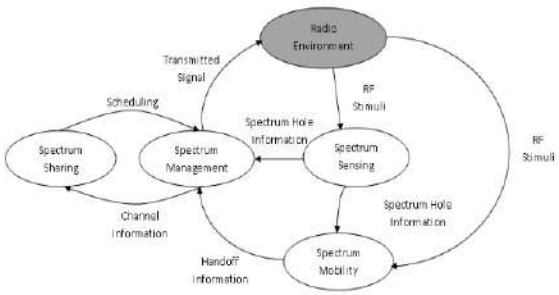

Figure -9 Spread spectrums [5]

6. *Spread Spectrum*

Spread spectrum is a well-known technique that can be used by a CR transmitter to spread the signal energy across a wide bandwidth. The resulted wideband secondary signal would have a low PSD, and therefore, the interference to a particular narrowband primary system can be reduced. An obvious drawback is that more primary systems operating in the wider band can be interfered with.

7. *Other IC Techniques*

When the primary signal is sufficiently strong, the CR receiver can form a beam toward the primary signal. The enhanced primary signal is then estimated (using either extraction or reconstruction) and subtracted from the received signal. When the primary signal is too weak to be reliably estimated, the CR receiver can form a different beam pattern to enhance the CR signal and nullify the primary signal.

8. *Spectrum Sensing*

Spectrum sensing plays an important role in the cognitive radio cycle. There are several existing and widely used methods including the energy detector [12], the matched filter detector [13] and the cyclostationary detector [14]. Energy detector is the most popular choice due to its magnitude square of the FFT output gives us the energy

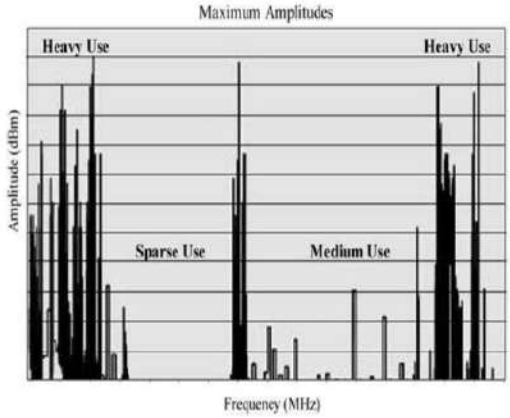

Figure -10 Sparse and medium use of spectrum[6]

contained in a band. If a channel is occupied then it has a higher energy level than an empty band. A value slightly greater than the noise floor is usually taken as the threshold to decide the binary occupancy st ate of a spectrum.

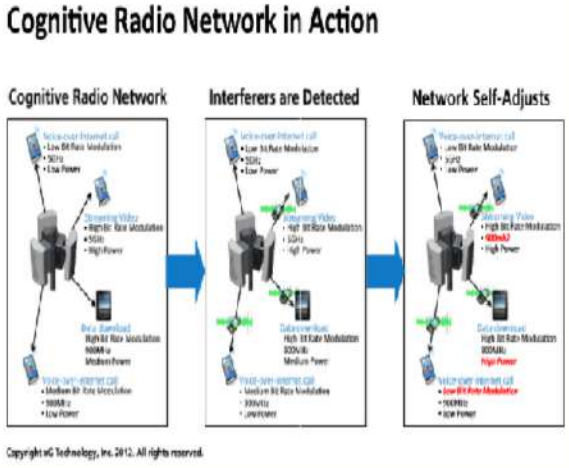

Figure-11 Interference cancellation and detected [7]

CONCLUSIONS

CR networks inevitably lead to complex and sophisticated interference scenarios. This has inspired our investigation on applying IC techniques to CR networks with a special focus on mitigating the internetwork interference. We have

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found that a CR receiver assisted by proper IC techniques can effectively combat interference from primary networks, given that the secondary signals have dissimilar characteristics to those of primary signals. In addition, various IC techniques have been found to be useful for CR transmitters to rigidly control their emission patterns and thereby mitigate the interference caused to primary systems. Moreover, we have shown that hybrid IC schemes can be obtained by combining simple IC techniques. Our investigations have suggested that the performance of CR networks can be significantly improved by using IC technologies. We have showcased a number of results relating to the fundamental communication limits in cognitive networks. We first discussed how, for small networks, different levels of cognition, or information about the wireless environment, in the secondary node(s) leads to different achievable rate and capacity regions. In large networks, we provide the throughput scaling law for three cognitive networks. Turning attention to the design of network parameters and communication protocols, the interference seen by the primary receivers from cognitive radios is of great importance.

FUTURE SCOPE

Cognitive radio is not just a new generation of software radio, to sense spectrum. Cognitive radio shall sense the communication and networking environments. Future terminal devices shall be cognitive and determine the most appropriate way of communications, that is, to form cognitive radio networks. Cognitive radio "networks" shall be the final goal in future wireless communications. Intranetwork Interference exists to some extent in every wireless communication system, and there is wealth of techniques established to mitigate them effectively. Several modified Interference models have been proposed as more practical models of the Interference at primary receiver.

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Communication, collaboration in open source software and mailing list activity

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Abstract: **A fundamental change in the development of software industry came with the emergence of Open Source Software projects. The source code of which is publicly available for inspection, modification and redistribution.OSS development section use electronic means, like emails to communicate and to have open discussions. Each software project has maintained its own mailing list. Many works have been done related with the mailing lists. The previous works included the identification of the list participants, number of posts and replies of the individual participant, correlation of developer's list and user's list. The focus in our paper is on the mailing lists of different open source software which give a better value of analysis regarding the communication. We are creating a story line on the bases of the releases occurring in a particular software. And for that the mails are extracted from the mailing list. The next step is, according to the release of the software versions a frequency occurrence of the keywords and tags is examined from the mailing list.**

Index Terms:- **Open source software (OSS), collaboration, communication, dynamic nature, mailing list.**

I. INTRODUCTION

Open source software whose code is available for modification [1] or enhancement by any user. In general open source software, projects, or initiatives are those that embrace and celebrate open exchange, collaboration participation, rapid prototyping, transparency and community development. OSS projects can be considered as people-oriented and knowledge sharing development environments. OSS is based on the geographically distributed concept. In OSS different developers can be linked to a project, how may not be physically all together present at one place of work. Rather they work on a project from different parts of the worlds and even suggestions to the modification can be put forward. So, concluding this we can say that OSS is distributed in nature.

Now the question that arises is how this is managed, worked and interacted on. Till now all the researchers are trying to uncover all these hidden questions related with OSS. Being distributed in nature, in OSS projects it becomes entirely important to communicate and interact with the development team on different forums. The other works [2,3,4,5] were based on the conventional ways of developing a relation with the development team.

As explained that open source has the source code available, so any modification occurring in the code of the version is openly available to all. The developers who propose the change in the project don't directly implement the modified code. Infact they interact and present forward questioners with the help of mails. Like this the communication channel develops. We will be studying the mails of the few projects and check out how the release from one version to another occur. With the help of the tool we will first extract the mails according to the certain time slot. And filer the release mails and from these mails a story line will be formed. This story line is about the changing activity from one release to another releases.The next step is the frequency calcution of the tags and the keywords occurring in the messages. Based on the frequency the graph plotting is done.

II. Elements of OSS Communication

A) Collaboration

Computer-supported work environments when effective, afford new means for collaborative learning. The developers who are geographically dispersed and want to share knowledge, access online artifact communication infrastructures etc can perform through collaborative activities [6]. One should aim to collaborate with different participates involving in a project. The interests and views get clearly specified. The work should be transparent and be fed back. First the views should be gone through and outputs related to that view should be forwarded back. This increases communication in a collaborative way.

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B) Communication

The developers and users of OSS projects are dispersed throughout the world. The individual sitting in India can be the core developer, reviewing the suggestions given by reviewing the suggestions given by a individual sitting in London. Now, suppose this individual is a newcomer at the present time. How this individual will interact and share his views to the core developers?

This is the main question to be answered in the OSS project. Communication is the only medium between the two individuals. And now how this communication occurs is another question.Communication can occur through emails, messages, forms, open and public discussions [7]. In Emails, which is a electronic method of communication of messages is the fastest and most efficient one.

C) Mailing List

The smallest unit or token of information posted by the individual is the "message" [7]. A message can be any valuable information or detail regarding the topics of projects.

New message: A message can be an initiating message, which give rise to or we can say initiates a new topic. A message can be a replied message, which response to the other messages (these messages can be new messages or replied) [8].An individual posting a message on a list is called a "poster". This poster can be an initiator or a replier. Initiator is the one which initiates the message. If already a sequence of message is going on, the reply to the already posted message is known as a replied message.

User's Developer's, project Managers, bugs detectors and maintainers share ideas, exchange knowledge on a form which is known as the "Mailing List". The two types of Mailing List are called as:

a) Developer's Mailing List
b) User's Mailing List

Why Mailing List is of Importance in OSS?

Maximum OSS Developer's communicate through Mailing List. Mailing List is the best and fastest way of interacting and sharing language. The type of communication makes a rich source of information which researchers use in the development and improvement of software. As mailing is an electronic medium based so interacting geographically is also very simple. Storage of the details of emails is available.

D) Change Activity

Any changes/modifications occurring in OSS due to the new arising suggestion or certain bug detection leads to an activity which is known as "change activity"

III. LITERATURE SURVEY

By now, in the fields of software evolution and in OSS allot of researchers have given their best workers to us. Talking more precisely the main focus of the researchers was to get into the insight of OSS projects collaboration and communication.

The researchers thought of this because as we know that OSS is dispersed geographically [9], so it becomes extremely necessary to study how the interaction occurs between the different developers sited away from each other. And how the collaborate together and resolve the issues in OSS projects.

Past analysis has treated OSS as static phenomena .As the knowledge about how developers sustain and reproduce over time was not known.

Analysis of Socialization in an open source software community [10], extends the study of collaborative development of the software. The socialization was analyzed from the two perspectives:

1) Firstly, that involves an individual learning process. Under this individual can interact and gain the knowledge regarding the OSS project issues.
2) Secondly, is a political process. Under this a participant who first was a newcomer enroll progressively to turn himself to be a major contributor.

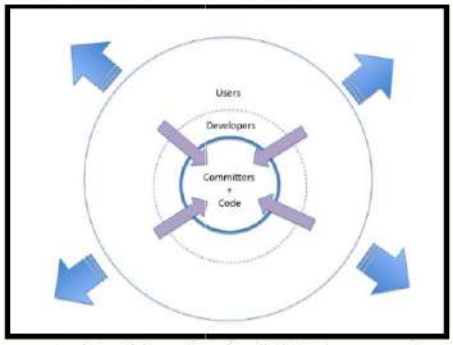

Figure 2: Socialization in OSS Community[9]

From static to dynamic improvisation of OSS [11]:

In past analyses, organization of OSS projects were taken as static phenomena .But further studies summarized, that the position of a participant inside a project changes

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frequently based on this active participation and interaction through message postings.

Evolution was explained in the case study of python. In this even the static to dynamic phenomena was also highlighted. It was said they when a participant first posts a post, he/ she is considered as a newcomer. When that newcomer gets replies on his posts and further discussion proceeds, the newcomer move a step in the socialization community [12]. Slowly, if the newcomer keeps on contributing to that project then a stage will reach that he will be considered as the major contributor of the project. And the same newcomer takes the core most position in the Socialization Circle of OSS.

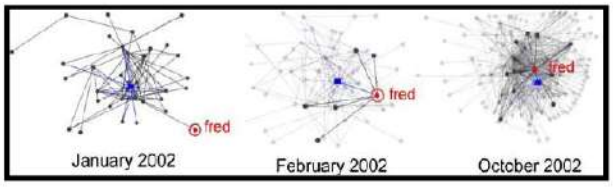

Figure 3: movement in a socio community [5]

In the figure 3, we have seen the how a participant named Fred enters into the socialization community of OSS project.

a) In first figure, in January he started as a newcomer
b) And in February in got more into the community circle
c) And by October he managed to obtain a stable position of major contributor. And reached near the core position of the developer.

Researches extended their work on Understanding and Knowledge sharing Activities in OSS is the next step to collaboration and communication.

Studies explained that the projects of OSS are people-oriented, and many researchers focused on Mailing Lists to ponder on the coding activities of software developers. The best way to know about the interaction in a project is to view the Mailing Lists [13]. The Mailing List of Developer and User are both gone through. The emphasis of the research is sharing of knowledge between knowledge providers and knowledge seekers [7].

Knowledge Sharing Model (KSM):

Before jumping on to the knowledge model, one should be familiar with the terms being used in these types of models as like knowledge provider, knowledge seeker.

The Knowledge Provider is defined as the project expert or software developer who has the deep knowledge about project participants on the various issues regarding the software development and use. And the participant who seeks knowledge from these experts is known as knowledge seeker.

There exists a strong relation between knowledge providers and knowledge seekers. The relationship bridge between them only complete the process of communication or one can say the bridge of knowledge sharing activities.

In the view knowledge sharing in OSS project is in agreement with Zeldin (1999) [14], "Sharing knowledge is a Synergistic Process"- which means you gain out more than you put in. When two or more participants exchange emails, messages, they are said to share knowledge. In our common language a conversation is built up. Knowledge Sharing in OSS projects is just all about interacting, helping each other and collaborating. Knowledge Sharing dynamics in Mailing Lists enables the foundation of Knowledge sharing Model (KSM).

In this model the knowledge provider and knowledge seeker participates to share their knowledge and exchange the views on the public bases.

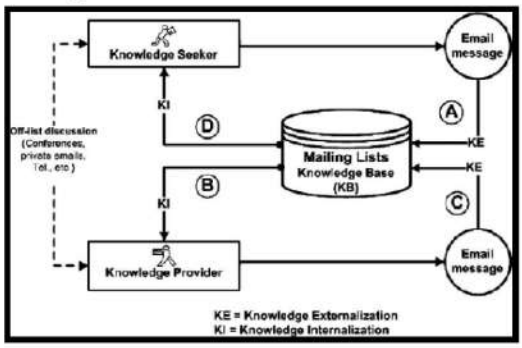

Figure 4 : Knowledge Sharing Model [8]

Knowledge seeker sends an email message regarding what he/she seeks the knowledge about. The seeker transfers their knowledge to the Mailing List by the means of a process known as **"Externalisation".** The Process of acquiring knowledge from the Mailing List is known as **"Internalisation" [15].** The Mailing List here acts as a Knowledge Base.

Through mining the information of developer's commits, researchers within the community of software engineering can investigate evolutionary aspects of OSS projects and analyze developer's behaviours and collaboration [16]

The latest research of 2013 regarding the communication unfolds most of the facts and figures which were not disclosed in the previous researches. As the researchers mentioned before [1,5,6,8,13] that electronic means such as emails, instant messaging or public discussions are the

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various techniques used in the communication of OSS development team.

Researchers investigated that the hub for project communication is the "Mailing List" [13]. Prior works focused on the bug detection mails, handling of the patches, social networks. With this new thoughts brought forward questions regarding what the developers communicate about. The objective is to increase the understanding of development Mailing List communication.

The categories and subcategories are shown in the figure 6 on which the discussion was based.

The distribution showed that implantation has the most frequent occurring category, having 36% threads. The implementation alone takes the one third of the total thread. The second most frequently occurring category is the usage comprising about 27%. This chart of categories explains that how are the topics distributed among the threads.

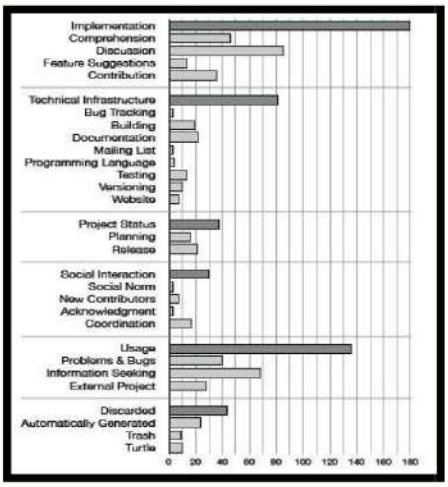

Figure 6: Distribution of threads per category[8]

The next question of importance is that is Mailing List is the only medium of communication that occurs in OSS projects. The answer is "no". Repositories are the source of communication.

IV. ANALYSIS WORK AND METHODOLOGY

By taking an example of a single project (android) I just want to explain the implementation techniques to be used in my work.

a) Release based message analysis:

Project	Android
Data source	Sept 2008-dec 2013
Total message count	572012
Message according to version, release 1	25
Release 2	86
Release 3	348
Release 4	12

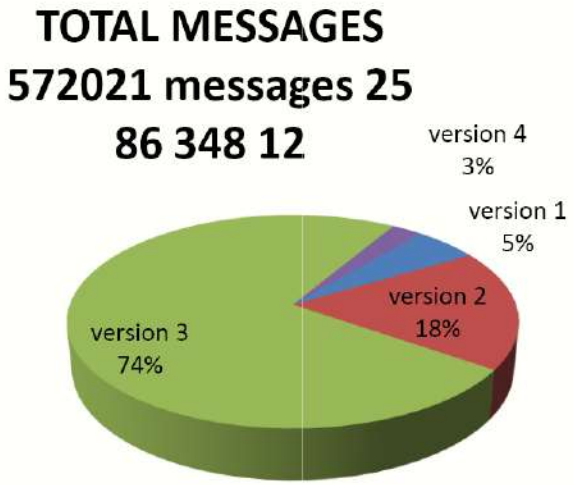

Figure 7 : Representation of the messages based on releases

ii) Tags based analysis:

Patch	30807	572021
Rfc	2985	572021
Bug	63811	572021
Git	39449	572021
Config	26440	572021
Version	109849	572021
Without tags	1549	572021

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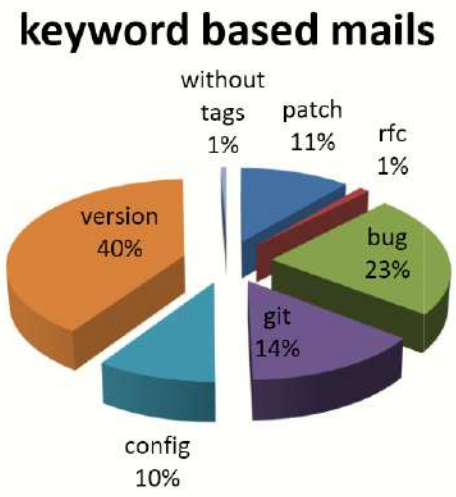

Figure 8 : Pie Chart Representation of Tags

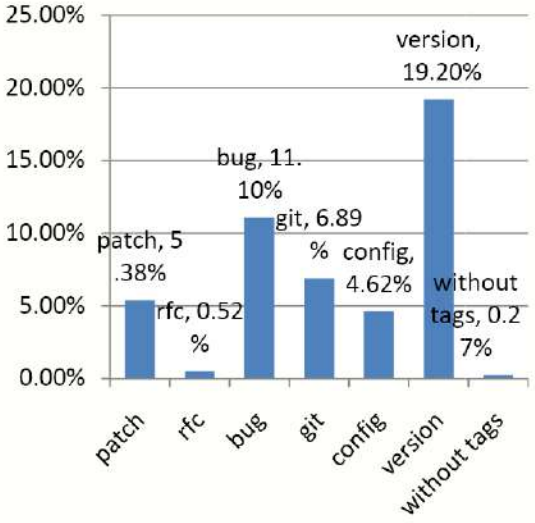

Figure 9: histogram representation showing the frequency occurrence of tags

V. CONCLUSION

The conventional roles on OSS communication is that the development mailing lists are central to the entire development process and act as the hub for project communication. It has turned to be successful for projects like LINUX and Apache. This paper concludes with the posting and replying activity occurring between the two participates and studying of the coorelation that exists between the Developer's mailing list and the User's Mailing List. The other important aspect taken into consideration in this paper is the type of discussion that occurs in the projects Mailing List. The topics of discussion is divided into 6 categories and 24 subcategories. It has been observed that the implementation category alone constitutes one third of the discussion in the mailing List.

The analysis study gives a clear view of what discussion goes on in the mailing lists from the developers prospective. The tag frequency is the number of times a tag has occurred in the communication or can say a set of mails(as if we are considering the release based mails).

VI. FUTURE WORK

The Researchers has given alot of information regarding the OSS, collaboration, communication, Mailing lists, change activity and so on. All these are basic elements of OSS have being presented in detail by many Researches. Now, in our paper we want to continue the aspects given by researchers with certain new ideas which we want to implement in our work. Our focus is on the communication activity through the Mailing List. The objective of our work is to study the few Open source software for creating a better value of studying by correlating the activities occurring in each software with the other.

The research questions to be undertaken by me are:

Studying the activities of communication of Five different Open Source Software. What co-relation occurs?

Analysis of the frequency - the keywords and tags occurring in the mailing list is examined.

- For this the two step procedure is performed:
  1) Extraction of the mails of a particular software for analysis.
     TOOL: MARKMAIL
  2) After extraction by the help of text miner the frequency can be examined.
     TOOL: QDA MINER(WORDSTAT)

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Comparative Analysis among Search-Based Software Testing Algorithms

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Abstract: **As the cost of manual testing in practice is very high, there is an increasing interest in methods to automate construction of good test inputs. Search-Based Software Testing is one of the meta-heuristic algorithms to automate a testing task. There is a wide range of optimization and search techniques. This paper discusses algorithms named hill climbing, simulated annealing, and genetic algorithms for software testing. Key to any optimization algorithm is the definition of fitness function that guides the search to find good solutions in a reasonable time. The search-based algorithms are strongly dependent on the domain of the problem under consideration because they use heuristics or knowledge related to the particular domain. This paper presents the comparison among the search-based software testing algorithms.**

Keywords: **Search-Based Software Testing, Meta-Heuristic Search Algorithms, Genetic Algorithms.**

I. INTRODUCTION

Software testing is an important phase of software development life cycle. It is the process of assessing the quality of the developed software by detecting as many faults as possible. It alone accounts for 40% to 50% of software development cost. Since cost of manual testing in practice is very high, therefore 100% automated testing is desirable to improve the quality of modern complex software system. There have been constant attempts to reduce the efforts and time required for software testing by automating the process of software test data generation. This led to an increasing interest in methods to automate construction of good test inputs.

The last decade has witnessed a considerable increase in the areas of applying Search--based optimization methods to this problem. This area of search has come to be known as Search-Based Software Testing (SBST) [1]. This is an instance of Search-based Software Engineering (SBSE). The term SBSE was coined by Harman and Jones in 2001[7]. Search-Based Software Testing is the use of meta-heuristic algorithms to automate a testing task. A wide range of different optimization and search techniques can and have been applied. The most widely used are local search, simulated annealing, genetic algorithms and genetic programming. However no matter what search technique is employed, it is the fitness function that captures the crucial information; it differentiates a good solution from a poor one, thereby guiding the search.

II. LITERATURE SURVEY

A. *Meta-heuristic Search Algorithms*

Even though varied test case generation approaches are available, research is still being carried out to optimize the generation of test cases with minimum human effort. The focus has been on meta-heuristic algorithms and evolutionary algorithms. Search-Based Software Testing is the use of these meta-heuristic search techniques [4] [6] to automate a testing task. Each of these Search-based algorithms is strongly dependent on the domain of the problem under consideration because they use heuristics or knowledge related to the particular domain. Algorithms used in this field are hill climbing, simulated annealing, genetic algorithms etc. Each of these algorithms has its own advantages and disadvantages compared to other algorithms.

In general, there are two requirements 2][3] that need to be fulfilled in order to apply a search-based optimization technique to a testing problem.

- Representation: The candidate solutions for the problem at hand must be capable of being encoded so that they can be manipulated by the search algorithm- Usually as sequences of elements as for chromosomes with genetic algorithm.
- Fitness Function: The fitness function guides the search to promising areas of the search space by evaluating candidate solutions. The fitness function is problem specific and needs to be defined for a new problem. It differentiates a good solution from a poor one, thereby guiding the search.

1) *Hill Climbing*

Hill climbing [1] [2] is a technique that starts from a randomly chosen candidate solution. At each step, the elements of a set of 'near neighbors' to the current solution are considered. Just what constitutes a near neighbor is problem specific, but typically neighbors' are a 'small mutation away' from the current solution. A move is made to a neighbor that improves fitness. There are two choices: In next ascent hill climbing, the move is made to the first neighbor found to have an improved fitness. In steepest ascent hill climbing, the entire

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Neighborhood set is examined to find the neighbor that gives the greatest increase in fitness. If there is no fitter neighbor, then the search terminates and a (possibly local) maximum has been found. Figuratively speaking, a 'hill' in the search landscape close to the random starting point has been climbed. Clearly, the problem with the hill climbing approach is that the hill located by the algorithm may be local maxima, and may be far poorer than global maxima in the search space. For some landscapes, this is not a problem because repeatedly restarting the hill climb at a different location may produce adequate results. Despite the local maxima problem, hill climbing is a simple technique which is both easy to implement and surprisingly effective.

2) Simulated Annealing

The simulated annealing search algorithm [1][3][6] is based on the chemical process of annealing – the slow cooling of a highly heated material. The structural properties of the cooled solid depend on the rate of cooling. Simulated annealing is similar to hill climbing; however, it allows probabilistic moves to poorer solutions (less restricted movement around the search space) to avoid local maxima. The probability of acceptance of an inferior solution changes as the search progresses, and is dependent on the difference in objective value between the current solution and the neighboring inferior solution being considered (drop in fitness value), and a control parameter known as the temperature. Initially the temperature is high, in order to allow free movement around the search space so that the search is less dependent on the starting solution. As the search progresses, the temperature decreases and there is less freedom of movement. However, if cooling is too rapid, not enough of the search space will be explored, and the chances for obtaining a local maxima are increased.

3) Genetic Algorithms

Genetic algorithms [1] [2] [3] use concepts of population and of recombination. Of all optimization algorithms, genetic algorithms have been the most widely applied search technique in SBSE, though this has largely been for historical reasons, rather than as a result of any strong theoretical indications that these approaches are in some way superior. An iterative process is executed, initialized by a randomly chosen population. The iterations are called generations and the members of the population are called chromosomes, because of their analogs in natural evolution. The process terminates when a population satisfies some pre-determined condition. On each generation, some members of the population are recombined, crossing over elements of their chromosomes. A fraction of the offspring of this union is mutated and, from the offspring and the original population a selection process is used to determine the new population. Crucially, recombination and selection are guided by the fitness function; fitter chromosomes having a greater chance to be selected and recombined. There is an alternative form of evolutionary computation, known as evolution strategies developed independently of work on Genetic Algorithms. However, evolution strategies have not been applied often in work on SBSE.

III. INFERENCE

The three meta-heuristic algorithms that can be used in software testing are compared in this section. As we know that the search based software testing algorithms are strongly dependent on the domain of the problem so each algorithm has its own applications where they can be used more efficiently. This paper has reviewed some common search algorithms. The various algorithms that have been reviewed are hill climbing, simulated annealing, and genetic algorithms. Key to any optimization algorithm is the definition of fitness function that guides the search to find good solutions in a reasonably time. But in this section some crucial parameters are taken into consideration and on the basis of these parameters it is seen that which algorithm can be used in a given situation. The various algorithms are compared on the basis of various parameters taken into consideration. The various parameters taken into consideration are:

- Meta-heuristic approach
- domain specific
- local search approach
- global search approach
- search one point at a time
- fitness unction used to guide search
- backtracking used to deal with local maxima
- neighborhood dependent
- principle of crossover, mutation used
- simplicity

Each algorithm is characterized by its special features. Every algorithm cannot be used in every situation. Based on heuristics one algorithm is chosen based on our requirements. Requirement specifications while choosing an algorithm is very important. So we can say that each algorithm has its own advantages and disadvantages so the chosen problem will define which algorithm will be appropriate for a given problem. Hill climbing is a local search approach. On the other hand simulated annealing and genetic algorithms are global search algorithms finding many solutions in the search space at a given time. In each algorithm, fitness function is essential as it helps in guiding.

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TABLE 1.COMPARISON AMONG META-HEURISTIC SEARCH ALGORITHMS

ALGORITHMS / PARAMETERS	HILL CLIMBING	SIMULATED ANNEALING	GENETIC ALGORITHM
Meta-heuristic Approach	yes	yes	Yes
Domain specific	yes	yes	Yes
Local Search Approach	yes	no	No
Global Search Approach	no	yes	Yes
Search one solution at a time	yes	yes	No
Fitness function	Yes	yes	Yes
Simplicity	yes	no	No
Neighborhood Dependent	yes	yes	No
Principle of mutation used	No	no	Yes
Backtracking used to deal with local maxima	yes	no	No

The fitness function is problem specific. It should be defined for a given problem. Search-Based Software Testing is an effective means to find inputs for any software that leads to short or long run times. The fitness function is the execution time of the software and it is calculated by running it with an input.

IV. CONCLUSIONS

Since the cost of manual testing in practice is very high, research into automated software testing is very generic approach in which solutions may be sought for various software testing problems automatically, usually optimization algorithms. Search-Based Software testing is a dramatically growing research field in which optimization techniques are used to automate various aspects of software process. Comparison has been made between these algorithms based on some relevant parameters. This paper has reviewed some common search algorithms like hill climbing, simulated annealing, and genetic algorithms. Each of these algorithms has its own advantages and disadvantages compared to other algorithms. Hill Climbing algorithm (HC) is known as local search approaches because they consider only one solution at a time. This approach is simple but sometimes inefficient and time consuming as they move only in the local neighborhood of those solutions. They could not escape from local optima in the search space of possible input data. To overcome this problem backtracking to some earlier nodes is required. Simulated Annealing (SA)is similar to hill climbing in a way that it considers one solution at a time and moves in local neighborhood of those solutions. However it allows probabilistic moves to poorer solutions to avoid local maxima. On the other hand Genetic Algorithms (GA) is a form of global search, sampling many solutions at a time. In the last two decades genetic algorithms have been widely employed for test data generation.

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Comparative Analysis of AODV, DSDV and DSR Protocol by Varying Pause Time in MANET

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***Abstract:*-A Mobile ad hoc network is a gathering of various data transmission node. The nodes in the MANET are movable. Due to this quality of Mobile ad hoc network, the topology is highly dynamic. There is no fixed infrastructure in this type of network. Any node that wants to transmit the data from source to destination, the data has to promote from one node to another node to reach the destination node. In this paper we have done a comparative investigation of three routing protocols in MANET by varying the pause time. The simulations have been made by considering the three parameters throughput, packet delivery ratio and end to end delay. The simulator used for making the comparative analysis NS-2.33. The results shows that the DSR protocol outperforms the other two protocols AODV and DSDV in Throughput and packet delivery ratio and DSDV outperform the AODV and DSR in end to end delay.**

***General Terms*—MANET, AODV, DSR, DSDV**

1. INTRODUCTION

A Mobile ad hoc network is a group wireless mobile node that transfers the packet from source to destination by using the transitional nodes. The nodes in the network act as routers for transferring the packets. As nodes in the network are highly mobile, this causes the topology to be highly dynamic in nature. Routing in the mobile ad hoc network is a challenge in this type of network where topology is getting change highly. The MANET is a collection of self-configuring nodes which does not depend on any infrastructure [1]. The property of MANET is its easy exploitation. Due to this property it can be used in military and emergency areas. Many routing protocols are proposed in MANET like AODV, DSR and DSDV [2].

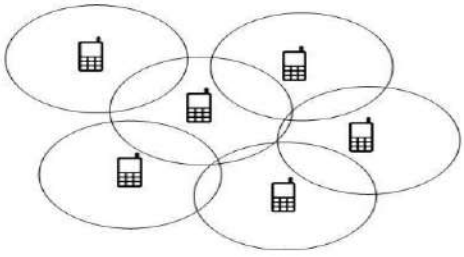

Figure 1: A Mobile Ad Hoc Network with 6 Nodes.

In MANET all the computing resources are battery based and hence are having less powerful computing resources [3]. Another feature of mobile ad hoc network is that it can perfectly be used in military applications as setting up this type of network is cost effective and takes less time [3].

2. ROUTING PROTOCOLS IN MANET

Routing protocols in MANET are broadly classified into 2 categories:

1. Table driven routing protocols.
2. Reactive routing protocols.

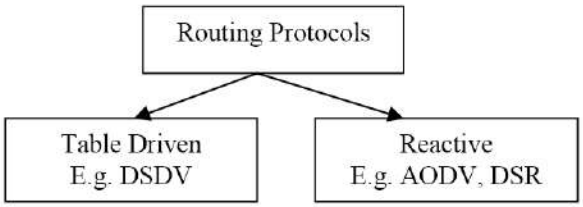

Figure 2: Basic Category of Routing Protocols.

3. Table Driven Routing Protocols

- Distance Sequenced Distance Vector

Distance sequenced Distance Vector (DSDV) is a table driven routing protocols which promote the packets from one node to another node using routing table. The routing table usually contains the next hop information and sequence number [4]. DSDV routing protocol depends on a well recognized algorithm Bellman-Ford algorithm where each device maintain the shortest path to the next device in the network of devices [4]. DSDV routing protocols is a proactive routing protocol that solves the major setback of wired network which is count to infinity problem by introducing the distance sequence number [4]. The major use of sequence number used in DSDV routing protocol is to check freshness of route. The node with the greater entry is used to forward the packet as it will contain a new fresh route. The sequence number is also used to discriminate the stale route from new one [5].

Each node in the network using DSDV protocol periodically circulates the routing information to all its neighbors. The any change in the routing table is circulated

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by using two techniques full dump updates and incremental updates.

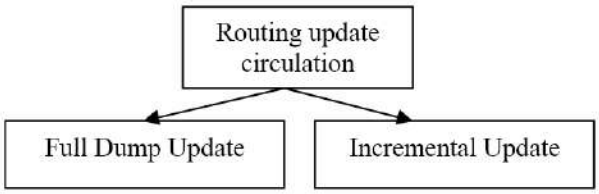


Figure 3 Routing Update circulation technique.

The main diversity between Full Dump update and incremental update is the full dump sends the full routing table information to all the neighbors and incremental update propel only that information to the neighbors that has metric changed since the last update [5].

4. Reactive Routing Protocols

- ADHOC on-Demand Routing Protocol

AODV is a reactive or source initiated routing protocol which is based on the concept of DSDV. AODV mostly consists of two phases [6]:

Route Discovery stage

Route maintenance stage

- Route Discovery phase

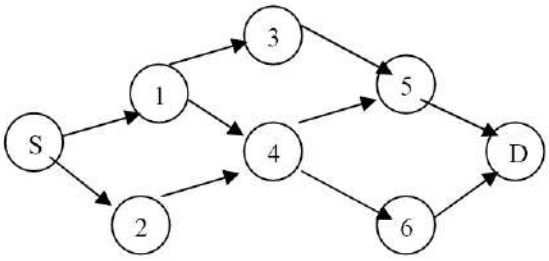
AODV is a source initiated routing protocol in which source broadcast the route request packet (RREQ) to all the neighbors. The neighbors in turn broadcast the packets to other neighbors until one of the node send the route reply (RREP) packet or the RREQ packet reaches to destination node. There are three types of control packets used in AODV [6]

Route request (RREQ)

Route Reply (RREP)

Route Error (RRER)

RRER control messages are used when the link between the two nodes break then the consulting node send the RRER control message to the source node so that route discovery can be initiated again. The node that has the path to the destination node or the node itself sends the reverse path to the source node.

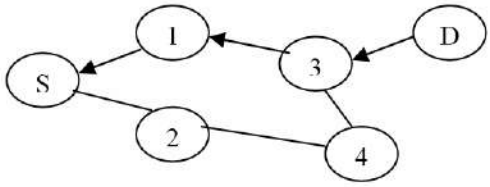


RREQ

Figure 4: Route discoveries Process in AODV.

5. Route Maintenance Phase

As the nodes in the mobile ad hoc network are mobile, there are chances of breaking of route between the nodes. In this case route maintenance comes into action. Whenever the path between the two nodes breaks it send the route error control message to the source node [6].



RREP

Figure 5: Propagation of route reply in AODV.

6. Distance Source Routing

Distance Source Routing (DSR) is a source initiated routing protocol. In DSR, the sender knows the complete hop- by-hop route to the destination. These routes are stored in a route cache [6]. When a sender wants to transmit the source packet to another node, which is not in the range of that node, send an information packet to all the neighboring nodes. This process is called route discovery process. Detection of the appropriate route is done with the help of propagation of RREQ packet. There is a flooding of route request packets to all the nodes in the network until the destination node reaches [7].

The Route request packet carries the entire information about the route to be traverse by the node. The destination node replies with the entire route to the source in the reverse direction.

The main task of the sender is to transmit the route request packet to all the neighbors for propagation of RREQ packet until the destination node met. If the node is not the destination node then it broadcast the packet to the neighboring node. Then the destination node send the reverse path bask to the source node [7].

Now the feature of DSR protocol is route maintenance. Each node which is transmitting the packets is responsible for confirming the packets sent by it has been successfully received by the destination node. If it is not happening then it is the responsibility that a route error packet should be transmitted to back to the source node. So that the source can again initiate the route discovery process. This process is called route maintenance [7].

7. Parameters used for simulation

The following parameters are used for simulation

- Throughput

  Throughput may be defined as the total useful packet size acknowledged by all the destination nodes in a specific duration of time [5]. In networks throughput is calculated in Kilobits per second (Kbps).

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- Packet Delivery Ratio
  It may be defined as total data packets received by all the destination nodes to those generated by constant bit rate source node [5].
- End to End Delay
  End to End delay may be defined as the sum of all the delays encountered at each node and all the delays caused at link on the path in a network [6].

8. Simulation Technique

The simulations were performed using Network Simulator 2 (Ns-2.33).Constant bit rate have been used as traffic source for simulation results. Different pause time have been taken for simulation are 3,6,9,12. The number of nodes was kept constant 30 in a simulation area of 585mX935m. The random way point model have been used for the simulation purpose. In random way point model node start moving in random direction with a specific speed and then after reaching the destination it stop for a specific time and starts again.

TABLE 1 Simulation Parameter

Parameter	Values
Number of nodes	30
Simulation Time	60s
Protocols taken	AODV,DSR and DSDV
Propagation Model	Two-Way model
Pause Time	3,6,9,12
Mobility Model	Random Way Point
Simulation Area	585X935 m^2
Maximum Speed	1000m/s
Traffic used	CBR on UDP

9. Outcomes and Discussion

During the simulation we have used three routing protocols AODV, DSR and DSDV. We have compared the protocols by varying the pause time. The simulation has been repeated for three rimes for three pause time 3, 6,9,12. The number of nodes in the network is 30. The mobility model used is Random Way point Model.

Throughput

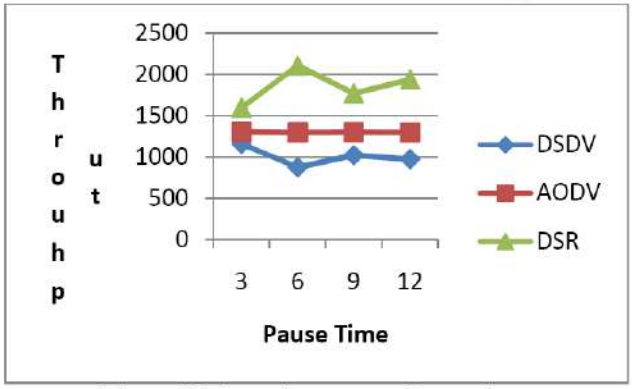

Figure 6: Throughput versus Pause time.

In figure 6 a comparison of three routing protocols AODV, DSDV and DSR have been made by varying the pause time. The results show that DSR perform well in all the simulation setup. The AODV protocol shows average performance if we talk about the throughput of the network. In the end DSDV underperform all the routing protocols due to routing table overheads.

- Packet Delivery Ratio

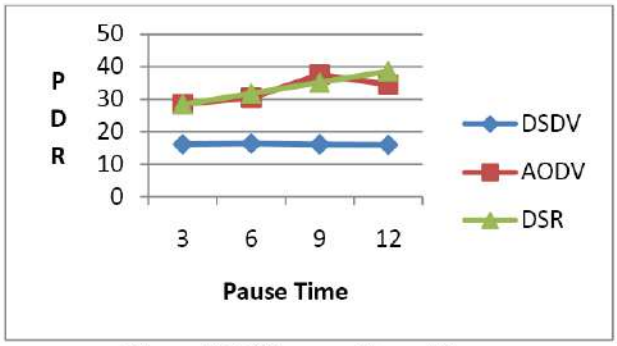

Figure 7: PDR versus Pause Time.

In figure 7 packet delivery ratios of three routing protocols have been compared by varying the pause time of the nodes. It has been observed from the results that the DSR and AODV protocols outperform the DSDV routing protocol. The AODV protocol gives the approximate the same reading as that of DSR. In some simulation setup DSR outperform AODV as well. Hence we can say that DSR gives better PDR than AODV and DSDV.

End to End Delay

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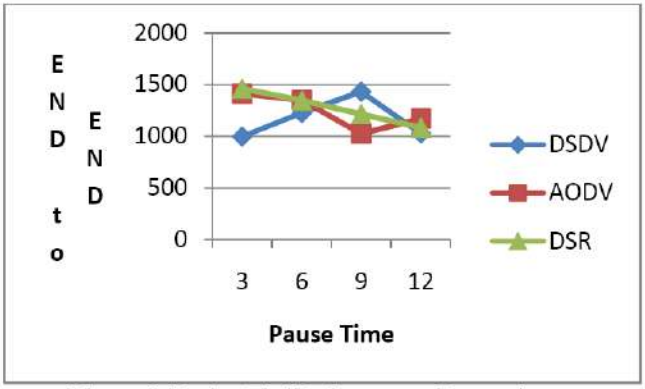

Figure 8: End to End Delay versus Pause time.

In figure 8 the end to end delay of three routing protocols has been compared against pause time. The results show that DSDV outperform all the routing protocol i.e. it deliver the lesser delay than AODV and DSR. On the other hand DSR shows the maximum delay. This is due to the fact that DSR stores the entire route to the destination. Hence packet becomes quite heavy. Time taken to segmentation and reassembly causes grater delay. AODV shows the average performance in case of delay.

10. Conclusion and Future Work

In this paper we have analyzed the performance of three routing protocols by varying the pause time of the nodes used in the network. It has been observed from the results and discussion that DSR protocol outperforms the AODV and DSDV in throughput and PDR. AODV and DSDV show the good performance in End to End delay. AODV being the reactive protocol gives average performance in all the simulation setup. In we can extend the protocols and parameters to be evaluated for making the extended comparative study of routing protocols.

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Design and Implementation of Modified Booth Algorithm and Systolic Multiplier on FPGA Using VHDL

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Abstract:-**From few years parallel computing is used in every field so that desirable results can be obtained in less time. Parallel computing enhances the speedup, performance, efficiency, cost etc. This paper discus the effective design of binary multiplication using modified booth's algorithm and systolic multiplier. The systolic architecture increases the computing speed by combining the concept of parallel processing and pipelining into a single concept. Systolic array is an arrangement of processors in an array where data flows synchronously across the array between neighbors, usually with different data flowing in different directions. The design is simulated using model sim by mentor graphics tool and Xilinx is used for the implementation of the code in FPGA.**

Keywords: **Systolic array, FPGA, Processing element, binary multiplication.**

1. INTRODUCTION

Systolic systems consists of an array of PE (Processing Elements) processors are called cells; each cell is connected to a small number of nearest neighbors in mesh like topology. Each cell performs a sequence of operations on data that flows between them. Generally the operations will be the same in each cell; each cell performs an operation or small number of operations on a data item and then passes it to its neighbor. Each cell at each step takes in data from one or more neighbors (e.g. North and West), processes it and, in the next step, outputs results in the opposite direction (South and East). Systolic arrays compute in "lock-step" with each cell (processor) undertaking alternate compute/communicate phases.[1] The systolic array can be defined as —Imagine n simple processors arranged in a row or an array and connected in such a manner that each processor may exchange information with only its neighbors to the right and left. The processors at either end of the row are used for input and output. Such a machine constitutes the simplest example of a systolic array and —Systolic Arrays are regular arrays of simple finite state machines, where each finite state machine in the array is identical .A systolic algorithm relies on data from different directions arriving at cells in the array at regular intervals and being combined. By pipelining, processing may proceed concurrently with input and output, and consequently overall execution time is minimized. Pipelining plus multiprocessing at each stage of a pipeline should lead to the best-possible performance. [2]

Systolic architecture can be used for special purpose processing architecture because of

1. Simple and Regular Design.
2. Concurrency and Communication.
3. Balancing Computation with I/O.

The paper is organized as follows. Section 1 says about the introduction. Section 2 deals with description of systolic array architecture. Literature review discussed in section 3. Section 4discuss the design methodology and section 5 Implementation of the methodology. Conclusion of the topic is discussed in section 6.

2. DESCRIPTION OF SYSTOLIC ARRAY ARCHITECTURE

A systolic array is composed of matrix-like rows of processing elements called cells. Processing elements (PE)s are similar to central processing units (CPU)s, except for the usual lack of a program counter, since operation is transport-triggered, means by the arrival of a data object. Each cell shares the information with its neighbors immediately after processing. The systolic array is often rectangular where data flows across the array between neighbors PEs, often with different data flowing in different directions. The data streams entering and leaving the ports of the array are generated by auto-sequencing memory units, ASMs. Each ASM includes a data counter. In embedded systems a data stream may also be input from and/or output to an external source

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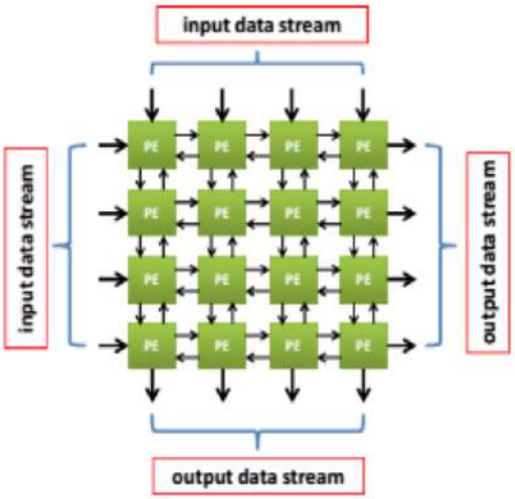

Figure 1. Architecture of systolic array

Systolic arrays are arrays of DPUs which are connected to a small number of nearest neighbor DPUs in a mesh-like topology. DPUs perform a sequence of operations on data that flows between them. Because the traditional systolic array synthesis methods have been practiced by algebraic algorithms, only uniform arrays with only linear pipes can be obtained, so that the architectures are the same in all DPUs. The consequence is that only applications with regular data dependencies can be implemented on classical systolic arrays. Like SIMD machines, clocked systolic arrays compute in "lock-step" with each processor undertaking alternate compute and communicate phases. But systolic arrays with asynchronous handshake between DPUs are called wavefront arrays. One well known systolic array is Carnegie Mellon University's iwrap processor, which has been manufactured by Intel. An iWarp system has a linear array processor connected by data buses going in both directions. A linear systolic array in which the processors are arranged in pairs where one multiplies its input by xand passes the result to the right and the next adds aj and passes the result to the right. [3]

3. LITERATURE REVIEW

A.Implementation of Binary Multiplication using Booth and Systolic Algorithm on FPGA using VHDL. [4]

In this paper, an attempt is made to implement the prototype of binary multiplier using Booth algorithm (for signed number) and the systolic array multiplication algorithm (for unsigned number). This is implemented using Xilinx I SE6 software, simulated using Modelsim XE 5.5

a Simulator by Mentor graphics. The synthesis is done on Field Programmable Gate Array (FPGA) Spartan2S15 kit Using Very High Speed Integrated Circuit(VHSIC) Hardware Description Language (VHDL).

B. Design & Implementation of Systolic Array Architecture. [5]

The paper describes the implementation of 2-D systolic array matrix multiplier architecture in RTL using one dimensional array to target the design on a appropriate FPGA/PROM/CPLD devices. It also discusses the digital realization of a binary multiplier. The system development started with top-down planning approach and the blocks were designed using bottom-up implementation. The programs were written, simulated and synthesized using Mentor Graphics tools, Modelsim and Leonardo Spectrum.

C.Design and Implementation of an Efficient Modified Booth Multiplier using VHDL. [8]

This paper presents an efficient design of Modified Booth Multiplier and then also implements it. The Modified Booth Recoding method is widely used to generate the partial products for implementation of large parallel multipliers, which adopts the parallel encoding scheme. In this paper the software design of the Modified Booth Multiplier is explained with the help of flow chart. The simulation is done using Xilinx ISE Design Suite 14.2 tool and Modelsim tool and the results obtained are shown both for 4 bit and 8 bit multiplication. The implementation of this multiplier is done using VHDL on Spartan 3E kit and the hardware results are also shown.

4. DESIGN METHODOLOGY

According to Modified Booth's algorithm, the two input binary numbers the one with minimum number of bit changes is considered as multiplier and the other as a multiplicand in order to reduce the time taken for calculating the multiplication product. Modified Booth Multiplier consist of three basic components namely Booth encoder (BE), Booth Selector (BS) and adder tree summation. The basic operation of Booth Encoder is to decode the multiplier signal and output will be used by booth selector to generate the partial product. Adder tree summation accumulates the entire partial product to produce the result. This method is explained in flow chart as below:-

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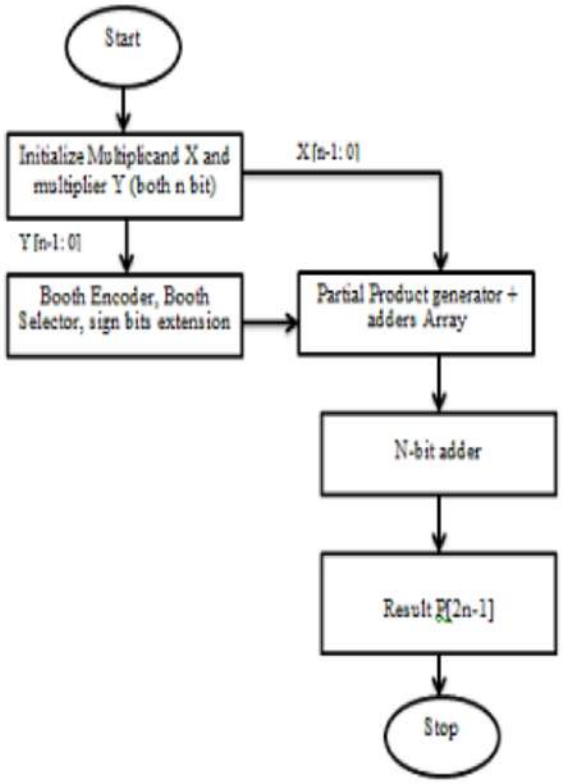

Figure 2: Flowchart of Modified Booth's algorithm

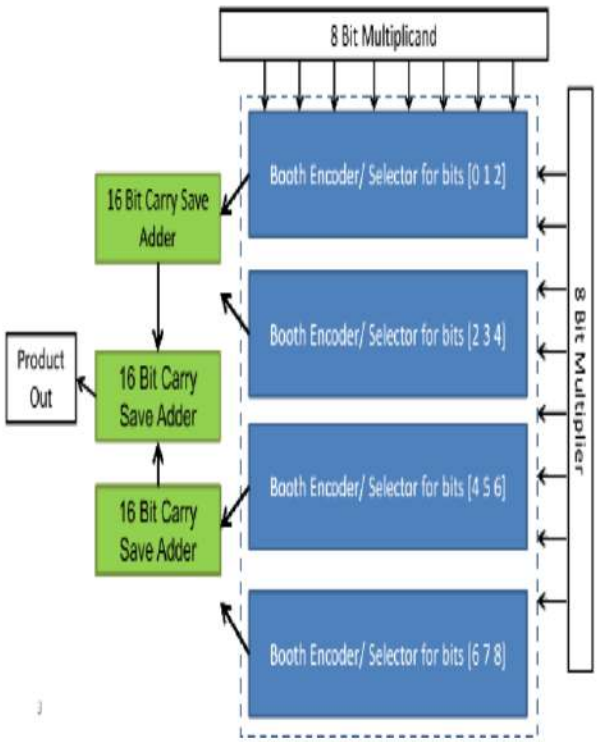

Figure 3: Block Diagram for Booth's Multiplier

- Modified Booth Algorithm: (for unsigned numbers)

1. Pad the LSB with one zero.
2. Pad the MSB with 2 zeros if n is even and 1 zero if n is odd.
3. Divide the multiplier into overlapping groups of 3-bits.
4. Determine partial product scale factor from modified booth 2 encoding table.
5. Compute the Multiplicand Multiples
6. Sum Partial Products

In systolic multiplication, to carry out the multiplication and get the final product following steps should be followed

1. The multiplicand and multiplier are arranged in the form of array as shown in the Fig. (4).

2. Each bit of multiplicand is multiplied with each bit of multiplier to get the partial products.

3. The partial products of the same column are added along with carry generated.

4. So the resulted output by adding partial products and the carry is the final product of the two binary numbers.

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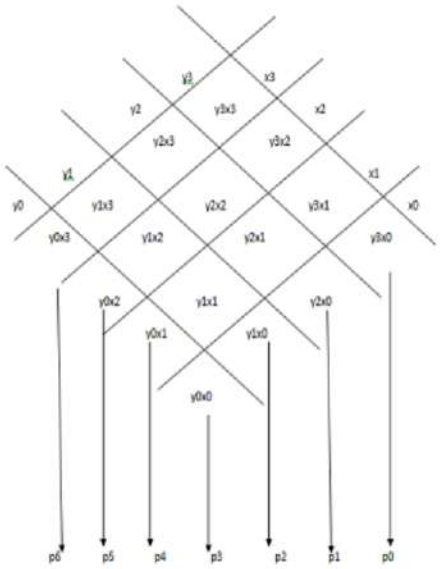

Figure 4: Block Diagram For systolic multiplier

4. IMPLEMETATION

The simulation of the program is done using online tool to find results which is shown in Fig (5). Another method for simulation of the program is done by using Modelsim tool by mentor graphics and Xilinx is used for the implementation of the code in FPGA which is shown in Fig (6).

Here are some screenshots at various stages of the implementation procedure:

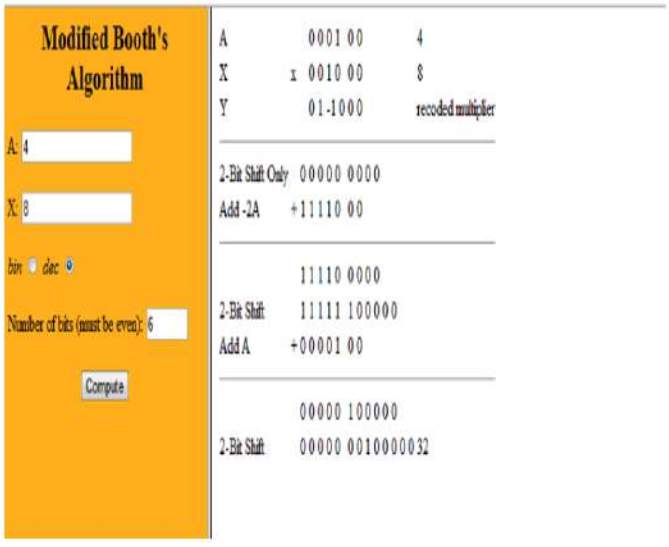

Figure 5: Modified booth algorithm using online tool

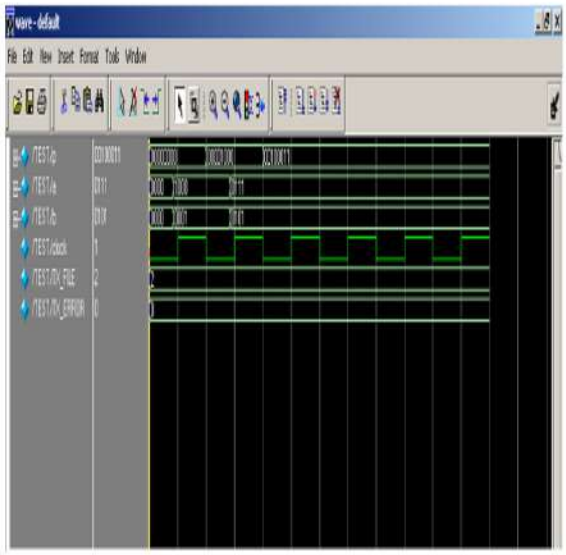

Figure 6: Output in waveform using Modelsim

6. CONCLUSION AND FUTURE SCOPE

There are many binary multipliers used at present, they can be replaced by FPGA binary multiplier which consumes less area, takes less time to multiply and consumes less power, which are the main criterions of the present system. In this paper, binary multiplication is done with the help of modified booth algorithm and systolic multiplier. The modelsim simulator is used to implement the multiplier. In future, synthesis can be done by FPGA Spartan 2 S15 kit using Very High Speed Integrated Circuit (VHSIC) Hardware Description Language (VHDL).

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Effective cluster selection using optimized load balancing in mobile adhoc networks

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***Abstract*—Mobile Ad hoc Networks is a collection of wireless mobile nodes, which form temporary networks without relying on any existing infrastructure or centralized administration or standard support services regularly available in wide area networks to which the host may normally be connected. In this paper we discuss the selection of nodes for the cluster was not randomly and the selection of nodes is based upon the capacity of the cannel, so that the distribution of load in the clusters was balanced which enhance the bandwidth and lifetime of the network. Simulation is carried by using the simulator NS2**

***Index Terms*— Mobile Ad hoc Networks, simulator NS2**

I. INTRODUCTION

All Mobile Ad hoc Networks is a collection of wireless mobile nodes, which form temporary networks without relying on any existing infrastructure or centralized administration or standard support services regularly available in wide area networks to which the host may normally be connected. MANETS is one of the most important technologies that have gained interest due to recent advantages in both hardware and software techniques. MANETs technology allows a set of mobile uses equipped with radio interfaces (Mobile nodes) to discover each other and dynamically form a communication network. MANETs incorporates routing functionality into mobile nodes so that they become capable of forwarding packets on behalf of other nodes and thus effectively become the infrastructure. Providing multiple routing paths between any source-destination pair of nodes has proved to be very useful in the context of wired networks. They are opening up to various applications of Quality of service, Such as delay, throughput, packet loss and network lifetime. The mobility of nodes and the error prone nature of the wireless medium pose many challenges, including security.

A. Advantage of MANETs

- They provide access to information and services regardless of geographic position.
- They are independent from central network administration.
- Network is Self-configuring, nodes also act as routers.
- Less expensive as compared to wired network.
- Scalable—MANETs can accommodate the addition of more nodes.
- Improved Flexibility as compared to wired networks.
- Robust due to decentralize administration.
- The network can be set up at any place and time.
- MANETS is used in various practical applications such as military applications, emergency operations and wireless sensor networks.

Load balancing mechanism allowing the traffic through the less congestion route [3]. Load balancing is distributing processing and communications activity evenly across a computer network so that no single device is overwhelmed .Load balancing is a methodology to distribute workload across multiple computers or a computer cluster, network links, central processing units, disk drives, or other resources, to achieve optimal resource utilization, maximize throughput, minimize response time, and avoid overload. Using multiple components with load balancing, instead of a single component, may increase reliability through redundancy [12]. Load balancing is iterative in nature. Local iterative load balancing algorithms were first proposed by Cybenko. These algorithms iteratively balance the load of a node with its neighbors until the whole network is globally balanced. There are mainly two iterative load balancing algorithms: the diffusion algorithms and the dimension exchange algorithms. Diffusion algorithms assume that a processor simultaneously exchanges load among all neighbor processors, whereas DE algorithms assume that a processor exchanges load with only one neighbor at each time step [10]. With Load balancing, MANETs can minimize traffic congestion and load imbalance, as a result, end to end packet delay can be minimized, mobile nodes lifetime can be minimized [11]

B. Advantage of Load Balancing

- Load balancing can minimize traffic congestion and load imbalance, as a result, end to end packet delay can be minimized, mobile nodes lifetime can be minimized [11].
- Load balancing distributes the load among the nodes [2,13]
- Load balancing is used in multiple routing and provide more than one path for transferring the packets from source to destination [10]

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- Load balancing is a major issue in time critical and information intensive applications for increasing performance of distribution applications on dynamic networks [10].
- Load balancing is used to utilize network resource more efficiently and minimized congestion and it also adjust the distribution of traffic among multiple disjoint paths based on the measurement of network traffic[12]

C. Clustering

Clustering [13] is the process of building hierarchies among nodes in the network. In this approach an ad hoc network is partitioned into group of nodes called as clusters. The MANETs can be divided into several clusters. Each cluster is composed of one clusterhead and many normal nodes, and all the clusterheads form an entire dominating set. The clusterhead is in charge of collecting information (signaling, message, etc.) and allocating resources within its cluster and communicating with other clusterheads. And the normal nodes communicate with each other through their clusterhead, no matter they are in the same cluster or not.

Advantages

- *Reusability*: spatial reuse of resources at nodes
- *Simplification*: of addressing

Stability and Localization: smaller and potentially mode stabile sub-network structures.

II. Related Work

In the related work, we discussed the work represented by various researchers on the Load Balancing in Mobile Adhoc Networks.

In this paper [3], a novel analysis model has been proposed to calculate the load of wireless ad hoc networks that using multipath routing. As the result of this paper, multipath routing can balance the load only when the density of the nodes is very high and there are many paths. In this paper [7] authors propose Routing with Load Balancing Using Mobile Agent. The concept of mobile agent for route discovery and balance the traffic load on the route. This mobile agent selects the disjoint (alternate) path called Active Path Set (APS) for reliable transmission to avoid congestion. A mobile agent provides topology updation and path maintenance also. Result shows that mobile agent approach outperforms existing ad hoc routing protocols in terms of packet delivery fraction, average end to end delay and normalized routing load. In this paper [10], a new multipath routing protocol i.e. Load Balancing Ad Hoc On Demand distance vector was proposed that uses all discovered paths simultaneously for transmitting data, by using this approach data packets are balanced over discovered across many nodes through network. In this Paper [9], a traffic estimator which makes calculations based on previously sent packets and a new model for evaluating the load balance under multipath routing was introduced. Traffic load estimator method based on an exponential decrease function and then traffic estimation methods that are applicable in Mobile Ad hoc networks. In this paper [4], a routing protocol method called Load Balancing and Asymmetrical Multipath Routing was proposed. It makes the traffic load distribution more evenly and protects the node which has less energy, so it can prolong the life time of the network as long as possible. In this paper [1], the multipath routing protocol with load balancing provides a solution for the congestion network and increases its capacity. A new protocol Load Balancing Ad hoc on demand Multipath Distance Vector was proposed. As the result the significant performance improvement of the network for the multipath routing protocol with load balancing. The protocol works better in terms of average delay, capacity and load balance.

To the best of our knowledge no such technique exist that simultaneously take advantage of both load balancing & clustering.

III. Problem Definition

Before Movement of node from one location to another always creates a new cell of nodes that needs to be optimized for effective transmission. This optimization process takes lot of computation and can cause latency in the network. Therefore the new solution is required for approach cell management. Thus in this scheme a new cluster selection procedure based on load balancing is proposed that is explain in the next section.

IV. Proposed Work

In this section we discuss the proposed solution of our technique:

A. The initial condition is to place a moving node in an appropriate cluster keeping in mind that the average channel capacity of the whole network is maintained at certain threshold value.

B. The another condition to be justified is that, node will join only that cluster whose average channel capacity is less than the average channel capacity of the network.

C. The step evolved in the placement of node in a cluster depends upon the mobility of node, offered channel capacity and energy left out.

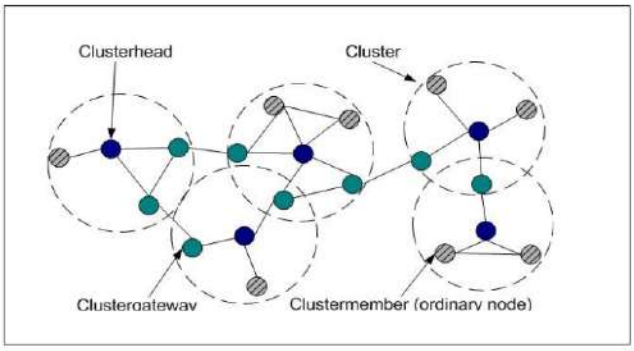

Fig. 1. Formation of Clusters

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V. PROCESS INCLUDED

In this section we discuss the process that can be included for the formation of the technique:

(a) Cluster formation
(b) Selection of mobile nodes
(c) Stopping randomly selection of clusters
(d) Cluster selection on the basis of channel capacity

Pseudo code

```
Connecting time=0.0
While (connecting time ≤ actual time)
{
(i) Cluster_formation (Nodes, head, channel_capacity);
(ii) Select moving nodes ◄——— nodes;
(iii) Number of cluster formed ◄——cluster;
(iv) Movement (node_id, channel_capacity_node,
        previous_cluster_id);
(v) Join cluster (node_id, new_cluster_id);
(vi) Carry transmission();
Connectivity time = connectivity time+1
}
Cluster_formation (nodes, head,channel_capacity)
{
(a) Select No. of nodes ———►nodes
(b) Give node_id & maintain data
(c) Select cluster head———►head
(d) Store channel_capacity (node)
}
Cluster( node_id, new_cluster_id)
{
While (x≤no of cluster)
{
If avg(channel_capacity(node_id,cluster_id)) ≤ avg
(channel_capacity(network))
{
Join cluster(node_id, new_cluster_id)
}
x=x+1
}
else
Join random_cluster ();
}
}
```

In the pseudo code, initially the cluster are formed and tabular entry is maintained that stores node id, cluster id and channel capacity. In the next step the moving nodes are identified and the node id is stored in separate table when this node approaches another cluster. The average channel capacity is calculated including the approached node if is justified the condition B & C as explain above. It is allowed to join the cluster and the new cluster id is allocated otherwise the node can randomly select the cluster. This allowed load balancing to be incorporated in cluster selection process in order to maintain effective lifetime and improve transmission in the network.

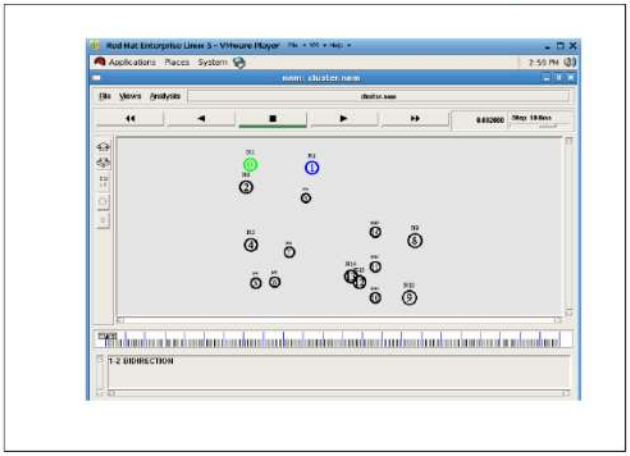

Fig. 2. Shows the number of Nodes. Node 1 & Node 2 are Bidirectional

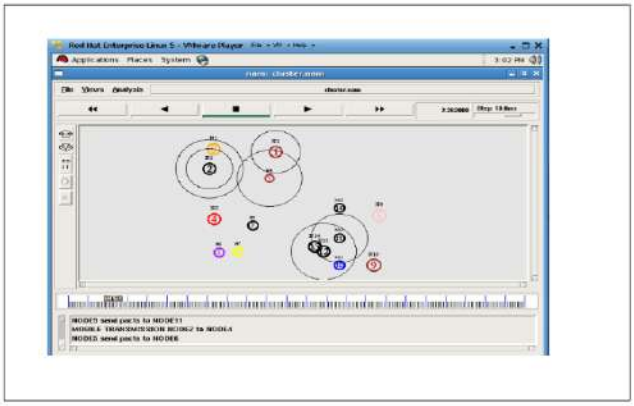

Fig. 3. Shows the transmission between the Nodes

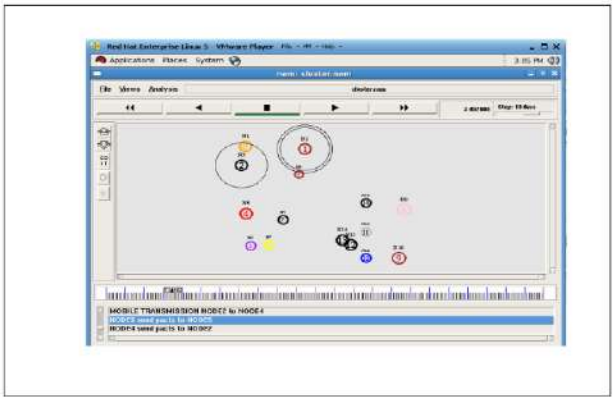

Fig. 4. : Shows the transmission between Node 5 & Node 6

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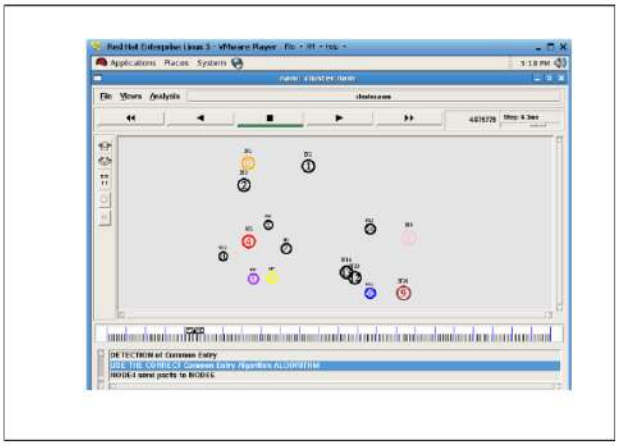

Fig. 5. Shows the Node 4 enters the another cluster

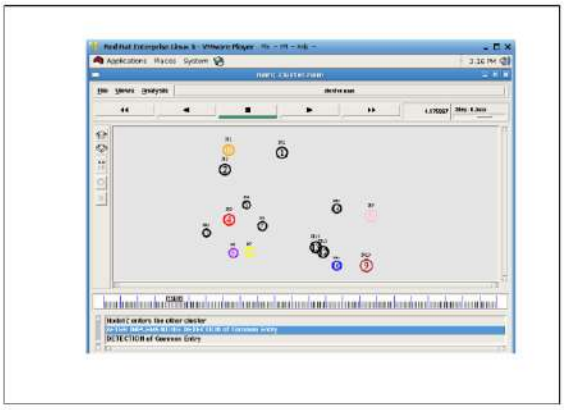

Fig. 6. shows that nodes have common entry detection is done between different clusters

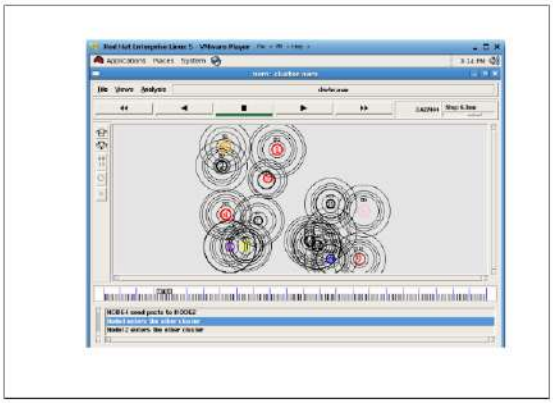

Fig. 7. Example shows after common entry detection correct common entry algorithm is implemented

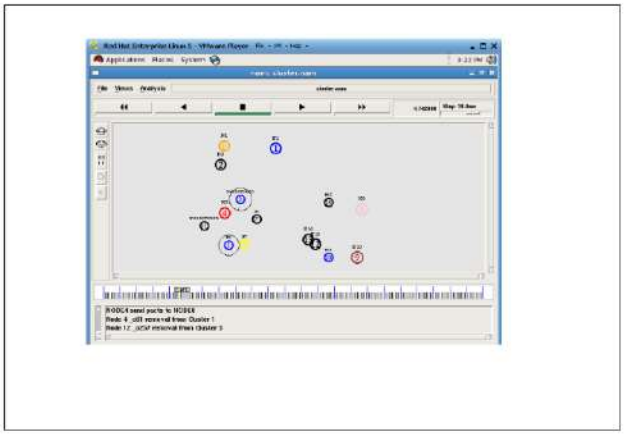

Fig. 8. shows Node 4 is removed from cluster 1 ad Node 12 is removed from cluster 3

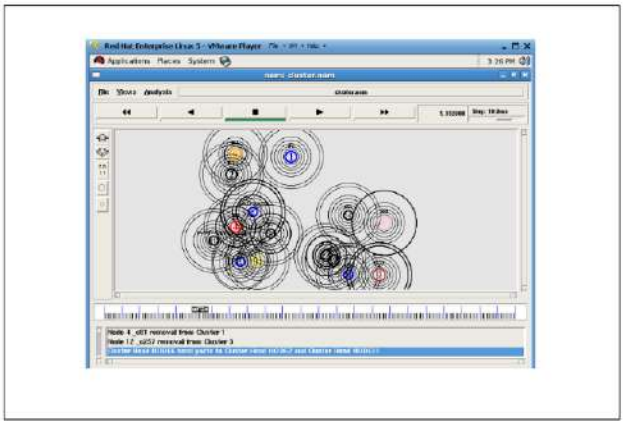

Fig. 9. shows Cluster Head Node 6 sends packet to Cluster Head Node 2 and Cluster Head Node 1

The results are based upon the following metrics and the graphs have been taken by using NS2 Simulator.

Metric used:

- Per node network bandwidth utilization(B)
- Network lifetime

Formula used:

B= (min channel rate + waiting overhead/ no of active connections) /Offered rate

Network lifetime= no of connected nodes * transmission time/ total simulation time

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TABLE I. THE GRAPH SHOWS THE BANDWIDTH WITH RESPECT TO NUMBER OF NODES

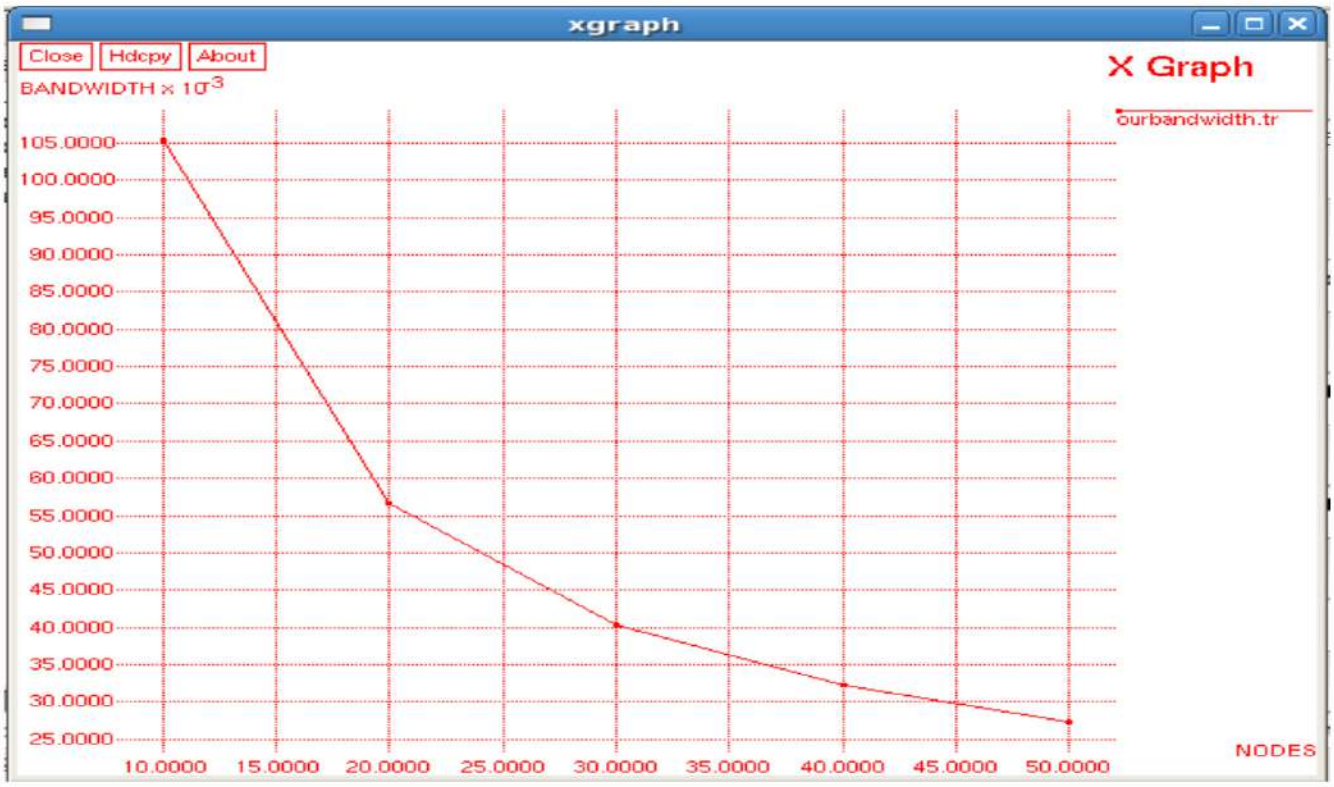

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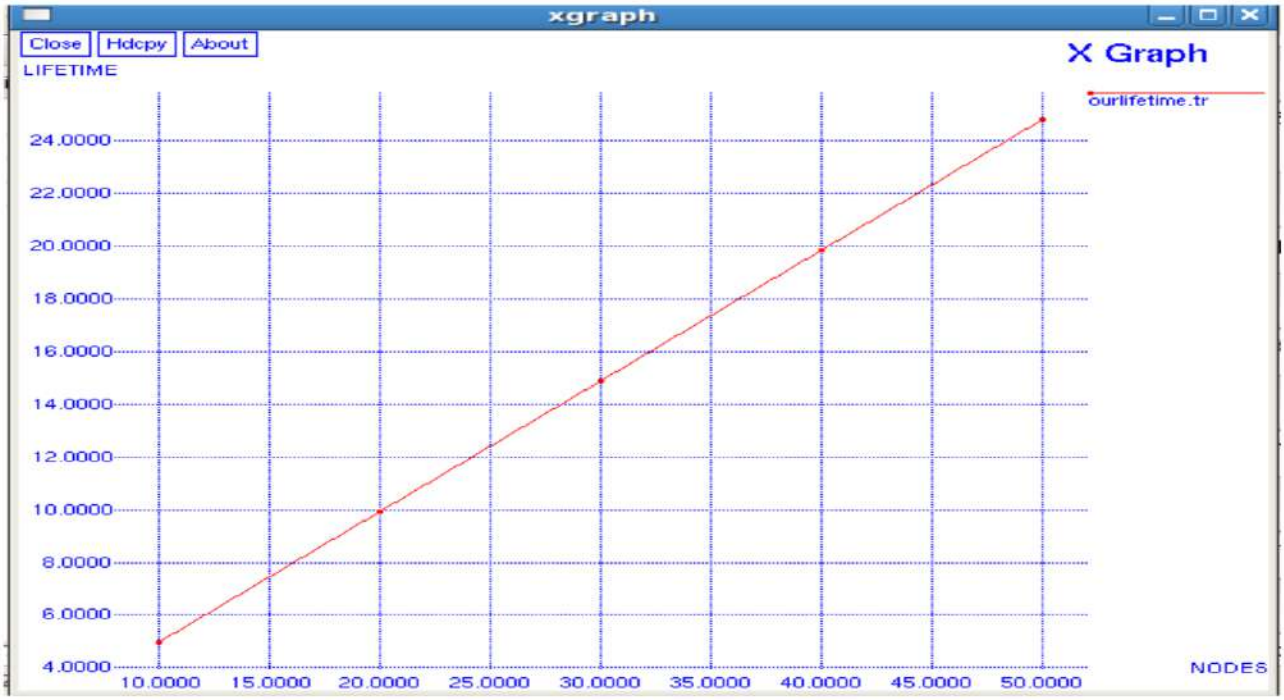
TABLE II. THE GRAPH SHOWS THE LIFETIME WITH RESPECT TO NUMBER OF NODES



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VI. Conclusion & Future Scope

In this paper we discuss the pseudo code in which load balancing and clustering are the main issue. The nodes are not randomly selecting the cluster but the nodes select that cluster that have lesser channel capacity. So that the usage of per node bandwidth is effectively used and the enhancement of the transmission and network lifetime. In this schema the base protocol that was used is AODV. In future this scheme can be implemented by using different protocol and the different results can be compared.

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Electronic Waste: A New Threat to Society

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Abstract— **This paper focuses on the Electronic Waste or E-waste in short, which is the potential threat to the beauty and well being of the environment .This has been lately understood by the authorities that it is serious concern and though laws have been passed in this direction, a lot, still, has to be done yet in practice. This paper highlights the threats it pose especially in context of Indian society.**

Index Terms—**Electronic Waste, BFR (Brominated Flame Retardants) , Million Tonnes(MT) , Hazardous waste.**

I. INTRODUCTION

The sight of an impoverished neighborhood with rows of hollowed-out computer monitors line a dingy lane or room after room on either side is piled high with dusty keyboards and metallic innards of computers and other electronic goods is not a tale but a sight of Gali 4, Old Seelampur, Northwest Delhi. This is the opening gates to a new India, wasteland of urban refused. Large heaps of so called e-waste, short for *electronic waste* spawns incites to be refurbished, dismantled and recycled. The root cause of this problem is technological advancement because on an average a computer is replaced in 18-24 months, not because it is broken or faulty but just because it has become outdated and the software on it has become obsolete. Such computers and electronic goods have no or little resale value and as they have no takers the comfortably or not so comfortably occupy the garages, basements, warehouses and lanes. This problem is not confined to India rather it is global. According to the Grass Roots Recycling Network, there were 300 million to 600 million obsolete personal computers in United States till 2004 and the data must have increased manifold times all these years and all other places of the world.[1] Another reason is the fast changing lifestyle, status and perception linked to the latest and expansive gadget.

'E-waste' means electrical and electronic equipment, whole or in part, rejected from their manufacturing and repairing process, which are intended to be discarded. [2]

The term e-waste is applied to all waste caused by discarding electronic devices, especially consumer electronics. [3] E-waste is a major concern in areas of personal computing and wireless devices that are quickly discarded by consumers. The lifespan of these electronics are short-lived due to rapid technological advances and lower costs to purchase each year. Consumers generally buy new instead of reusing because their electronic device quickly becomes obsolete or it may be cheaper to purchase new. Inkjet printers are one example of a common e-waste problem as consumers believe they can save money to purchase a new printer with ink than to buy ink refill for their old one.

But the question is why the hue and cry about e-waste? This is so because this type of waste cannot be ignored as it comes under the category of hazardous wastes. Computer besides containing high quality plastic and metals like aluminum, silver, palladium, nickel, tin etc are also housing heavy toxic metals like chromium, mercury, lead, cadmium some of which can be radioactive. Computer monitors contain brominated flame retardants in circuit boards, cables, wires, casing and housings. The chemicals in these materials are environmental toxins. Picture tubes and display devices contain lead. Computer monitors contain cadmium that causes damage to nervous system. Backlight system of computer contains mercury which is again harmful. Alarmingly, most computers contain at least three t o eight pounds of lead.[4]

I. COMPOSITION AND HAZARDS OF E-WASTE

The health and environmental risks of informal recycling are high. Extracting metals like copper and gold in open acid baths, which is illegal, releases toxins such as dioxins, heavy metals, lead, cadmium, mercury and brominated flame retardants (BFRs). Acid and chemical residues contaminate water and soil. Informal recyclers work without protective clothing, exposing themselves to hazardous chemicals that can lead to physical injuries. Mercury, for instance, can cause brain and kidney damage, and BFRs disrupt hormonal function and chronic illnesses like asthma and skin diseases.

The e-wastes if not properly disposed presents a threat to environment. All above hazardous metals can leach

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into the soil and groundwater, if burned the harmful fumes go into the air polluting it further. After realizing how grave the situation is several countries have passed legislations requiring business houses and residents to e-Cycle consumer electronics, that is recycle PC's color monitors, cell phones and color televisions. Several other harmful metals commonly found in this type of waste is listed below with its harmful effects.

Table 1: Composition and Harms in e-waste: [5]

Sr. No	Metal's Name	Applications	Harmful Effect
1.	Americium	Smoke Alarms	Radioactive, Carcinogenic
2.	Mercury	Fluorescent tubes, tilt switches, flat screen monitors	Sensory impairment, dermatitis, memory loss, and muscle weakness. Environmental effects in animals include death, reduced fertility, slower growth and development.
3.	Sulphur	Lead acid batteries	Liver damage, kidney damage, heart damage, eye and throat irritation.
4.	BFR's	Flame retardant Plastics	Impaired development of the nervous system, thyroid problems, and liver problems.
5.	Cadmium	Light-sensitive resistors, corrosion-resistant alloys for marine and aviation environments, and nickel-cadmium batteries.	Kidney damage, leaches into soil harming microorganisms and disrupting the soil ecosystem.
6.	Lead	CRT, lead acid batteries, PVC	Harms nervous system, cardiovascular system, kidneys.
7.	Beryllium oxide	Filler in some thermal interface materials such as thermal grease used on heat sinks for CPUs a	Carcinogenic, causes beryllium disease.
		nd power transistors, magnetrons, X-ray-transparent ceramic windows, heat transfer fins in vacuum tubes, and gas lasers.	

Currently about 10% of the e-waste are e-Cycled in US by companies like Viatek solutions in Tumpa, Florida that dissembles old computers ,monitors, fax machines, printers and other electronic equipment that they obtain from business houses and individuals.[6] For example, the broken plastic equipments are recycled to make benches and shelving. Here as these companies whose waste it is, have not developed proper dissembling methods this all poses potential danger to health of the workers. But the bigger question is what is done with large part of this US e-waste, Well, it is smartly discarded by the formula 'Not in my Backward'; they export it to countries like Pakistan, India, China. Some companies are smarter, they save the cost of importing the e-waste to Southeast Asia, they simply dump it in Haiti, small island country in proximity to US. If the so called most responsible country treats it e-waste in this way, what to expect from others. Some developing countries like India and China have progressively dealing with this menace but the pace, with which it is mushrooming, by local refuse and imports, is making all efforts futile. Still people are not so equipped with formal procedures of e-Cycling and this poses an acute danger to health of human beings and animals and to environment as a whole.

II. E-waste Generation in India

According to a study by the Manufacturers Association for Information Technology ("MAIT"), together with GTZ, the German Technical Cooperation agency, India generated 3,32,979 MT of electronic waste in 2007, while an additional 50,000 MT was illegally imported into the country. By 2011, it was estimated that e-waste generated in India would touch 4, 70,000 MT. Of the total e-waste generated, only about 40% finds its way to the recycling stream while the remaining 60% remains in warehouses, storages of companies due to poor and inefficient collection system followed by them. The study also brought out that around 94% of the organizations polled did not have any policy on disposal of electronic and electrical waste. Though a number of corporate houses were aware about the environmental threats arising on account of improper disposal of e-waste, the level of awareness and depth of understanding was found lacking.[7]

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Key statistics relating to the extent of e-waste generated, available for recycling and ultimately processed is given below:

Table 2: E-Waste Generation in India – Breakup

Components	Generated	Available	Processed for Recycling
Computers	56,324	24,000	12,000
Cellular Phones	1,655	143	7,000
Televisions	2,75,000	70,000	-----
Imports	-----	50,000	------
Total	3,32,979	1,44,143	19,000

All data in MT; Source: MAIT[8]

In early 2010, twenty containers of hazardous waste from Greece and Reunion, a French colony, imported by a paper factory in Tamil Nadu were sent back from the Tuticorin Port. As recently as in August, 2010, more than 120 tones of e-waste in eight containers and imported from various countries by different companies were seized in Chennai. Of the total five consignments, one was from Australia, one from Canada, two from Korea and one from Brunei. Subsequent examination of the goods revealed that there were very old, used and unusable computer monitors, CPUs and processors, control panels, electrical motor parts, printers and keyboards. These imports were found to be in direct violation of the provisions of the Customs Act, 1962 read with the Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules, 2008.[9]

III. The Legislations

The e-waste problem for long was not addressed separately and there was no specific law to deal with this. Until the MAIT's report (2007) after which the Indian Law makers realized the importance of this issue and Ministry of Environment and forest passed a notification on 12th May, 2011 e-Waste (Management and Handling) Rules 2010 which became a law on 1stMay, 2012 under the ambit of Environment Protection Act of 1986. [10]

The objective of the law is to establish an effective mechanism to regulate the generation, collection, storage, transportation, import, export, environmentally sound recycling, treatment and disposal of e-waste. This includes a refurbishment system, collection system and producer responsibility thereby reducing the wastes destined for final disposal. Under the rule a fine upto Rs.1 lakh and imprisonment upto7 years can be awarded to violators. The rule clearly declares that dealing with e-waste is the 'Extended Producer Responsibility' and that he must devise mechanism for its proper take back and disposal.[11]

IV. E-Waste Management: Challenges for India

The mantra of "Reduce, Reuse, Recycle" applies here. Reduce your generation of e-waste through smart procurement and good maintenance. Reuse still functioning electronic equipment by donating or selling it to someone who can still use it. Recycle those Products that cannot be repaired. While the overall challenges regarding management of e-waste in India are the same faced by other developing economies, the vast geographical diversity and economic disparities between regions often make e-waste management challenges unique in India. A few of the key challenges faced are:

a. Rapidly increasing e-waste volumes, both domestically as well as generated through imports. Imports are often disguised as second-hand computer donations towards bridging the digital divide, or as metal scrap.

b. Limited accuracy in the estimates of the quantity of e-waste generated and recycled.

c. Low level awareness among consumers about the hazards of incorrect e-waste disposal.

d. Widespread e-waste recycling in the informal sector using rudimentary techniques such as acid leaching and open air burning resulting in severe environmental damage.

e. E-waste workers have little or no knowledge of toxins in e-waste and are exposed to serious health hazards, etc.

Despite the legislative measures adopted by the government the scenario in Indian scene has not much changed because it is not yet sincerely being implement and the waste producers are not doing the rightful that they ought to do. Among the few hardware manufacturers that have a good e-waste collection track record is Wipro. Since the time that it introduced the take-back program in 2007, it has improved and matured its process for take-back and safe processing. In FY 2010-11, a total of 260.43 tons of e-waste more than 150 percent compared to the previous year was collected from its 17 collection centers across India and disposed through its network of certified partners. Wipro played an important role in being part of the committee that helped draft the e-waste regulation. [12] Though the law was welcomed as the right

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initiative in the direction by all environmentalists and NGO's there were several reasons for which it was criticized. Following are some of the them:

- Firstly, it ignored the unorganized and small and medium sectors where 90 percent of the e-waste is generated.
- Secondly, the law currently does not provide for any plan to rehabilitate those involved in informal recycling (kabariwala's).
- Thirdly, the Rules also do not detail the business model for collection of e-waste from consumers. The legislations enacted by the Government cover generation, storage, transportation and disposal of hazardous waste but do not propose a streamlined collection mechanism.
- Fourthly, the draft Rules also do not recognize the magnitude of trans-boundary movement of e-waste under different categories, for example, under the pretext of metal scraps and secondhand electrical appliances.
- Lastly, as per the Ministry of MSME, the MSME sector is mainly affected as producer under the new draft rules, imposing many responsibilities on the producers (MSMEs) in regard to collection, disposal and recycling of e-waste. It has commented that as per the Fourth All India Census of MSMEs (2006-07),there are about 1,11,754 units engaged in IT, Telecom equipment, household appliances, consumer and lighting equipment, monitoring and control equipment in the country, out of which only 27, 415 are registered units and 84, 339 are unregistered units. The average gross output of the registered MSME units ranges from Rs. 80.00 lakh to Rs. 1.00 crore per annum/unit.[13] It is stated that an environmentally sound recycling unit may involve heavy investment because of the technology involved . It will be economically viable only when there is adequate turnover of such firms.

By the end of the year, the nation's largest e-waste recycling plant is due to be up and running. Built on government land in Bangalore, it will have the capacity to recycle about 60,000 tons of e-waste annually. The government is simultaneously trying to pass a new law to oversee formal e-waste management, both through the establishment of more large-scale recycling plants and by regulating the formal disposal of e-waste. The transition won't be easy: 95% to 97% of the e-waste collected in India funnels into the informal sector, in which about 80,000 people work, for recycling. "The informal sector is well networked, has a historic presence and provides fiscal incentive to consumers on collection of waste," remarked Abhishek Pratap, a Greenpeace India activist .It provides livelihood to a huge number of poor migrant laborers." [14]

V. Conclusion

Clearly E-waste is a massive threat to the beauty and well being of the environment .It has been still not clearly understood by the authorities as well as the people. Laws have been passed in this direction but they are not exercised yet. Also, the law put all pressure on producers, who are seldom interested and also not in a position to deal with all the waste that has piled up, so it is the consumers who must realize the responsibility and do not follow the rat race of the latest and he best. Moreover there is need to mend the law further, formalizing the waste collection sector and this can be done by NGO's and authority which provides licenses to the kabariwalas who have the proper methods for collection and disposal mechanisms.

General public must also be educated and this new cause of pollution should be included in the syllabi of educational institutions of our country.

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Energy efficient routing protocols in mobile Ad-Hoc networks

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Abstract: **This paper presents a survey on energy efficient routing protocols for Mobile ad hoc networks. The Internet Engineering Task Force (IETF) has defined a MANET. A MANET is a wireless network which consist of many wireless routers i.e. Mobile devices or also known as associated hosts. It is a Temporarily Network that is built between various mobile hosts for forwarding and receiving data packets from each other. There is no need of any central administration and does not built infrastructure as compare to cellular networks. There is no need of any base stations in a Network. MANET is deployed for emergency situation. In a mobile ad hoc network, nodes move randomly; therefore the topology may change rapidly and in unpredictable manner [1].**

Keywords: **MANET, IETF, Energy Efficient Routing, Associated Hosts.**

I. INTRODUCTION

A MANET term is stand for Mobile Ad-Hoc Network. A MANET is a temporarily network that is built between various wireless mobiles or associated hosts. It is defined by Internet Engineering Task Force (IETF) in 1980's. MANET is viewed as suitable systems which can support some specific applications as virtual classrooms, military communications, emergency search and rescue operations, data acquisition in hostile environment, communication set up in exhibitions, conference and meetings, in battle field among soldiers to coordinate defense or attack, at airport terminals for workers to share files etc. [1] It is used to forwarding and receiving the data packets and information from one node to another node. It does not need to have any base station as in the cellular networks have and any central administration between the networks. MANET is also called the peer to peer network in which there is no central server is there [3]. It is a wireless infrastructure less network that can be deployed easily anywhere, anytime. There is no need of any wires to connect associated hosts (Mobiles) with each other in a network. Each node will act as a router and forward data packets to other nodes in a network. It uses multi hop relaying. Since the nodes are independent to move in any direction, there may be frequent link breakage. It has a major advantage is that instant deployment. [5]

II. Importance of Routing Protocols

The importance or need of Routing Protocols is to solve problems for efficient design and deployment of various working devices in MANET. It is used to find an efficient route or way in which a mobile device can communicate with other devices without any link breakage and efficiently [4]. The main need of routing protocols is to save the time, it has to be cost effective and faster route finder so as to communicate efficiently between various wireless routers (Mobiles). There are both direct and indirect links that are established between various mobile devices with the help of various routing protocols [6]. The network topology keeps changing in MANET and it is very difficult for routing process The routing protocols are divided into three categories - Proactive or Table Driven Protocols, Reactive or On Demand Routing Protocols, Both Reactive and Proactive Hybrid Routing Protocols [7].

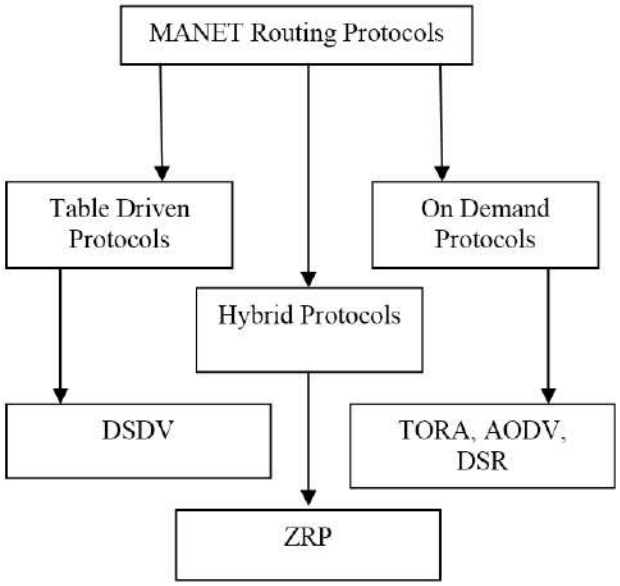

Figure. 1: MANET Routing Protocols.

2.1 Classification of MANET Routing Protocols

The MANET routing protocols are divided into three categories - Proactive or Table Driven Protocols, Reactive

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or On Demand Routing Protocols, Both Reactive and Proactive Hybrid Routing Protocols. There are various routing protocols that are DSDV, TORA, AODV, DSR, ZRP. The Table Driven protocol (Proactive) is DSDV, On Demand Protocols (Reactive) is TORA, AODV, DSR and Hybrid protocol (Bothe Reactive and Proactive) is ZRP [2].

(a) Table Driven (Proactive) Routing Protocols:

Table Driven routing protocols are also called proactive routing protocols. Table Driven routing protocols uses Link state routing algorithm in a network [10]. In this type of routing, each wireless routers keeps information about another wireless routers (Mobiles) in the form of routing tables. Whenever there is a change in network topology or design of a network that information is updated in routing tables of each nodes [13].

(b) On Demand (Reactive) Routing Protocols:

In Reactive or on demand routing protocols, when a sending host want to send some data packets to destination hosts, then these protocols uses the route discovery mechanism which discover the various routes from sending host to destination hosts and pick the efficient route or way to deliver the data packets over a network [2]. Unlike Proactive or table driven routing protocols, all communication devices or associated hosts need not to be maintained up to data routing information in routing tables.

(c) Hybrid (Both Reactive & Proactive) Routing Protocols:

Hybrid routing protocols are both reactive and proactive routing techniques. In this type of routing technique there are many less numbers of associated hosts are there in a network for data and information sharing. ZRP (Zone Routing Protocol) is an example of hybrid routing technique [8].

2.3 Description of Protocols:

(a) DSDV: Dynamic Sequenced Distance Vector Routing Protocol. This protocol is based on the Bellmen Ford algorithm which is used to keep information of all destination nodes in routing tables and if any change is occurs in network topology or design of network that information is updated in the routing tables. Each entry in a routing tables are assigned with a sequence number. Each associated host keeps advertise its routing information of routing table to its neighbor hosts [1].

(b) AODV: Adhoc on Demand Vector Routing Protocol. It is a type of reactive protocol. It is based on Distance Vector Algorithm. It uses broadcast and unicast communication. In this protocol, when an associated mobile host or sender wants to send data to another mobile host or destination, it will sends a broadcast request propagates to each mobile host until it didn't find the best or efficient route to destination host [12].
After finding a best route or way, then a unicast request (RREQ) is sends back to sender as an (Acknowledgement).
The broadcast request is sends to all its neighbors and then distributed further until it didn't find an efficient route.

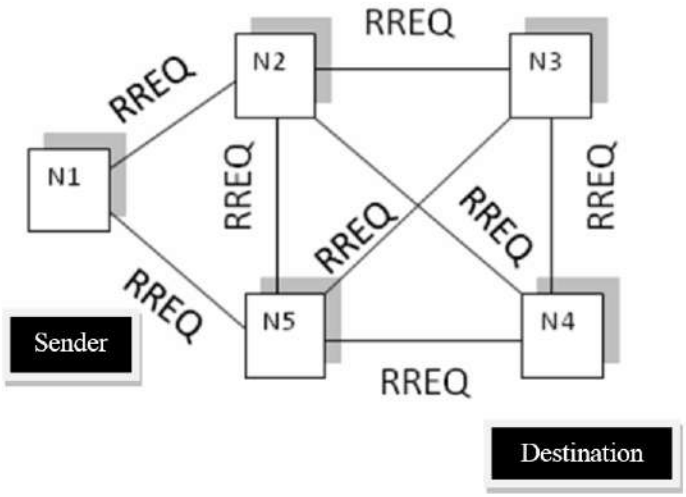

Figure. 2 Broadcast a message from sender to destination in a network.

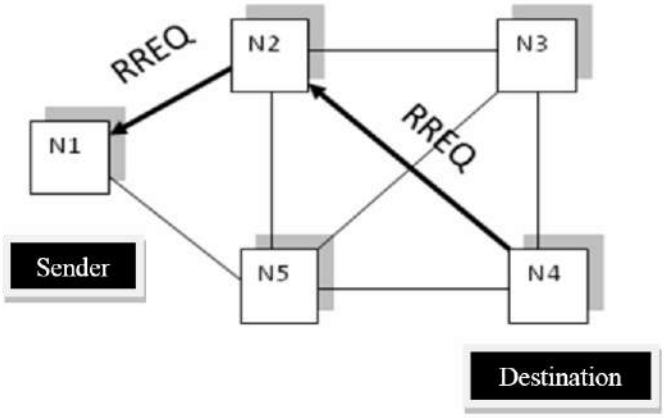

Figure 3: Unicast a request (RREQ) as an acknowledgement after finding efficient or shortest path.

(c) DSR: Dynamic Source Routing. Dynamic means it creates the routes or way dynamically in an mobile adhoc network and source routing means it contains whole information about each packet i.e. to which node the information is transferred and that information is saved in

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routing tables. It support working on MAC layer [11]. It provides higher bandwidth and less power consumption. It provides efficient routes or ways in a network.

(d) ZRP: Zone Routing Protocol. ZRP is a protocol that is used in large MANET or network. In this protocol each node maintains routes in a region that is known as routing zone [1] [9]. A node is directly communicate with its neighbors and also used for discovering the neighbors by checking the direct links in a network of a associated hosts. Neighbors discovery mechanism is done by intra-zone routing protocol (IZRP) [1].

(e) TORA: Temporary Ordered Routing Algorithm. It is on demand routing protocol or reactive protocol in MANET. It is highly efficient, adaptive and use to build temporal routes in a network. This protocol used by many associated hosts and need only maintain the information about adjacent hosts. When a sending host wants to send data packets to their destination hosts, this protocol quickly build routes from sender to destination and it is also used to maintain that routes [14][15]. TORA protocol is based on topological sort because it is used to find shortest path in a directed acyclic graph. It is used to minimize routing traffic [13]. The failure or removal of any node is quickly resolved without any source intervation by switching to an alternate route [5] [9].
It is used to keep up to date information at each node. TORA is very highly adaptive and efficient protocol that is used to find a best route for uninterrupted communication [16].
It is designed to minimize the communication overhead associated with adapting to network topological changes.
TORA protocol has three control packets :-

(i) QRY (Query)

(ii) UPD (Update)

(iii) CLR (Clear)

- QRY: It is used for both creating and maintain the routes in a MANET.
- UPD: This control packet is used for update the routing information in routing tables when there is a change become in network topology
- CLR: This control packet is used to clear the routes after delivering the data packets to the destination hosts.

Working of TORA protocol: -

(i) The figure 4 shows the numbers of mobile hosts and one sender and one destination.

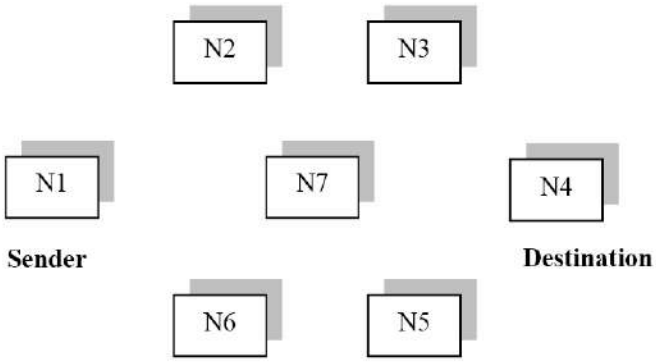

Figure 4: No of nodes in a network.

(ii) Firstly sender sends or broadcast ORY message to create and maintain multiple routes to the destination.

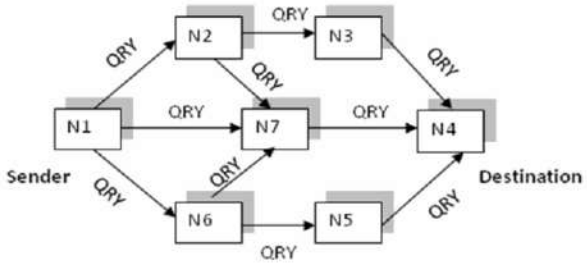

Figure 5: Broadcast a QRY message in network.

(iii) Then if any topological change is done or any network design is changed then TORA protocol keeps information up to date in the routing table.

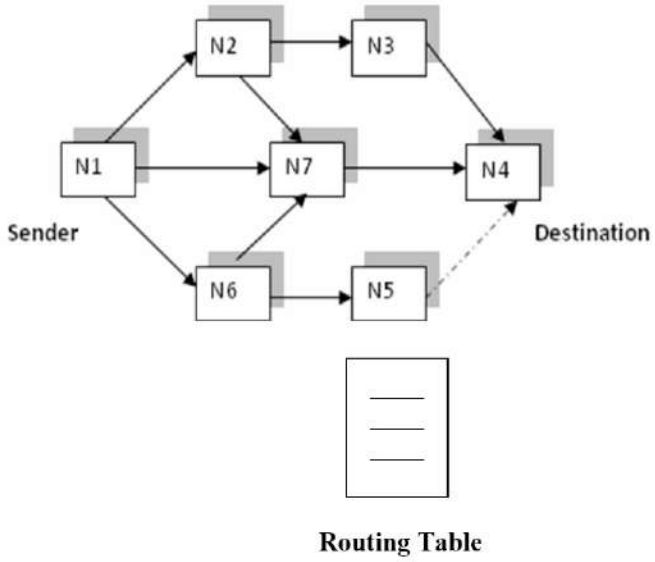

Figure 6: Information about changing routes are update in routing tables.

(iv) After that it will finally finds the shortest path or route to reach to the destination.

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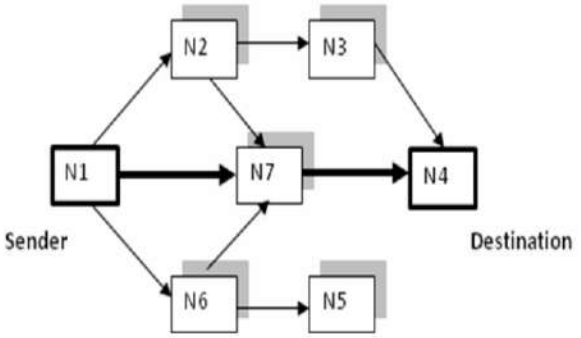

Figure 7: Finds the shortest path i.e. N1- N7- N4

(v) After communication then TORA is used to clear the routes by the help of control packet CLR.

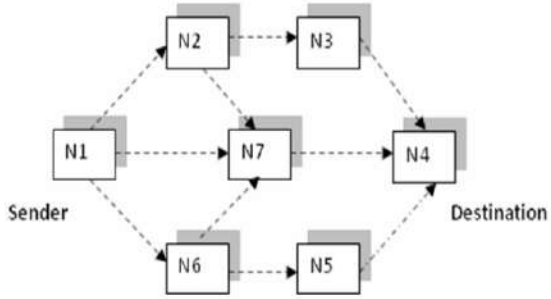

Figure 8: Clear all the routes after communication.

III COMPARISON TABLE:

Table 1: Comparison of TORA with other protocols [8]

Properties	AODV	DSR	DSDV	TORA
Reactive	Yes	Yes	No	Yes
Multiple Routes	No	Yes	No	Yes
Power Consumption	No	No	No	No
Unidirectional Link Support	No	Yes	No	No
Multicast	Yes	No	No	No
Periodic Broadcast	Yes	No	Yes	Yes

IV. SIMULATION PARAMETERS

4.1 PDR/ PDF: Packet Delivery Ratio/ Packet Delivery Fraction.

PDR/ PDF is a ratio between numbers of packets that are received and the number of packets sent over a network.

Table 2. Packet Delivery Ratio (PDR) [3]

No. of nodes	TORA	DSDV	AODV
25	82.91	78.77	99.78
50	99.89	83.53	99.73
75	84.57	91.47	99.67
100	98.24	77.75	99.08

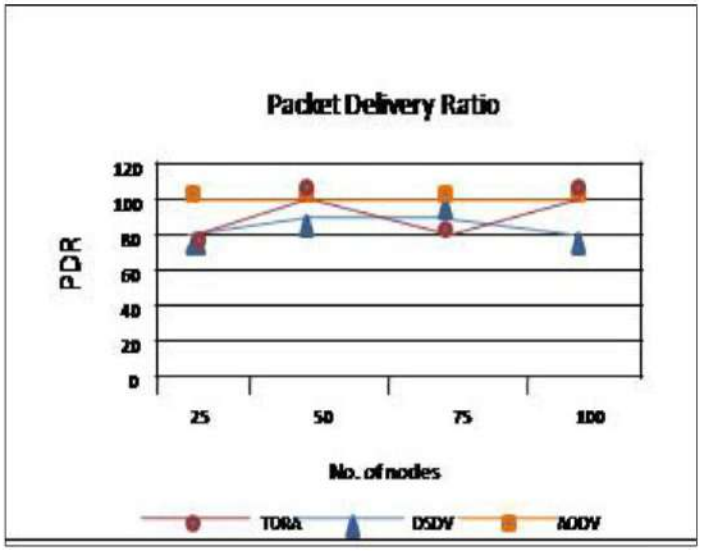

Figure 9: Packet Delivery Ratio [3]

4.1.1 Results:

- In TORA, the PDR represents zigzag graph or fluctuated graph. From 25 to 50 nodes, PDR increases highly, from 50 to 75 nodes, PDR of TORA becomes low and from 75 to 100 nodes, PDR increases highly.
- In AODV, the PDR represents a straight line in a graph. It remains same or represents straight line at graph at each nodes i.e. (25,50,75,100).
- In DSDV, the PDR increases at nodes 25,50,75 and PDR decreases at nodes from 75-100.

4.2 Throughput:

Throughput is measured by total number of packets that is successfully delivered to the individual destination over total time. It is measured by KB/sec.

Table 3. Throughput [3]

No. of nodes	TORA	DSDV	AODV
25	42.75	59.55	76.3
50	50.91	64.02	76.06
75	36.87	69.48	75.38
100	42.23	58.33	77.38

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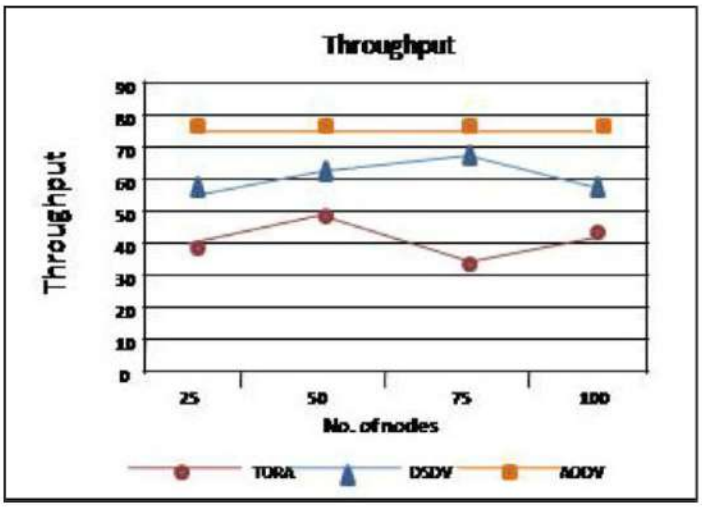

Figure 10: Throughput [3]

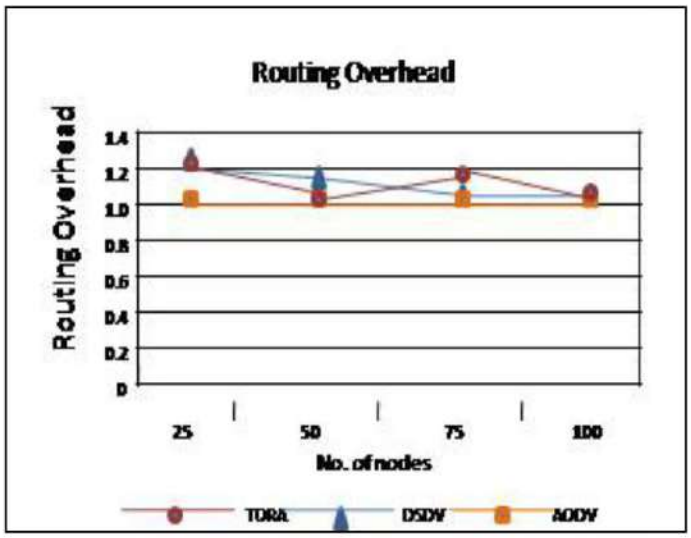

Figure 11: Routing Overhead [3]

4.2.1 Results:

- In TORA, throughput represents fluctuated or zigzag graph. From 25 to 50, throughput increases, from 50 to 75 nodes, throughput decreases and from 75-100 nodes, throughput slightly increases.
- In AODV, throughput at nodes 25, 50, 75, 100 remains slightly same.
- In DSDV, throughput at nodes from 25 to 75 increases and 75 to 100 nodes throughput decreases.

4.3 Routing Overhead (ROH):

The routing overhead measures the total numbers of control packets (QRY, UPD, and CLR) sent divided by the numbers of data packets delivered successfully.

Table 4: Routing Overhead (ROH) [3]

No. of nodes	TORA	DSDV	AODV
25	1.21	1.27	1.002
50	1	1.2	1.002
75	1.18	1.09	1.003
100	1.02	1	1.009

4.3.1 Results:

- In TORA, ROH is of zigzag graph or represents fluctuated graph. From 25 to 50 nodes, it decreases, from 50 to 75 nodes, ROH increases and from 75 to 100 nodes, it will decrease again.
- In AODV, ROH represents straight line at each nodes i.e. at nodes 25, 50, 75, 100 ROH remains same.
- In DSDV, the ROH keeps decreases from 25 to 100 nodes.

4.4 Average End to End Delay:

Average End to End Delay measures delay time in forwarding and receiving data packets in each intermediate node. In this unsuccessful route establishment are ignored.

Table 5: Average End to End Delay [3]

No. of nodes	TORA	DSDV	AODV
25	11.49	10.99	14.09
50	8.17	8.72	15.01
75	16.43	7.67	15.92
100	15.87	53.73	15.46

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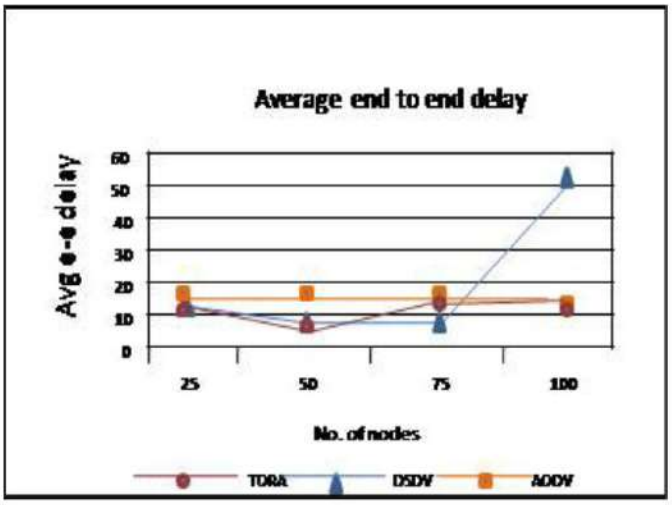

Figure 12: Average End to End delay [3]

4.4.1 Results:

- In TORA, it represents zigzag graph. From nodes to 25 to 50, it will decreases, from nodes 50 to 75, it will increases and from 75 to 100, it will slightly decreases.
- In DSDV, from nodes 25 to 75, the average end to end delay decreases and from 75 to 100, it will highly increased.
- In AODV, the average end to end delay, the delay is slightly same.

V. CONCLUSION

On briefly survey of this paper, the performance of three protocols i.e. AODV, DSDV, TORA were examined closely. Each protocol behaved differently on energy consumption concepts. The route discovery and route mechanism of each these protocols were examined differently. The simulation results of these protocols are discussed briefly in this paper and revealed that TORA protocol is more efficient than DSDV and AODV protocols. TORA is less energy consumption and lifetime of network is better than DSDV and AODV. TORA is a dynamic protocol that creates many routes and maintain that routes and after communication it will clear all routes that have made between sender and destination. Hence we conclude that TORA is more energy efficient protocol than the AODV and DSR protocol.

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Glowworm Swarm Optimization

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***Abstract*:-Glowworm Swarm Optimization is a new method of swarm intelligence based algorithm for optimizing multi-modal functions raised by K.N.Krishnanad and D.Ghose in 2005[1]. In this paper the basic Glowworm Swarm Optimization algorithm and it's variants have been discussed.**

***Index Terms*— Basic Glowworm Swarm Optimization Algorithm (GSO)**

I. INTRODUCTION

In GSO, each glowworm distributes in the objective function definition space. These glowworms carry own luciferin respectively, and has the respective field of vision scope called local-decision range. Their brightness concerns with in the position of objective function value [2].

Each glowworm encodes the object function value $J(x_i(t))$ at its current location $x_i(t)$ into a luciferin value $l_i(t)$ and broadcasts the same within its neighborhood. The set of neighbors $N_i(t)$ of glowworm i consists of those glowworms that have a relatively higher luciferin value and that are located within a dynamic decision domain and updating by formula (1) at each iteration.

Local-decision range update:

$$r_d^i(t+1)=\min\{r_s,\max\{0, r_d^i(t) + \beta\,(n_t - |\,(N_i(t)\,|)\}\} \quad (1)$$

Where $r_d^i(t+1)$ is the glowworm i's local-decision range at the t+1 iteration, r_s is the sensor range, n_t is the neighbourhood threshold, the parameter β affects the rate of change of the neighborhood range.

The number of glow in local-decision range:

$$N_i(t) = \{j :\| x_j(t) - x_i(t) \|< r_d^i;\ l_i(t)< l_j(t)\} \quad (2)$$

Where $x_i(t)$, is the glowworm i 's position at the t iteration, $l_i(t)$ is the glowworm's luciferin at the t iteration.; the set of neighbors of glowworm consists of those glowworms that have a relatively higher luciferin value and that are located within a dynamic decision domain whose range r_d^i is bounded above by a circular sensor range r_s $(0 < r_d^i < r_s)$. Each glowworm i selects a neighbor with a probability $p_{ij}(t)$ and moves toward it. These movements that are based only on local information, enable the glowworms to partition into disjoint subgroups, exhibit a simultaneous taxis-behavior toward and eventually co-locate at the multiple optima of the given objective function [2].

Probability distribution selects a neighbor:

$$P_{ij}(t) = \frac{l_j(t) - l_i(t)}{\sum_{k\in N_I(T)} l_k\,(t) - l_i(t)} \quad (3)$$

Each iteration consists of a luciferin-update phase followed by a movement phase based on a transition rule [3].

Movement phase: During the movement phase, each glowworm decides, using a probabilistic mechanism, to move toward a neighbor that has a luciferin value higher than its own. That is, glowworms are attracted to neighbors that glow brighter [3].

Movement Update:

$$x_i(t+1)= x_i(t)+s\left(\frac{x_j(t)-x_i(t)}{\|\,x_j(t)-x_i(t)\,\|}\right) \quad (4)$$

Luciferin-update phase: The luciferin update depends on the function value at the glowworm position. During the luciferin-update phase, each glowworm adds, to its previous luciferin level, a luciferin quantity proportional to the fitness of its current location in the objective function domain. Also, a fraction of the luciferin value is subtracted to simulate the decay in luciferin with time [3].

The luciferin update:

$$l_i(t) = (1-\rho)\ \ l_i(t-1) + \gamma J(x_i(t)) \quad (5)$$

Where $l_i(t)$ is a luciferin value of glowworm i at the t iteration, $\rho \in (0,1)$ leads to the reflection of the cumulative goodness of the path followed by the glowworms in their current luciferin values, the parameter γ only scales the function fitness values, $J(x_i(t))$ is the value of test function.

Each glowworm i selects a neighbor j with a probability $P_{ij}(t)$ and moves toward it. These movements that are based only on local information, enable the glowworms to partition

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into disjoint subgroups, exhibit a simultaneous taxis-behavior toward and eventually co-locate at the multiple optima of the given objective function[2].

- BASIC GSO ALGORITHM [3]

Set number of dimensions = m
Set number of glowworms = n
Let s be the step size
Let $x_i(t)$ be the location of glowworm i at time t
deploy_agents_randomly;
for i = 1 to n do $l_i(0) = l_0$
$r_d^i(0) = r_0$
set maximum iteration number = *iter_max*;
set t = 1;
while $(t \leq iter\_max)$ do:
{
for each glowworm i do: % Luciferin-update phase

$$l_i(t) = (1-\rho)\, l_i(t-1) + \gamma J(x_i(t)) \quad (5)$$

for each glowworm i do: % Movement-phase
{

$$N_i(t) = \{j: d_{ij}(t) < r_d^i;\ l_i(t) < l_j(t)\};$$

for each glowworm $j \in N_i(t)$ do:
{

$$P_{ij}(t) = \frac{l_j(t) - l_i(t)}{\sum_{k \in N_I(T)} l_k(t) - l_i(t)};\%\ \text{See (3)}$$

$j = select\_glowworm(\underset{p}{\rightarrow})$;

$$x_i(t+1) = x_i(t) + s\left(\frac{x_j(t) - x_i(t)}{\| x_j(t) - x_i(t) \|}\right);\%\ \text{See (4)}$$

$r_d^i(t+1) = \min\{r_s, \max\{0, r_d^i(t) + \beta\,(n_t - |\,(N_i(t)\,|)\}\};\%$ See (1)
}

t← t+1;

}

2. VARIANTS OF GSO ALGORITHM:

2.1 Modified GSO

All proposed modifications aim to eliminate situations, in which the glowworm does not change its position [4].

2.2 GSO v1

In the first version of modified GSO, in the case of no neighbors an agent *tries* to jump to a new location. The new coordinate j of the glowworm i is randomly generated on the basis of previous location by means of the formula [4]:

$$\chi_j^i(t+1) = x_j^i(t) + (0.5 - R)s$$

Where: R is a random number having a uniform distribution in the range (0, 1) and s is the step size.

New, *trial* location (χ) is inside a hyper-cube whose side length equals to the step size and a centre is at old glowworm position. The jump is accepted only if the current solution will not be worsen. Otherwise the position of the glowworm remains unchanged.

2.3 GSO v2

In the second version of modified GSO the concept of trial movements from GSO v1 is used and additionally the sensor range (r_s) is extended by a factor of 5% when number of glowworms inside a sphere of radius r_s is less then n_d. This modification helps the agent to use information gained from other agents and weakens the effect of random movements introduced by first modification [4].

2.4 GSO group

In the original algorithm agents spontaneously divide into disjoint groups, but some of them are not able to join to any group or even to use information from other agents. Agents always move and collaborate in predefined groups. In each group there is one chosen agent (called *master*), which determines the movement of all agents from the group. The master is placed in the middle of its group and is surrounded by several *slave* agents, which are almost uniformly distributed on a hyper-sphere centered at master position. Distance between master and slave agents is denoted by r_d and initially equals to 10% of the sensor range. The master-slave distance for a given group is controlled by the master agent and varies in the range from 33% of the step size to 10% of the sensor range.

In each iteration the master checks the *luciferin* value of own slave agents and in most cases uses standard GSO algorithm to designate the direction of a common group step. Agents from other groups are interrogated only in the case when all group members have the same value of the luciferin [4].

3.1 A Definite Updating Search Domains of Glowworm Swarm Optimization Algorithm (GSO-D)

The basic GSO algorithm foundation, introduce a conception of definite updating search domains at glowworm position stochastic updating stage to control the change of glowworm position. So that after the update the glow position always in current most superior individual periphery to enhances the convergence rate of the algorithm. Improvement algorithm according to update location at blew formula[5]:

$$x_i(t) = x_{best}(t) + (\text{rand} - 0.5) \quad (6)$$

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and $x_{best}(t)$ as the best one at the t iteration, $x_i(t)$ is the position after updated of glow that need to change.

3.2. GSO-D Algorithm

The basic step of GSO-D as below [5]:

Step 1. Initialization parameters of ρ, γ, β, s, l_0,m, n, initialization the position of each glowworm.

Step 2. To each glow, updating luciferin value according to equation (5).

Step 3. Selects conforms to the condition glowworm according to equation (2).

Step 4. Regarding does not conform to Equation (2) condition glowworm to renew its position with equation (6).

Step 5. Using (3) to select the distribution $j(j \in N_i(t))$, and updating with equation (4).

Step 6. Revision search radius by equation (1).

Step 7. One iteration complete, enter the next iteration judges whether to satisfy the termination condition, satisfied the withdrawal circulation, the record result, otherwise transferred Step 2.

4. Leader Glowworm Swarm Optimization Algorithm (LGSO)

In basic GSO algorithm foundation, introduce leader mechanisms. Before each generation of the algorithm, set the best glowworm's position as the leader in the current generation. After each generation, all glowworms are moved to the location of the leader, so that the glowworm swarm has high ability of searching global optimization, and improving the algorithm's ability in high dimensional space optimization. Improved algorithm updates the location as the following formula [6]:

$$x_i(t) = x_i(t) + rand*(x_{leader}(t) - x_i(t)) \quad (7)$$

Where, $x_{leader}(t)$ is the position of the t^{th} leader, $x_i(t)$ Is the position of the glowworm?

4.1 LGSO algorithm

The basic step of LGSO as below:[6]

Step 1. Initialization parameters of ρ, γ, β, s, l_0, m, n, initialization the position of each glowworm.

Step 2. To each glow, updating luciferin value according to equation (5).

Step 3. Selects conforms to the condition glowworm according to equation (2).

Step 4. Select the optimal location of the current generation of glowworm swarm and set it to the leader.

Step 5. Using (3) to select the distribution $j(j \in N_i(t))$, and updating with equation (4).

Step 6. Revision search radius by equation (1).

Step 7. Each glowworms move to the leader position according to (7).

Step 8. One iteration complete, enter the next iteration, judges whether to satisfy the termination condition, satisfied the withdrawal circulation, the record result, and otherwise transferred Step 2.

5. APPLICATIONS

GSO algorithm is a swarm intelligence bionic algorithm and it has good capacity to search for global extremum and more extremums of multimodal optimization problems. The GSO algorithm was applied to multimodal optimization, noise issues, theoretical foundations, signal source localization, addressing the problem of sensing hazards and pursuiting of multiple mobile signal sources problems.

The application of GSO is also included in the area of multiple signal source location or identification of odour sources and hazardous spills.

6. CONCLUSIONS AND FUTURE SCOPE

GSO algorithm becomes a new research hotspot of computational intelligence draw our sights on it. With the research deeper and deeper, it's been used at noisy text of sensor [8] and simulating robots [9].

For Glowworm swarm optimization (GSO) the accuracy is not high and it has the disadvantage of slow convergence, which is over come in modified GSO algorithm such as GSO-D. These further purposed algorithms has strong global search ability, fast convergence rate and has greatly improved the accuracy [5].

It is possible to further improve the family of GSO algorithms for example in case of GSO v2 it is possible to add an additional mechanism, which will decrement the sensor range to its initial level. This modification aims to restore the local information exchange[4].

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Image Segmentation Approaches

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***Abstract*—In areas such as computer vision and Image processing, image segmentation has been and still is a relevant research area due to its wide spread usage and application. This paper focuses on quantitative evaluation and analysis of image segmentation techniques. Image segmentation techniques are being widely used and choosing suitable image segmentation technique is one of the key factors for getting better results. We considered the techniques under the following three groups: Threshold-based, Edge-based and Region-based. Region Growing is an approach to image segmentation in which neighboring pixels are examined and added to a region class if no edges are detected. This process is iterated for each boundary pixel in the region. If adjacent regions are found, a region-merging algorithm is used in which weak edges are dissolved and strong edges are left intact. Region Growing offers several advantages over conventional segmentation techniques. Unlike gradient and Laplacian methods, the borders of regions found by region growing are perfectly thin (since we only add pixels to the exterior of our region) and connected. The algorithm is also very stable with respect to noise.**

Keywords: **Image Segmentation, Region based, Approaches**

I. INTRODUCTION

The main goal of image segmentation is domain independent partitioning of an image into a set of disjoint regions that are visually different, homogeneous and meaningful with respect to some characteristics or computed property such as grey level, texture or color to enable easy image analysis. Image segmentation is a useful tool in many realms including industry, health care, astronomy, and various other fields. Segmentation in concept is a very simple idea. Simply looking at an image, one can tell what regions are contained in a picture. Is it a building, a person, a cell, or just simply background? Visually it is very easy to determine what a region of interest is and what is not. Doing so with a computer algorithm on the other hand is not so easy.

II. RELATED WORK

(Dr.S.V.Kasmir Raja, A.Shaik Abdul Khadir, Dr.S.S.Riaz Ahamed, 2009) have studied the watershed method, also called the watershed transform, is a region based image segmentation approach based on mathematical morphology.. It also concluded the Matlab implementation of the watershed transform which is very sensitive to image noise and usually produces over segmented regions. (Ms.Chinki Chandhok, Mrs.Soni Chaturvedi, Dr.A.A Khurshid, and Aug2012) have concluded the new approach for image segmentation by applying k-means algorithm. In image segmentation, clustering algorithms are very popular as they are intuitive and are also easy to implement. This paper proposes a color-based segmentation method that uses K-means clustering technique.

(Shilpa Kamdi, R.K.Krishna 2012) This paper provides a survey of achievements, problems being encountered, and the open issues in the research area of image segmentation and usage of the techniques in different areas along with various region growing algorithms.

(Rajeshwar Dass, Priyanka, Swapna Devi 2012) This paper describes the different segmentation techniques used in the field of ultrasound and SAR Image Processing. This paper investigates how various techniques are different from each other. Here they focus more on the more common approaches which are discontinuity based and similarity based in detail

III. PROBLEM DEFINATION

In this our main objective is to study the region based image segmentation techniques which produce better results in achieving the main goal of image segmentation. There are many techniques under image segmentation. Here we have discussed the most prominent technique which is known as region based technique.

IV. IMAGE SEGMENTATION AND SEGMENTATION APPROACHES [1][2]

Segmentation refers to the process of partitioning a digital image into multiple regions (sets of pixels).The goal of segmentation is to simplify or change the representation of an image into something that is more meaningful and easier to analyze. Image segmentation is typically used to locate objects and boundaries in images. Each of the pixels in a region are similar with respect to some characteristic or computed property, such as color, intensity, or texture. Adjacent regions are significantly different with respect to the same characteristic. The purpose of image segmentation is to partition an image into meaningful regions with respect to a particular application

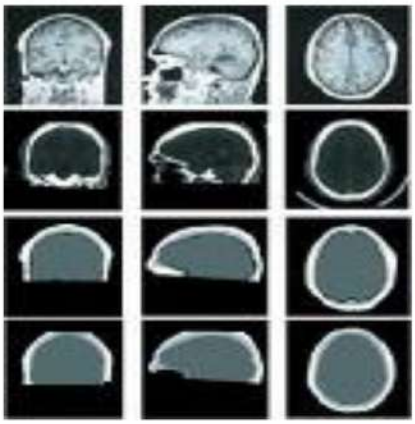

Fig 1: Segmentation

Some applications of image segmentation in medical field include:

- Locate tumors and other pathologies,
- Measure tissue volumes,
- Computer-guided surgery

APPROACHES OF IMAGE SEGMENTATION

1. Discontinuity Based-Interested In Identification of:

- Isolated points
- Lines
- Edges Present In Images

2. Similarity Based-In this; we try to group those pixels which are similar in some sense. The Approaches under this technique is:

- Thresholding Operation
- Region Based Approach
  - Region Growing
  - Region Shrinking(Region Splitting and Merging)

This paper explains region based segmentation in detail

A. REGION BASED SEGMENTATION[3][4]

Image segmentation reduces pixel data to region-based information. It is explained in two categories:

REGION GROWING:

A simple approach to image segmentation is to start from some pixels (seeds) representing distinct image regions and to grow them, until they cover the entire image. For region growing, we need a rule describing a growth mechanism and a rule checking the homogeneity of the regions after each growth step. Group pixels or sub-regions into larger regions when homogeneity criterion is satisfied. Region grows around the seed point based on similar properties (grey level, texture, color).

REGION GROWING ALGORITHM

- Simpler
- It takes more time than both the above algorithms

ALGORITHMIC APPROACH

- Region Splitting
  - Region growing starts from a set of seed points.
  - An alternative is to start with the whole image as a single region and subdivide the regions that do not satisfy a condition of homogeneity.
- Region Merging
  - Region merging is the opposite of region splitting.
  - Start with small regions (e.g. 2x2 or 4x4 regions) and merge the regions that have similar characteristics (such as gray level, variance).
  - Typically, splitting and merging approaches are used iteratively.

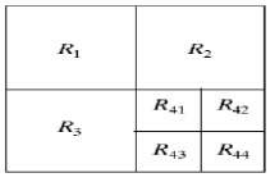

Fig 2. Region Merging

B. SPLIT AND MERGE APPROACH

The goal of Image Segmentation is to find regions that represent objects or meaningful parts of objects. Major problems of image segmentation are result of noise in the image.

An image domain X must be segmented in N different regions R(1),…,R(N)

- This is a 2 step procedure:
  - top-down: split image into homogeneous quadrant regions
  - bottom-up: merge similar adjacent regions

The algorithm includes:

TOP-DOWN

The opposite approach to region growing is region splitting. It is a top-down approach and it starts with the assumption that the entire image is homogeneous. If this is not true, the image is split into four sub images. This splitting procedure is repeated recursively until we split the image into homogeneous regions. If the original image is square N x N, having dimensions that are powers of 2(N = 2n); All regions produced but the splitting algorithm are squares having dimensions M x M , where M is a power of 2 as well. Since the procedure is recursive, it produces an image representation that can be described by a tree whose nodes have four sons each. Such a tree is called a Quadtree.

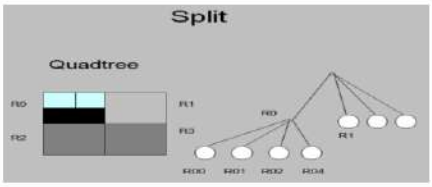

Fig 3. Quadtree

Steps:

- successively subdivide image into quadrant regions *Ri*
- stop when all regions are homogeneous:((*P(Ri) = TRUE*) obtain quad tree structure

BOTTOM-UP

- at each level, merge adjacent regions *Ri and Rj if P(Ri [Rj]) = TRUE*

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- Iterate until no further splitting/merging is possible .

HOW IT WORKS

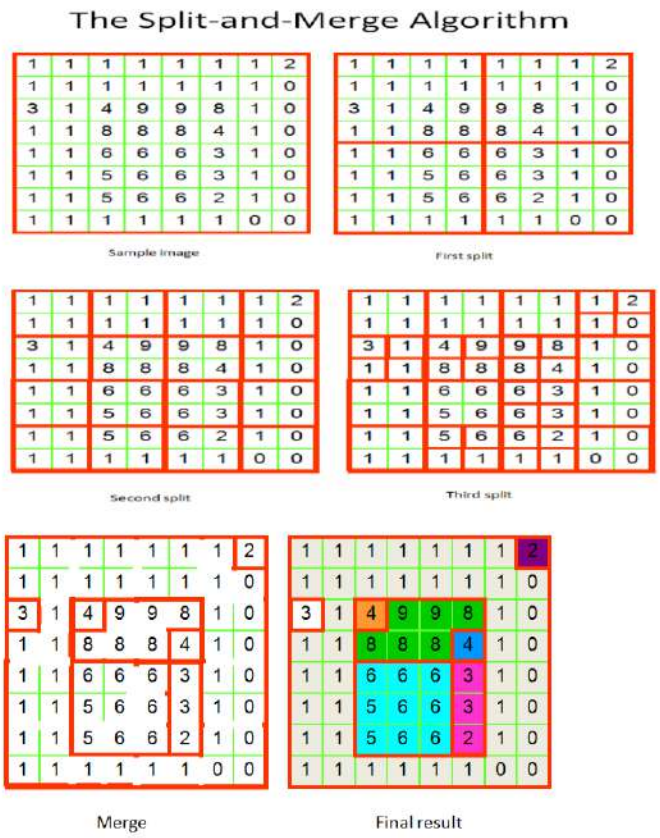

Fig 4: Steps of Working

C. CLUSTERING [6][7]

Clustering is a classification technique. Given a vector of N measurements describing each pixel or group of pixels (i.e., region) in an image, a similarity of the measurement vectors and therefore their clustering in the N-dimensional measurement space implies similarity of the corresponding pixels or pixel groups. Therefore, clustering in measurement space may be an indicator of similarity of image regions, and may be used for segmentation purposes. The vector of measurements describes some useful image feature and thus is also known as a feature vector. Similarity between image regions or pixels implies clustering (small separation distances) in the feature space. Clustering methods were some of the earliest data segmentation techniques to be developed.

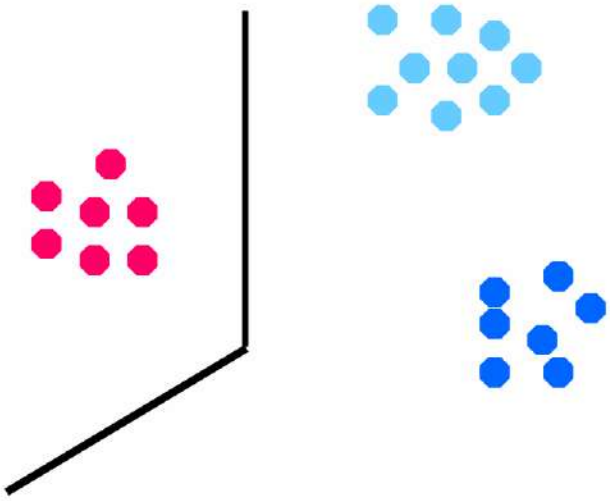

Fig5: Similar data points grouped together into clusters

CLUSTERING ALGORITHM:[6][7]

K-Means Clustering

K-Means clustering generates a specific number of disjoint, flat (non-hierarchical) clusters. It is well suited to generating globular clusters. The K-Means method is numerical, unsupervised, non-deterministic and iterative.

K-Means Algorithm Properties

- There are always K clusters.
- There is always at least one item in each cluster.
- The clusters are non-hierarchical and they do not overlap.
- Every member of a cluster is closer to its cluster than any other cluster because closeness does not always involve the center of clusters.

The K-Means Algorithm Process

1. The dataset is partitioned into K clusters and the data points are randomly assigned to the clusters resulting in clusters that have roughly the same number of data points.
2. for each data point:
- Calculate the distance (Euclidean) from the data point to each cluster.
- If the data point is closest to its own cluster, leave it where it is. If the data point is not closest to its own cluster, move it into the closest cluster.
3. Repeat the above step until a complete pass through all the data points' results in no data point moving from one cluster to another. At this point the clusters are stable and the clustering process ends.

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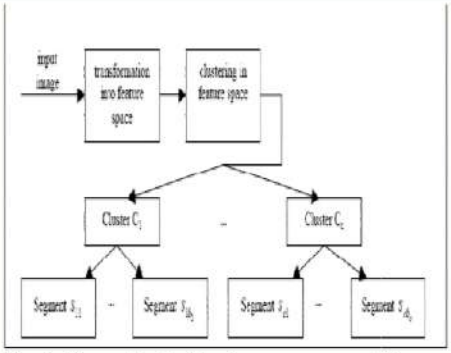

Fig 6: Flow-chart of an image segmentation method

Example:

Fig 7: Original image

Fig 8: Original 2-Clusters (Only two colors can be seen after segmentation)

Fig 9: Clusters (4 colors can be seen with 4 clusters)

Fig10: Clusters (6 colors can be seen after segmentation)

The image segmentation is done using k-means clustering in 3-D RGB space, so it works perfectly fine with all images.

V. CONCLUSION

At last, after studying all the different approaches of region based, we conclude that K-means Algorithm worked the best when we compare how well the images were segmented. But if we compare the time taken by each algorithm, Watershed algorithm works best. The watershed transform is often applied to the problem where there are separate touching objects in the image. The worst algorithm in both time and segmentation is Region Growing Algorithm.

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Instruction Level Parallelism

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I. INTRODUCTION

Computer designers and computer architects have been striving to improve uniprocessor computer performance since the first computer was designed. The most significant advances in uniprocessor performance have come from exploiting advances in implementation technology. Architectural innovations have also played a part, and one of the most significant of these over the last decade has been the rediscovery of RISC architectures. Now that RISC architectures have gained acceptance both in scientific and marketing circles, computer architects have been thinking of new ways to improve uniprocessor performance. Many ofthese proposals such as VLIW , superscalar, and even relatively old ideas such as vector processing try to improvecomputer performance by exploiting instruction-level parallelism. They take advantage of thisparallelism by issuing more than one instruction per cycle explicitly (as in VLIW or superscalar machines) or implicitly (as in vector machines).

As an example of instruction-level parallelism, consider the two code fragments in Figure 1.The three instructions in (a) are independent; there are no data dependencies between them, and in theory they could all be executed in parallel. In contrast, the three instructions in (b) cannot be executed in parallel, because the second instruction uses the result of the first, and the third instruction uses the result of the second.

Load C1<-23(R2)	Add R3<-R3+1
Add R3<-R3+1	Add R4<-R3+R2
Add C4<-C4+C3	Store 0[R4]<-R0
(a) parallelism=3	(b) parallelism=1

The amount of instruction-level parallelism varies widely depending on the type of code being executed. When we consider uniprocessor

Performance improvements due to exploitation of instruction-level parallelism, it is important to keep in mind the type of application environment. If the applications are dominated by highly parallel code (e.g., weather forecasting), any of a number of different parallel computers (e.g., vector, MIMD) would improve application performance. However, if the dominant applications have little instruction-level parallelism (e.g., compilers, editors, event-driven simulators, lisp interpreters), the performance improvements will be much smaller.[1]

II. ABOUTINSTRUCTION LEVEL PARALLELISM

Most processors since 1985 have used the pipeline method just described to overlap instructions. Achieving not instruction overlap but the actual execution of more than one instruction at a time through dynamic scheduling and how to maximize the throughput of a processor.ILP is a measure of the number of instructions that can be performed during a single clock cycle. Parallel instructions are a set of instructions that do not depend on each other to be executed.

- Architectural technique that allows the overlap of individual machine operations (add, mul, load, store …)
- Multiple operations will execute in parallel (simultaneously)
- Goal: Speed Up the execution

The potential overlap among instructions is called instruction level parallelism. There are two approaches to it;

1. Hardware

2. Software

Hardware level works upon dynamic parallelism whereas, the software level works on static parallelism.The Pentium processor works on the dynamic sequence of parallel execution but the Itanium processor works on the static level parallelism. Instruction-level parallelism (ILP) is a measure of how many of the operations in a computer program can be performed simultaneously. Consider the following program:

1. e = a + b

2. f = c + d

3. g = e * f

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Operation 3 depends on the results of operations 1 and 2, so it cannot be calculated until both of them are completed. However, operations 1 and 2 do not depend on any other operation, so they can be calculated simultaneously. If we assume that each operation can be completed in one unit of time then these three instructions can be completed in a total of two units of time, giving an ILP of 3/2.[1]

ILP vs. Parallel Processing

ILP

- Overlap individual machine operations (add, mul, load…) so that they execute in parallel
- Transparent to the user
- Goal: speed up execution

Parallel Processing

- Having separate processors getting separate chunks of the program (processors programmed to do so)
- Nontransparent to the user
- Goal: speed up and quality up[1]

RISC CONCEPT BASED ON ILP

Reduced Instruction Set Architecture

-"Internal computing Architecture in which processor instructions are paired down so that most of them can be executed in one clock cycle, theoretically improving computing efficiency" Black Box Pocket Glossary of Computer Terms.**[2]**

Typical RISC Pipeline:

ILP Challenges

What prevents one instruction per cycle (CPI=1)?

-Hazards

-Dependencies

In order to achieve parallelism we should not have dependences among instructions which are executing in parallel:

- H/W terminology Data Hazards(RAW, WAR, WAW)
- S/W terminology Data Dependencies

Types of Dependencies

1. Name dependencies
   - Output dependence
   - Anti-dependence
2. Data True dependence
3. Control Dependence
4. Resource Dependence

Types of Hazards

Any situation that will prevent the smooth flow of the instructions along the pipeline is the HAZARD.

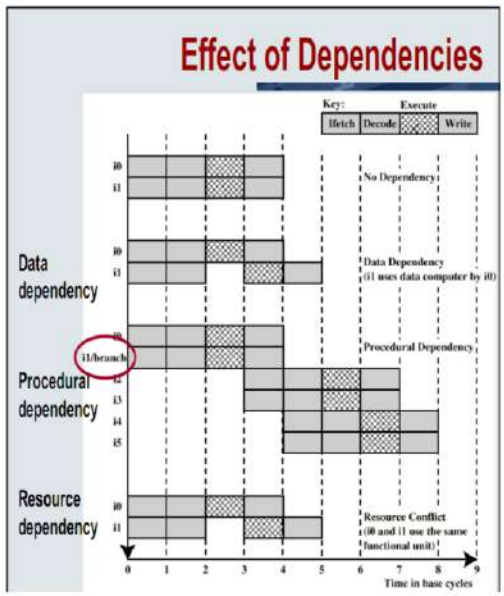
1. Structural hazards:Dueto limited resources and contention among them.

2.Data hazards: Instruction depends on result of prior instruction still in the pipeline. It include following hazards:

a. RAW
b. WAR
c. WAW

3.Control hazards: Caused by delay between the fetching of instructions and decisions about change in control flow (branches and jumps).Mainly instructions that change the PC(Program counter).[3]

Effect of Dependencies



5. EXPLOITING ILP IN VARIOUS MACHINES

1. THE BASE MACHINE

In order to properly compare increases in performance due to exploitation of instruction-level parallelism, we define a base machine that has an execution pipestage parallelism of exactly one.

This base machine is defined as follows:

·Instructions issued per cycle = 1

·Simple operation latency measured in cycles = 1

·Instruction-level parallelism required to fully utilize = 1

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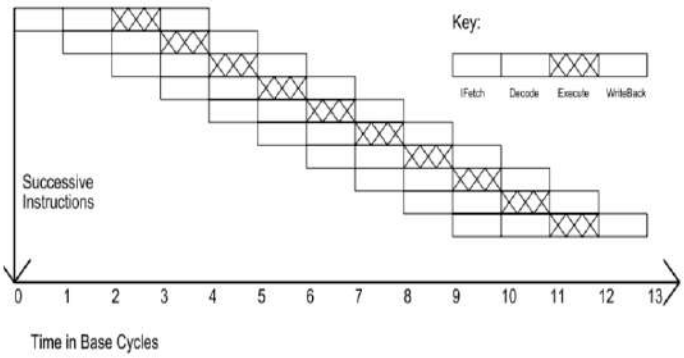
The one-cycle latency specifies that if one instruction follows another, the result of the first is always available for the use of the second without delay. Thus, there are never any operation-latency interlocks, stalls, or NOP's in a base machine. A pipeline diagram for a machine satisfying the requirements of a base machine is shown in Figure. Note that although several instructions are executing concurrently, only one instruction is in its execution stage at any one time. Other pipestages, such as instruction fetch, decode, or write back, do not contribute to operation latency if they are bypassed, and do not contribute to control latency assuming perfect branch slot filling and/or branch prediction.In figure, we have 10 instructions which are executed in total 13 cycles.



EXECUTION IN BASE MACHINES

2. SUPERSCALER MACHINES

As their name suggests, superscalar machines were originally developed as an alternative to vector machines. A superscalar machine of degree cans issuen instructions per cycle. A superscalar machine could issue all three parallel instructions in Figure 1 in the same cycle (total cycle takes 7).

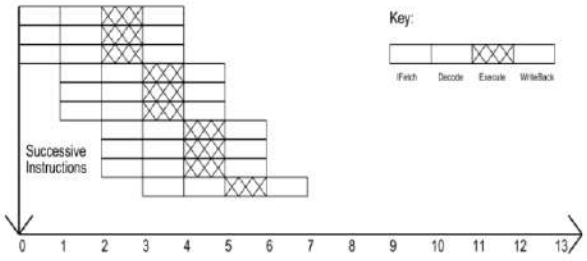
Formalizing a superscalar machine according to our definitions:

·Instructions issued per cycle =n

·Simple operation latency measured in cycles = 1

·Instruction-level parallelism required to fully utilize =n

Superscalar execution of instructions is illustrated in below figure.In order to fully utilize a superscalar machine of degreen, there must beninstructions executable in parallel at all times. If an instruction-level parallelism ofnis not available, stalls anddead time will result where instructions are forced to wait for the results of prior instructions.



EXECUTION IN SUPERSCALER MACHINES(n=3)

3.VLIW Machines

VLIW, orvery long instruction word, machines typically have instructions hundreds of bits long. Each instructioncan specify many operations, so each instruction exploits instruction-level parallelism. Many performance studies have been performed on VLIW machines. The execution of instructions by an ideal VLIW machine is shown in Figure. Each instructionspecifies multiple operations, and this is denoted in the Figure by having multiple crosshatchedexecution stages in parallel for each instruction. VLIW machines are much like superscalar machines, with three differences. **First**, the decoding of VLIW instructions is easier than superscalar instructions. Since the VLIW instructions have a fixed format, the operations specifiable in one instruction do not exceed the resources of the machine. However in the superscalar case, the instruction decode unit must look at a sequence of instructions and base the issue of each instruction on the number of instructions already issued of each instruction class, as well as checking for data dependencies between results and operands of instructions. In effect, the selection of which operations to issue in a given cycle is performed at compile time in a VLIW machine, and at run time in a superscalar machine. Thus the instructions decode logic for the VLIW machine should be much simpler than the superscalar.

A **second** difference is that when the available instruction-level parallelism is less than that exploitable by the VLIW machine, the code density of the superscalar machine will be better.This is because the fixed VLIW format includes bits for unused operations while the superscalar machine only has instruction bits for useful operations.

A **third** difference is that a superscalar machine could be object-code compatible with a large family of non-parallel machines, but VLIW machines exploiting different amounts of parallelism would require different instruction sets. This is because the VLIW's that are able to exploit more parallelism would require larger instructions. In spite of these differences, in terms of run time exploitation of instruction-level parallelism, the superscalar and VLIW will have similar characteristics.

Multiple Issue + Static Scheduling = VLIW

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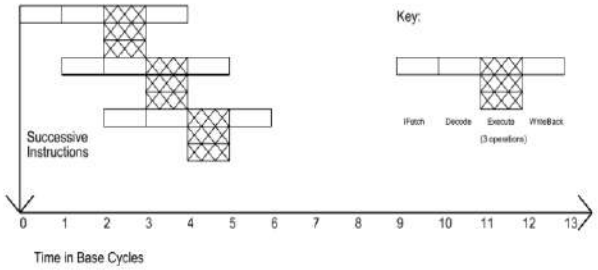
Multiple Issue + Dynamic Scheduling = Superscalar



EXECUTION IN VLIW MACHINES

4.Super pipelined Machines

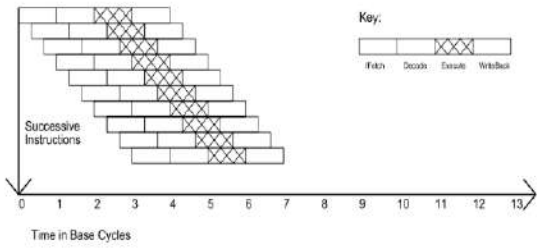
Super pipelined machines exploit instruction-level parallelism in another way. In a super pipelined machine of degree m, the cycle time is 1/m the cycle time of the base machine. Since a fixed-point add took a whole cycle in the base machine, given the same implementation technology it must take m cycles in the super pipelined machine. The three parallel instructions in Figure 1 would be issued in three successive cycles, and by the time the third has been issued, there are three operations in progress at the same time. Figure 7 shows the execution of instructions by a super pipelined machine.

Formalizing a super pipelined machine according to our definitions:

·Instructions issued per cycle = 1, but the cycle time is 1/m of the base machine

·Simple operation latency measured in cycles =m

Instruction-level parallelism required to fully utilize =m

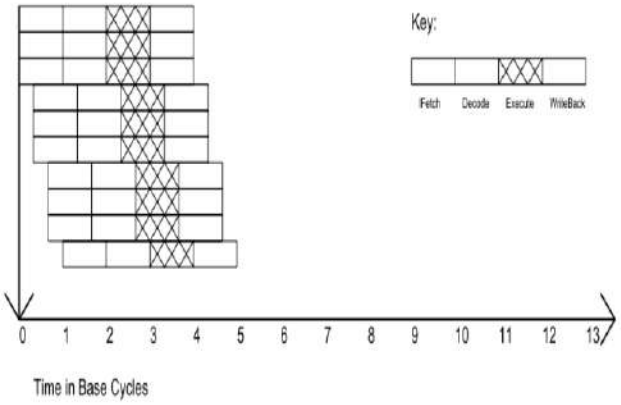


Super pipelined execution (m=3)

Super pipelined machines have been around a long time. Seymour Cray has a long history of building super pipelined machines: for example, the latency of a fixed-point add in both the CDC 6600 and the Cray-1 is 3 cycles. Note that since the functional units of the 6600 are not pipelined (two are duplicated), the 6600 is an example of a super pipelined machine with class conflicts. The CDC 7600 is probably the purest example of an existing super pipelined machine since its functional units are pipelined.

5. Super pipelined Superscalar Machines

Since the number of instructions issued per cycle and the cycle time are theoretically orthogonal, we could have a super pipelined superscalar machine. A super pipelined superscalar machine of degree (m,n) has a cycle time 1/m that of the base machine, and it can execute n instructions every cycle. This is illustrated in Figure.



A super pipelined superscalar (n=3,m=3)

Formalizing a super pipelined superscalar machine according to our definitions:

·Instructions issued per cycle =n, and the cycle time is 1/mthat of the base machine

·Simple operation latency measured in cycles =m

·Instruction-level parallelism required to fully utilize =n*m

The most important thing to keep in mind when comparing superscalar and super pipelined machines of equal degree is that they have basically the same performance. A superscalar machine of degree three can have three instructions executing at the same time by issuing three at the same time. The super pipelined machine can have three instructions executing at the same time by having a cycle time 1/3 that of the superscalar machine, and issuing three instructions in successive cycles. Each of these machines issues instructions at the same rate, so superscalar and super pipelined machines of equal degree have basically the same performance.[4]

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Latest Distributed Technologies: A Review

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Abstract: **The last decade has seen a substantial increase in commodity computer and network performance, mainly as a result of faster hardware and more sophisticated software. Nevertheless, there are still problems, in the fields of science, engineering, and business, which cannot be effectively dealt with using the current generation of supercomputers. In fact, due to their size and complexity, these problems are often very numerically and/or data intensive and consequently require a variety of heterogeneous resources thatare not available on a single machine. A number of teams have conducted experimental studies on the cooperative use of geographically distributed resources unified to act as a single powerful computer. This paper is the first systematic review of peer-reviewed academic research published in this field, and aims to provide an overview of the swiftly developing advances in the technical foundations of cloud computing ,grid computing and their research efforts.**

I. RELATED WORK

(Martin Courtney, 2010) has reviewed the studies of "The World Community Grid (WGC)" as Grid computing which runs on a software platform called BOINC (Berkeley Open Infrastructure for Network Computing), developed at the University of California, with funding from the National Science Foundation (NSF) in which there are 1.5 million systems involved worldwide to give cancer research scientists sufficient computing power to identify crystallized protein, helping them determine how cancer is formed and, potentially, how it might be prevented.

(Tyujihoshino, **2010**) He states research and development of new therapeutic drugs specified to neuroblastoma-TrkB, ALK, and SCxx are specifically planed for as targeted molecules-using the computer imaging processes. Neuroblastoma is one of refractory diseases in childhood cancer and the need for the improvement of survival rate has been loudly called.

IBM, the world's largest computer company, has a mission called "World Community Grid" as a contribution toward human society and this project will be supported by this mission.

About 10 projects including Extermination of AIDS and Dengue Fever, Hunger Relief, Cancer Diagnosis and Measures for Global Warming have been going with this mission.

(Miha Ahronovitz, oct.2011) has published results from his customer survey on Cloud Infrastructure as a Service providersAs expected, AWS is a clear popularity leader. 80% of the respondents know how to use their site or want to learn how to use it. [11]

(Michael Sheehan, 25 may 2011) has concluded the comparison of "Cloud computing," "Grid Computing" and "Utility Computing" through the graph plotting below.

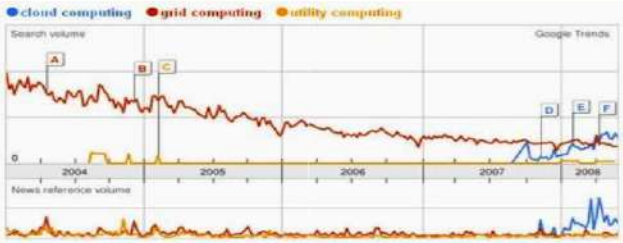

Fig: Comparison of Technology [14]

The term Grid Computing has been around for a while. It is trending downwards in the graph. Utility Computing has pretty much remained below the radar in comparison. But, the newcomer Cloud Computing, which made its full entrance into this trend analysis around 2007, is rapidly gaining momentum. 2008 seems to be a pivotal time where it surpassed Grid Computing (and continues to grow).

(Thu Pham, 05 sep 2012) has reviewed the report of Dwight Klappic(research vice president for Gartner) in which it is concluded that there is a rapid shift from more traditional software to the cloud, around 50% of the transportation subset of supply chains are currently cloud-based. It is also concluded that there is reduction in the expenses to the company

(Michael Sheehan, 20 Nov 2012) has studied the survey about the payment structure for cloud computing that is "How Customers Prefer to Pay for Cloud Hosting Services? 32% of potential users of services delivered from Cloud Computing prefer to pay on monthly basis. 18% say that would go for annual contract based on their resource needs and bursting.

(Houillon Pascal, April 2012) has given his studies on the collaboration of cloud computing and construction industry. Using the cloud in the construction industry is must because of the constant change of workers and frequent setup of new jobsite locations. Many workers need better access to company data to aid in timely, well-supported decision making and reporting while working in the field designated locations. But cloud technology has opened up new (TVH), a large construction company with many locations.

II. PROBLEM DEFINITION

There is Study of latest Distributed technologies like Grid computing, Cloud computing, related examples case studies and application areas along with various aspects.

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III. INTRODUCTION

The World Wide Web is used by millions of people every day for various purposes including email, reading news, downloading music, online shopping or simply accessing information about anything. Using a standard web browser, the user can access information stored on Web servers situated anywhere on the globe. This gives the illusion that all this information is situated locally on the user's computer. In reality, the Web represents a huge distributed system that appears as a single resource to the user available at the click of a button. [1]There are various types of distributed technologies, such as Grid computing, Cloud computing etc.

A. GRID COMPUTING

The Internet and the World Wide Web have improved dramatically over the last few years, mainly because of increasing network bandwidth, powerful computers, software, and user acceptance. These elements are currently converging and enabling a new global infrastructure called "The Grid", originally derived from the electrical "Power Grid" which provides electricity to every wall socket. As we don't care that the electricity we are using is coming from what place, one will also don't know that the network he is connected to is where but he'll only take his work form that network. One will only pay for the grid he's receiving and the way he's using. Grid computing makes huge collection on all over the world, which provides great comfort to engineers and scientists, as they will use that from anywhere around the world so it will create the situation as they are in their own office or laboratory. The grid computing could be also composed of small network. The whole network of grid computing could be made only for a single purpose too. [3]

"Grid computing is not a technical term – it is a marketing term. There is no technology called "Grid Computing", there are no products that implement "Grid Computing"[4]

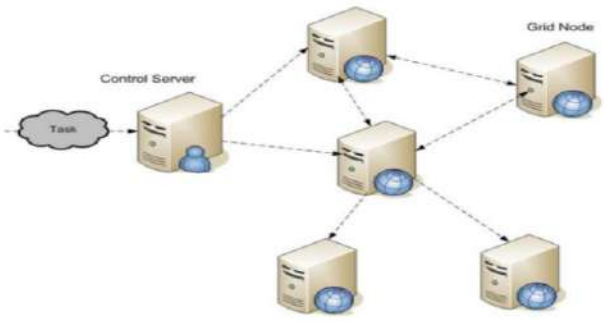

Fig: Grid Computing [15]

At its most basic level, grid computing is a computer network in which each computer's resources are shared with every other computer in the system. Processing power, memory and data storage are all community resources that authorized users can tap into and leverage for specific tasks..

B. A Typical View Of Grid Environment

Fig: Grid Environment [14]

There are three main use cases in distributed computing that are most often referred to as Grid Computing.

1. Computational Grids-Computational Grids account for a lion share of Grid Computing usage now and will certainly retain this lead in the near future to the least. In a nutshell, the idea behind it is very simple: if you have a task that is executing unacceptably long time, you can split this task into multiple sub-tasks, execute each sub-task in parallel on a separate computer, combine results from the sub-tasks and get the original task's result O (N)-times faster, where N is a number of sub-tasks in the split.

Computational Grids amount for almost all real-life applications of Grid Computing. The reason for this is quite obvious: unlike other use cases it provides clear and unambiguous value and is applicable to a wide verity of business tasks. When properly explained, it is easy to understand and easy to see how it can solve the real-life problems.

2. Utility or On-Demand Grids-This is the ultimate form of the Grid, in which not only data and computation cycles are shared but software or just about any resource is shared. The main services provided through utility grids are software and special equipments. For instance, the applications can be run on one machine and all the users can send their data to be processed to that machine and receive the result back.

3. Data Grids-Date Grids allows for splitting data onto multiple computers. Much like Computational Grids splitting computations, Data Grids allow placing data onto multiple computers or storage resources and treat them virtually like one.

C. CLOUD COMPUTING

Cloud Computing" to put it simply, means "Internet Computing." The Internet is commonly can be deployed on thousands of computer visualized as clouds; hence the computation done through the Internet. With Cloud Computing

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users can access database resources via the Internet from anywhere, for as long as they need, without worrying about any maintenance or management of actual resources. Besides, databases in cloud are very dynamic and scalable.

A simple example of cloud computing is Yahoo email, Gmail, or Hotmail etc. All you need is just an internet connection and you can start sending emails. The server and email management software is all on the cloud (internet) and is totally managed by the cloud service provider Yahoo, Google etc. The consumer gets to use the software alone and enjoy the benefits. The analogy is, 'If you need milk, would you buy a cow?' All the users or consumers need is to get the benefits of using the software or hardware of the computer like sending emails etc. Just to get this benefit (milk) why should a consumer buy a (cow) software /hardware? [5]

Cloud Services Categories

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. These services are broadly divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS) and Software-as-a-Service (SaaS). [6]

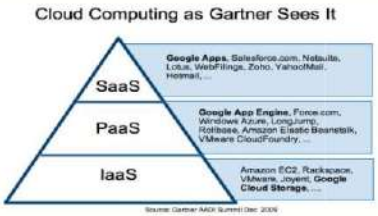

Fig: Cloud Models [6]

Service Models

Once a cloud is established, how its cloud computing services are deployed in terms of business models can differ depending on requirements. The primary service models being deployed are commonly known as:

• Software as a Service (SaaS) — Consumers purchase the ability to access and use an application or service that is hosted in the cloud. A benchmark example of this is Salesforce.com, where necessary information for the interaction between the consumer and the service is hosted as part of the service in the cloud.

• Platform as a Service (PaaS) — Consumers purchase access to the platforms, enabling them to deploy their own software and applications in the cloud. The operating systems and network access are not managed by the consumer, and there might be constraints as to which applications can be deployed.

• Infrastructure as a Service (IaaS) — Consumers control and manage the systems in terms of the operating systems, applications, storage, and network connectivity, but do not themselves control the cloud infrastructure. [6]

Types of cloud computing environments

The cloud computing environment can consist of multiple types of clouds based on their deployment and usage.

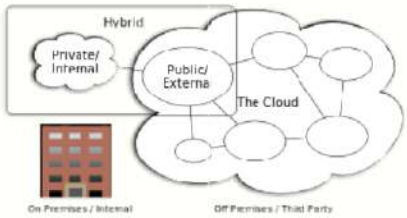

Fig: Types Of clouds[13]

1. Public clouds -A public cloud also known as "external cloud computing "sells services to anyone on the Internet. Currently, Amazon Web Services is the largest public cloud provider.This type of cloud computing is the traditional model that everyone thinks of when they envision cloud computing. In this model, vendors dynamically allocate resources (hard drive space, RAM, and processor power) on a per-user basis through web applications. Salesforce.com and ADP are two well-known vendors that offer public cloud computing services.

Characteristics of Public cloud

- Unlimited access- As long as you have internet access and a compatible device such as a smart phone or laptop computer, you can access your data anywhere.
- Unlimited data capacity- Public cloud computing is flexible to meet your business' growing data storage and processing needs.

2. Private clouds -A private cloudalso known as "internal cloud computing" is a proprietary network or a data center that supplies hosted services to a limited number of people.

3. Hybrid clouds - This is a combination of both private (internal) and public (external) cloud computing environments. Example is VMware v Cloud (Hybrid Cloud Services).

IV. CONCLUSION

More than seven papers were surveyed regarding the cloud computing, grid computing, advantages of cloud computing, risks in cloud computing and various approaches to solve thoserisks each with their pros and cons.. However cloud and grid computing is still struggling in its infancy, with positiveand negative comments made on its possibleimplementation for a large-sized enterprise. IT techniciansare spearheading the challenge and pursuing research toimprove on its drawbacks. Several groups have recentlybeen formed, such as the Cloud Security Alliance or theOpen Cloud Consortium, with the goal of exploring thepossibilities offered by cloud computing and to establish acommon language among different providers. Both computing is

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facing several issues in gaining recognitionfor its merits. Its security deficiencies and benefits need tobe carefully weighed before making a decision toimplement it.

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Latest Research Issues on Theory of Computation

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Abstract— **Computational science is the field of study concerned with constructing mathematical models and analysis techniques and using computers to analyze and solve scientific problems. In practical use, it is typically the application of computer simulation and other forms of computation to problems in various scientific disciplines. One of such mathematical models is automata theory. The concepts of automata theory have important use in designing and analyzing computational models of several hardware and software applications. Two general applications of automata are mainly discussed in this paper i.e. timed automata and cellular automata. This paper explains the major four latest research issues in automata. Following the introduction, section two introduces modeling of distributed systems with clocks using timed automata. Section three gives an overview of the learning system for computational topics. Tourism analysis using cellular automata is described in section four. Section five includes dynamics of the HIV infection under antiretroviral therapy using cellular automata.**

Index Terms—**model checking, timed automata, System of systems engineering (SoSE), geosimulation, cellular automata**

I. Introduction

The theory of computation (theoretical computer science, computability theory) is the branch that deals with how efficiently problems can be solved on a model of computation. Computational devices can be any device like personal computer, smartphone or a robot. Basic of every computational model remains same. Formal input is provided to the computational device to obtain a formal output within finite number of steps. This field is divided into three major branches: automata theory, computability theory, and computational complexity theory. Automaton theory is the study of abstract machine and the computational problems that can be solved using these machines. This abstract machine is called automata and here abstract means that it do not need to exist physically but only as a precisely-described idea. Two major applications of automata theory are: (1) Timed automata (TA) and, (2) Cellular automata (CA). A timed automaton is an automaton with timing constraints and is the foundation for real time systems. It is a finite automaton extended with a finite set of real-valued clocks. TA can be utilized to model and analyze the timing behavior of computer systems.

A CA consists of: cells and a set of rules. Each of the cells can be in one of several states. With time, the cells can change from state to state. The rules of CA determine how the states change. When the cells change state, each cell looks around and collects information on its neighbor's states. Hence, based on its own state, its neighbor's states, and the rules of the CA, the cell decides its new state and all cells change state at the same time. CA has a vast range of applications in geosimulation, cryptography, error correction coding and many more. In this paper, we present four latest research issues based on CA and TA.

II. Modeling of Distributed Systems with Clocks

Model checking is a technique for automatically verifying correctness properties of finite state systems. Several model checkers based on timed automata have been developed and they have been successfully applied to diverse systems .There are different modeling patterns based on timed automata for specifying temporal behavior of distributed systems with computer clocks (Ideal clock, Drifting clock, and Synchronized clock). Following are principles used in the strategies for defining a clear modeling pattern:

2.1 Principles for modeling strategies:

1. **Separation of the time aspects from the application aspects**:

Specify the time aspects of the model separately from the application aspects because it is important to provide modeling patterns that are application independent. For modeling the temporal evolution of system, a Timed Automaton is used which we will call a timer. The timer automaton (Tmr) is connected to the application automaton (App) through two synchronization channels i.e. set and expire.

There are two locations (E)xpired and (W)aiting and a clock x. The timer can be reset at any moment and the amount of time spent in location W depends upon T where T is any constant value or may be overwritten by the application.

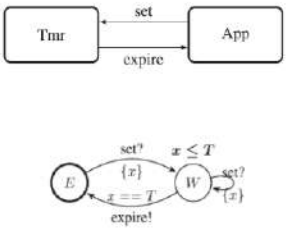

Fig. 2: Automaton of Tmran ideal, resettable timer [1]

The timer expires in the transition from W to E. This scheme constitutes the basis of the modeling.

1. Modeling of time by using timers

For managing time in a distributed system two different paradigms are used; Time Driven Paradigm and Clock Driven Paradigm. The Time Driven Paradigm assumes that each node measures time by using timers whereas Clock Driven paradigms/systems use clocks that are not reset and time marks that may have large values, so they represent a problem for model checking. When a program is designed, it is possible to model the system on the basis of rounds and these rounds can be specified with resettable timers.

2. **Use perturbed timed automata for modeling drifting clocks**:

While modeling real systems with timed automata, perturbed timed automata were defined to deal with uncertainty caused by using non ideal clocks. The perturbed timed automata can be transformed into timed automata, but it depends on the fact that the uncertainty of the clock rate can be moved into guards and the invariants of the timed automata, as long as the maximum drift and the measured time are known in advance. After applying this transformation, the resulting timed automata will include all the possible behaviors for every clock rate and it guarantees that the results provided by model checking are valid for one specific clock rate as well as for the whole range of possible rates.

3. For modeling clock synchronization use clock pointer:

A clock pointer restarts the timers that measure time for each application and ensures that all timers start counting time at the same instant. Each timer then evolves according to its drift, independent of the other timers just like perturbed automata but the deviation among the timers is corrected in the next round as soon as the clock pointer resets all the timers.

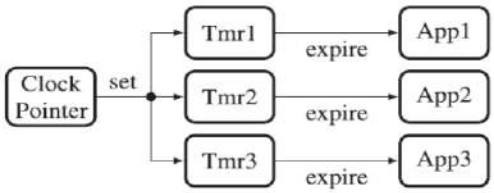

Fig. 3: Relationship between the clock pointer and the other automata (assuming three nodes) [1]

2.2 MODELING PATTERNS & VALIDATION

UPAAL model checker is one of the most popular model checker based on theory of timed automata.

The modeling strategies are applied with the UPAAL model checker & three different modeling patterns are described one for systems with ideal clocks, for systems with drifting clocks, and for systems with synchronized clocks. Then validation of these patterns is performed by using verifier provided by UPAAL. If the properties are satisfied, it proves that applications execute their task with some jitter which does not exceed the precision. If a property is not satisfied, it generates a trace that allows a modeler to see in which conditions the property is violated.

2.3 What further can be done?

Isolation of the time aspects from the application aspects introduces extra complexity in form of new automata, additional clocks, additional channels etc. this increases the state space and may render model checking unfeasible.

To avoid this problem optimization techniques should be used that may merge the patterns into equivalent models of lower complexity.

III. LEARNING SYSTEM FOR AUTOMATA AND RELATED TOPICS

Automaton is an important subject for disciples of computer science. Students of the University of Aizu, Japan introduces a learning system for automata theory. This learning system is a combination of java and robots technologies. Learners can construct their own automaton graphically in the system's interface, and then pass it to the robot, which then simulate the automaton transitions. Novice automata learners can learn by observing the motions of the robot. Lego Mindstorm NXT set is used to build the robot. This robot will operate with the simulator that is built up with Java language. Hence the robot must be able to communicate with the simulator in a Java environment. For this purpose the LeJOS NXJ is used, which is a Java programming environment for the Lego Mindstorms NXT. It allows to program LEGO robots in Java.

3.1 Simulator

The simulator is very easy to use and bilingual (English/Japanese).

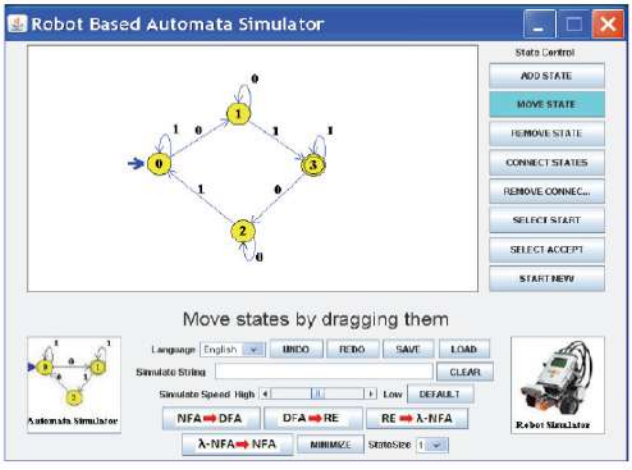

Fig. 4. Simulator [2]

Fig. 4 shows the simulator which consist of several options used for designing an automaton. Add state button is used to add the states, remove state button is used to remove the states.

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Similarly all the buttons are used for designing of an automaton.

3.1.1 Using automata simulator

The "Automata Simulator" button allows the user to input and visually simulate any input string. Through the given operations: NFA to DFA conversion, DFA to RE conversion, λ-NFA to NFA conversion, RE to λ-NFA conversion and automata minimization algorithms the learner can study various automata algorithms.

3.1.2 Using the Robot Simulator

User can define the robot motion and connect it with automaton states by clicking robot simulation button and can also play "Guess Automaton" game. After initializing the robot simulator, the robot simulator interface window will appear as in Figure5. Then input the string that the user wants to test with the robot motion in the "Simulate String" textbox. The directions associated with each automaton state are selected and then with the click on the "Make file for robot and send" button a java source file is created automatically. This java file will be named and stored in the directory and its associated classes will be uploaded into the robot's memory. These classes represent the automaton and the inputted string.

Fig.5. Robot Simulator [2]

3.1.3 Executing the files

Now the user can check the automaton behavior with respect to the given input by observing the robot's motion. Process is summarized in the following steps:

- Select "Files" option from the robot's display main menu as in Fig 6(a).
- The uploaded file is selected as in Fig 6(b).
- The robot will display the inputted string and the automaton information as in Fig 6(c) and Fig 6(d).
- Pressing any button in the robot will result in the options: "Execute", "Set as Default", and "Delete file as in Fig 6(e).
- If execute option is pressed, the robot will start the motion according to the inputted string and automaton.
- If the robot completes it motions, the string "end" will appear in the robot's display and a beep sound will be heard.
- Now pushing any button in the robot will result in one of the strings "accepting" or "rejecting" on the robot's display showing whether the underlying automaton is accepting or rejecting the given input string as in Fig 6(f).
- To terminate the program, push any button on robot.

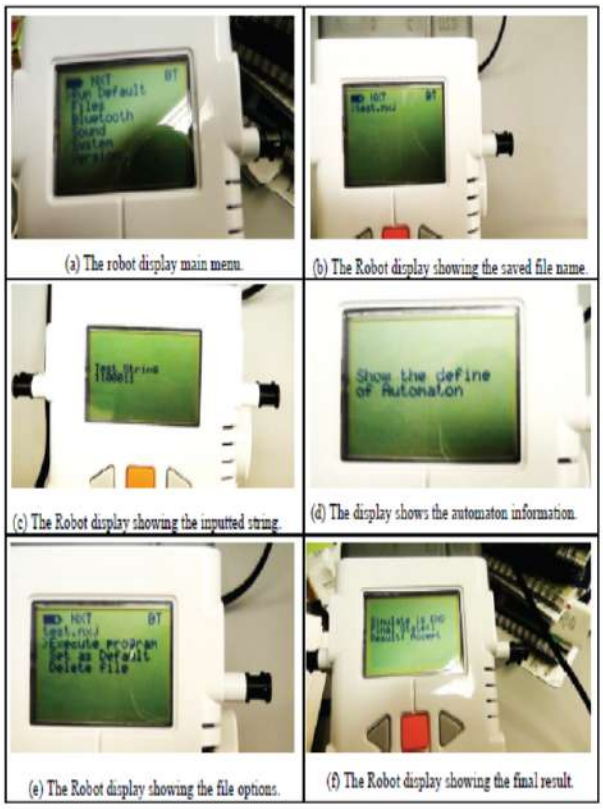

Fig. 6. Execution steps [2]

3.2 Robot-based Automaton Game

This is a guess automaton game played by two or more players. Some players act as question masters while other players are answerers. The question master input an automaton of his choice by using simulator editor. The automaton is hidden from the answerers. Then the question master click the "Robot Simulator" button from the main simulator interface and simulator will appear as in Fig 5. The question master then clicks on the "Game Simulation" button in the robot simulator interface window and the "Game Simulator" interface window will appear as in Fig 7.

Fig. 7. Game Simulator [2]

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Then the answerers should try to guess the inputted automaton by trying different inputs and observing the robot's motion. Following steps summarize the answerer's task:

- Input a guessed string to test in the automaton.
- Click on the "Make File for Robot and Send" button.
- Then select the save directory option and execute a program, then guess the automaton that is inputted by question master from the motion of the robot. Multiple guesses trials can be made and the winner is the player who will be first to guess the automaton.
- User can click on the "Answer" button to see the inputted automaton or "Cancel" button to try another automaton.

3.3 What further can be done?

The system currently supports English and Japanese languages, but more languages can be added to the future versions. In robot simulator the inputted automaton is limited to four states that represent the four directions of the robot motion: forward, backward, left and right. There is a need to extend the robot motion to allow motion in different angles and hence allow automata with more than four states.

IV. SMART TOURISM INDUSTRY INFORMATION SYSTEM USING CELLULAR AUTOMATA

Analysis of tourism faces many challenges; there is no government oriented decision support system (DSS) as for virtual communication there is a need of large-scale geographical information and diverse simulation models. Conceptual framework for a smart tourism industry information system can be drawn. The process of geosimulation is used here. Geosimulation includes simulation of the tourism system of systems (SoS) architecture and evolution process through cellular automata (CA) and multi agent systems (MAS) techniques. It is based on remote sensing data and geographic information systems (GIS) instruments. The mechanism of industrial evolution is illustrated by scale-free network analysis and social influence network.

4.1 Top Level Design for Virtual Systems

SoS thinking and SoS engineering (SoSE) can be implemented through top level design for the virtual system. The smart or virtual information system comprises of tourist geographical system, landscape system, social system and industrial layout system. The structural relationships between the SoS and the component systems are identified.

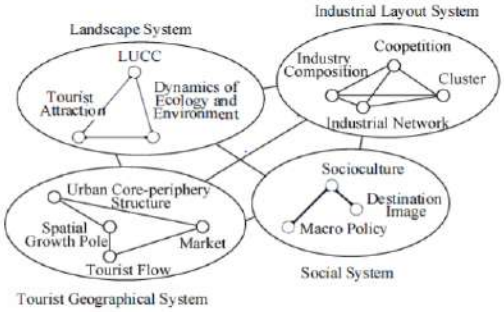

Fig. 8.Top level design for smart tourism industrial information system [3]

Geosimulation is concerned with the design and the creation of high-resolution spatial models. These models are used to explore the ideas about how spatial systems operate, developing simulation tools and software to support object-based simulation and applying it to solve real problems in geographical contexts. Geosimulation is best represented in automata based modeling. Automata-based tools such as cellular automata (CA) and multi-agent systems (MAS) encapsulate all of the features of the geosimulation approach. We can simulate cities based on principles of Geographic Information Science and Object-Oriented Programming. Objects are treated as automata and geographic theory is used to define their behaviour.

Fig. 9. Simulation of cities [5]

A Cellular automaton is a discrete model that consists of a regular grid of cells, for each cell, a set of cells called its neighborhood is defined relative to the specified cell. The kernel Fisher nonlinear discriminant learning machine is used for extraction of CA transition rules. CA cell is unmovable therefore it has limitations in dynamic environment and inter-cell communication. Hence, MAS modeling is used. MAS consist of multiple mutually interacting computing units called agents & ensure the consistency in SoSE applications in tourism geosimulation.

4.3 Mechanism of industrial evolution

For simulation of tourism three system network approaches are used i.e. small world network analysis, scale free network analysis and social influence network theory (SINT) with dynamic Bayesian network. Small world network analysis can be used for analog of the generation and evolution of a recent or a simple component system in the tourism SoS whereas Scale free network analysis has two aspects i.e. growth and preferential attachment. Growth means new nodes are added to the existing node. In preferential attachment process nodes are distributed among a number of existing nodes according to how much they already have, so that those who are already wealthy receive more than those who are not. The application of scale free network model will produce more sensible descriptions. SINT combined with Dynamic Bayesian Networks (DBN) will illustrate how to design SoS and achieve the best SoS configuration through circulated SoS measurements. DBN is a probabilistic graphical model (a type of statistical model) that represents a set of random variables and their conditional dependencies. Instance of a simple

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Bayesian network: Rain influences whether the sprinkler is activated, and both rain and the sprinkler influence whether the grass is wet. DBN provides a strong support for the extraction of the complex interactions between systems.

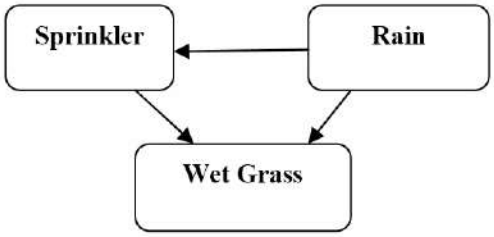

Fig. 10. Bayesian Network

4.4 Further research issues

CA offers an innovative approach to the study of urban systems. The evolution, dynamics and thermodynamics of ice sheets, such as the Antarctic ice sheet and Greenland ice sheet can also be simulated. Phenomenon of sprawl and the factors that produce it can be understood. Automata-based traffic models are also developed.

V. Dynamics of the HIV infection under antiretroviral therapy : Cellular automata approach

In this work the dynamics of HIV infection under the action of antiretroviral therapy is investigated using a cellular automata model where the effectiveness of each drug is self-adjusted by the concentration of CD4+ T infected cells present at each time step. Antiretroviral therapy is used for management of HIV/AIDS. CD4+T cell is a T cell with CD4 receptor that recognizes antigens on the surface of a virus-infected cell and secretes lymphokines that stimulate B cells and killer T cells. The cellular automata model considered in this work extends the HIV-CA model, previously proposed by Rita Maria Zorzenon dos Santos, in her review paper "Dynamics of HIV infection: a cellular automata approach" in 2001. This extension includes new rules and new cell states that allow for considering the effects of ARV therapies on the dynamics of the HIV infection.

The dynamics of HIV infection is described by considering the interaction among the immune cells and HIV. In HIV-CA model the cells are described by four-state automata representing different states of the CD4+ cells during the course of infection. Four states are:

- H (healthy cells)
- A1(productive infected cells, not yet identified by the immune system)
- A2(less productive infected cells, already detected by the immune system but still capable of infecting healthy cells)
- D (dead cells that give place to vacancies)

There are four rules. Rule 1 state that a healthy cell H becomes an infected-A1 cell, if it has at least one infected-A1 cell among its nearest neighbors, or at least four neighboring cells in the state infected-A2. Otherwise, it remains healthy H. Rule 2 state that A1-infected cell remains τ time steps in this state, after that it becomes an infected-A2 cell. τ is the period of time necessary for a new infected cell that carries a new viral particle to be detected by the immune system. Rule 3 state that A2-infected cell becomes a dead cell (D-cell) in the next time step. Rule 4 state that a dead cell D (vacancy) is replaced by a healthy cell H with probability (1−pinfec) preg, or by an A1-infected cell with probability pregpinfec, otherwise it remains in a dead state. The replacement simulates the dynamics generated in lymphoid tissues due to the blood incoming flux.

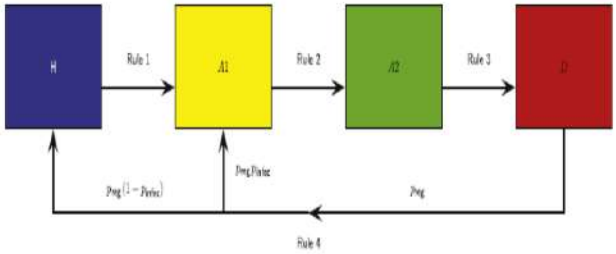

Fig. 11. Flow chart of the progression of the HIV-CA model before initiation of treatment [4]

5.1 Treatment

It is necessary to introduce three new states for healthy cells that would be considered after the beginning of the treatment just to check the effectiveness of ARV therapy. These states are used to describe healthy CD4+ T cells that have absorbed either the reverse transcriptase inhibitor (HRT) or the protease inhibitor (HP) at any time, or absorbed both inhibitors (HRTP) simultaneously. Rule concerning healthy cells should be split in new rules in the starting of the treatment to account for the interactions of healthy cells and the drugs adopted in the therapy. Healthy cells under therapy should continue to interact with viral particles but forcibly should also interact with drugs (inhibit reverse transcriptase and/or protease). If a given healthy cell has been infected and it has absorbed either or both drugs, it will produce a non-infectious virus. Hence, under treatment the new Rule 1 is summarized in Fig 12 and 13(a) and explained as follows:

- *Rule1a* states that Under treatment a healthy cell H state becomes HRTP with probability pRTI × pPI; or becomes HRT with probability pRTI × (1−pPI); or becomes HP with probability (1−pRTI) ×pPI; or becomes an infected-A1 cell with probability (1 − pRTI) × (1 − pPI), provided it has at least one infected-A1 cell or 4 A2 cells amongst its nearest neighbors, otherwise it remains healthy H.
- *Rule1b* states that a healthy cell HRT becomes a HRTP cell with probability pPI; or with probability (1 − pPI) × pRTI it remains a HRT cell or becomes an infected-A1 cell with probability (1 − pPI) × (1 − pRTI) and if it has at least one infected-A1 cell or R = 4 A2 cells in its nearest neighbors, otherwise it remains a healthy H cell.

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- *Rule1c* states that a healthy cell HP becomes a HRTP cell with probability pRTI; or with probability (1 − pRTI) × pPI remains a HP cell or an infected-A1 cell with probability (1 − pPI) × (1 − pRTI) and if it has at least one infected-A1 cell in its nearest neighbors, or atleast R=4 neighbors in infected-A2 state, otherwise it remains a healthy H cell.
- *Rule1d* states that a healthy cell HRTP converts into a healthy cell H in the next time step.

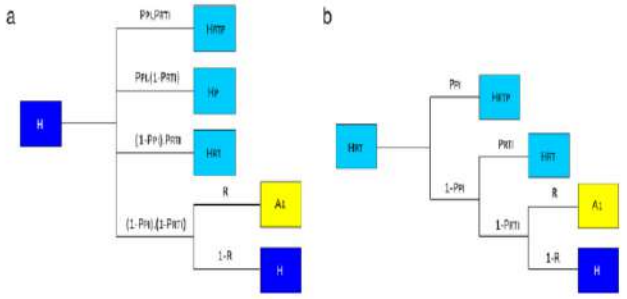

Fig.12. progression of healthy CD4+ T cells and (a) healthy-HRT (b) under cART (Combination Antiretroviral therapy)[4]

In both cases of absorption of RT inhibitor and PI inhibitor the cell would continue to act as a drug-free infected-A1 cell and will evolve to the infected-A2 state after time τ.

The states of automata after initiation of a combined ARV therapy are shown in fig.13 where both kinds of drugs are considered.

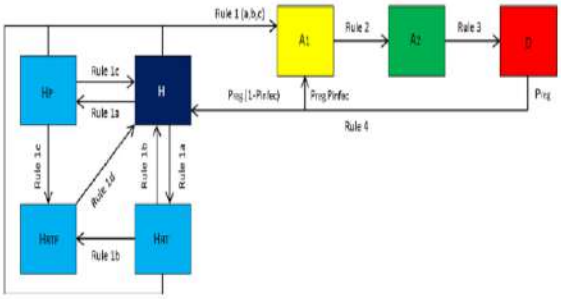

Fig.13.Progression of HIV-CA model (including cART) after beginning of the therapy.[4]

CONCLUSION

Theory of computation has many applications in every field of study. It is used in biology, artificial intelligent systems, geographical studies, distributed systems etc. Latest developments and research issues in the field of automata are considered in this paper. Theory of computation has an interesting future.

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Localization Techniques in Wireless Sensor Network

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Abstract— **To find the location of node in wireless sensor network is important. But awareness about the location of the node is one of the critical issue and challenge in wireless network. As the wireless sensor network have many applications such as the military, water monitoring, infrastructure monitoring, government security policy, habitat monitoring, environment monitoring, disaster relief and many more. In all the above application the localization of the node is most important parameter. In this paper the different techniques are presented to find the location of the node.**

Keywords— Localization, GPS, AOA, RSSI, APIT.

I. INTRODUCTION

There A Wireless Sensor Network (WSN) consists of a large number small sensor nodes communicating among themselves and they are typically deployed in quantity to sense, monitor and understand the physical world. A sensor is a device which measures a physical quantity and converts it into the signal which is used by instrument. A wireless sensor is the smallest unit of a network that has unique features, such as, it supports large scale deployment, mobility, reliability, etc. WSNs are not limited to science and engineering, but they are also included in other popular applications such as the military, water monitoring, infrastructure monitoring, government security policy, habitat monitoring, environment monitoring, and earthquake monitoring, are few examples. A sensor network consists of a discrete group of independent nodes with low cost, low power, less memory, and limited computational power that communicate wirelessly over limited frequencies at low bandwidth [1]. The main goals of WSNs are to deploy a number of sensor devices over an unattended area, and collect the environmental data and transmit it to the base station or remote location. Later, the raw data is processed online or offline for detailed analysis at the remote server according to the application requirements. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance and is now used in many industrial and civilian application areas, including industrial process monitoring and control, machine health monitoring, environment and habitat monitoring, healthcare applications, home automation and traffic control [2].

The WSN has many applications and the location of the sensor node is the critical in the success of the application. Localization in wireless sensor networks means that is to determine the positions of node in a wireless sensor network. The position of node in wireless sensor network can be known by direct technique, by establishing some infrastructure in which node can be known by extracting data from infrastructure. This of technique for example GPS technique in which node send the signal to that infrastructure periodically then infrastructure calculate the position of node in the wireless sensor network(WSM).

II. PARAMETERS FOR LOCALIZATION

The Four the different ways of estimating location information, we have to name parameters to distinguish the similarities and differences between different approaches. In this section we present the most typical parameters to classify different techniques [3].

A. *Accuracy* is very important in the localization of wireless sensor network. Higher accuracy is typically required in military installations, such as sensor network deployed for intrusion detection. However, for commercial networks which may use localization to send advertisements from neighboring shops, the required accuracy may not be lower.

B. *Image Enhancement* is among the simplest and most appealing areas of digital image processing. Basically, the idea behind enhancement techniques is to bring out detail that is obscured, or simply to highlight certain features of interest in an image. A familiar example of enhancement is when the contrast of an image is increased because "it looks better." It is important to keep in mind that enhancement is a very subjective area of image processing. A good example of this is the Fourier transform.

C. *Cost* is a very challenging issue in the localization of wireless sensor network. There are very few algorithms which give low cost but those algorithms don't give the high rate of accuracy.

D. *Power* is necessary for computation purpose. Power play a major role in wireless sensor network as each sensor device has limited power. Power supplied by battery.

E. *Static Nodes* All static sensor nodes are homogeneous in nature. This means that, all the nodes have identical sensing ability, computational ability, and the ability to communicate. We also assume that, the initial battery powers of the nodes are identical at deployment.

F. *Mobile Nodes* It is assumed that a few number of GPS enabled mobile nodes are part of the sensor network. These nodes are homogeneous in nature. But, are assumed to have more battery power as compared to the static nodes

and do not drain out completely during the localization process. The communication range of mobile sensor nodes are assumed not to change drastically during the entire localization algorithm runtime and also not to change significantly within the reception of four beacon messages by a particular static node.

III. LOCALIZATION ALGORITHM

In this section, localization techniques are classified with merits and demerits. The localization is to find location of the node there are the different localization techniques by which the location of the non located node can find and make intensities. communication between localized and non located node. Localization algorithm divided into two types of technique as given below:

1) *Direct localization techniques*

2) Indirect decentralized localization techniques

And indirect again involve two kinds of techniques as:

a) range-based

b) range-free localization techniques

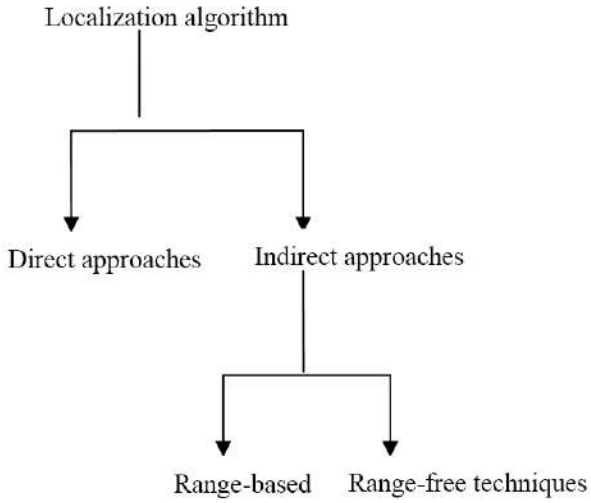

Figure 1:- Types of localization

1) Direct approaches: - This is also known as absolute localization. The direct approach itself can be classified into two types: Manual configuration and GPS-based localization. The manual configuration method is very cumbersome and expensive. It is neither practical nor scalable for large scale WSNs. On the other hand, in the GPS-based localization method, each sensor is equipped with a GPS receiver. This method adapts well for WSNs with node mobility. It is not economically feasible to equip each sensor with a GPS receiver since WSNs are deployed with hundreds of thousands of sensors. This also increases the size of each sensor, rendering them unfit for environments. Such WSNs cannot be used for underwater applications like habitat monitoring, water pollution level monitoring, tsunami monitoring etc [4].

2) *Indirect approaches:* - The indirect approach of localization is also known as relative localization since nodes position themselves relative to other nodes. The indirect approaches of localization were introduced to overcome some of the drawbacks of the GPS-based direct localization techniques while retaining some of its advantages, like accuracy of localization. In this approach, a small subset of nodes in the network, called the beacon nodes, are either equipped with GPS receivers to compute their location or are manually configured with their location. These beacon nodes then send beams of signals providing their location to all sensor nodes in their vicinity that don't have a GPS receiver. Using the transmitted signal containing the location information, sensor nodes compute their location. This approach effectively reduces the overhead introduced by the GPS-based method. However, since the beacon nodes are also operating in the same hostile environment as the sensor nodes, they too are vulnerable to various threats. This introduces new security threats concerning the honesty of the beacon nodes in providing location information incorrect. Within the indirect approach, the localization process can be classified into the following two categories [4].

a) Range-based:- In range-based localization, the location of a node is computed relative to other nodes in its vicinity. Range-based localization depends on the assumption that the absolute distance between a sender and a receiver can be estimated by one or more features of the communication signal from the sender to the receiver. The accuracy of such estimation, however, is subject to the transmission medium and surrounding environment. Range based techniques usually rely on complex hardware which is not feasible for WSNs therefore the size and cost increases. The common ones used in communication signal for range-based localization are Received Signal Strength Indication (RSSI) [5], Time of Arrival (TOA) [6], Angle of Arrival (AOA) [7], and Time Difference of Arrival (TDOA) [8].

1) Received Signal Strength Indication (RSSI): RSSI measures the signal power coming in a received node and calculates distance using received signal. The advantage of RSSI is it is easy to estimate. And the main drawback is power decreases when the node is at long distance. The RSSI technique is based on the fact that the radio signal attenuates exponentially with the increase of distance. Accuracy is affected by obstacles. Good accuracy is in less distance.

2) Time of Arrival (TOA): In this it sends a single packet from the one node to the other node which containing the time of its transmission, and it is to assume that there will be perfect clock synchronization between the nodes. The receiving node knows when the packet arrived and that is synchronized with the sender node, the distance travelled can be calculated using the following formula:

$d = c * \Delta t$

Where d is the distance between the nodes, c is velocity of light and Δt, the time difference. But the issue is to achieve synchronization between nodes. Therefore this method is not popular.

3) Angle of Arrival (AOA): Range information is obtained by estimating and mapping relative angles between neighbors. Angle is estimated with the help of known reference axis and the signal is send to another node.

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Different method for AOA measurement exits. The one of method is in which, array of RF antennas or microphones at receiver node helps in determining AOA. By analyzing the phase or time difference between the arrival of signals at different antennas or microphones, it is possible to discover the angle of arrival of the signal.

4) Time Difference of Arrival (TDoA):- To obtain the range information using TDoA, an ultrasound is used to estimate the distance between the node and the source. Like ToA, TDoA necessitates the use of special hardware, rendering it too expensive for WSNs [3].The propagation time can be directly translated into distance, based on the known signal propagation speed. These methods can be applied to many different signals, such as RF, acoustic, infrared and ultrasound. TDoA methods are impressively accurate under line-of-sight conditions. But this line-of-sight condition is difficult to meet in some environments.

b) Range-free: - Range-free localization never tries to estimate the absolute point to- point distance based on received signal strength or other features of the received communication signal like time, angle, etc. This greatly simplifies the design of hardware, making range-free methods very appealing and a cost-effective alternative for localization in WSNs. Amorphous localization, APIT, DV-Hop localization, are some examples of range-free localization techniques. As Range-based positioning algorithms put forward higher-requirements in hardware, which cost is too· high to be suitable in sensor nodes. Therefore, Range-free positioning mechanisms are being paid attention to by its low-cost and low power consumption.

*a) APIT Localization:-*APIT requires a heterogeneous network of sensing devices where a small percentage of these devices (percentages vary depending on network and node density) are equipped with high-powered transmission and location information obtained via anchor nodes. Using beacons from these anchors, APIT employs an area-based approach to perform location estimation by isolating the environment into triangular regions between beaconing nodes. A node's presence inside or outside of these triangular regions allows a node to narrow down the area in which it can potentially reside. By utilizing combinations of anchor positions, the diameter of the estimated area in which a node resides can be reduced, to provide a good location estimate [8].

Table 1 Comparison of node localization Techniques

TECHNIQUE	COST	ACCURACY	Energy efficient	HARDWARE SIZE
GPS	HIGH	HIGH	LESS	LARGE
GPS FREE	LOW	MEDIUM	MEDIUM	SMALL
TOA	HIGH	MEDIUM	LESS	LARGE
(using ultrasonic pulse)				
TDOA	LOW	HIGH	HIGH	LESS COMPLEX, MAY BE LARGE
AOA	HIGH	LOW	MEDIUM	LARGE
APIT	MEDIUM	MEDIUM	HIGH	MEDIUM
IV.	V.	VI.	VII.	VIII.

IV. CONCLUSION & FUTURE WORK

Localization of node in the wireless sensor network attains significant research interest. And this interest will further grow with the rapidly increasing of wireless sensor network. In this paper has provided the classification of various localization techniques. In paper localization techniques were classified based on GPS, GPS Free , Range Based , Range Free based etc. some of these techniques have lesser merits and greater demerit. And some of them have greater merit and lesser demerit. Localization is open problem in wireless sensor network. And the localization classification is useful for understanding various localization methods and it useful for who want to implement new localization algorithm.

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Measures to provide security Kiosk to VANETs

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***Abstract*-Today the world is equipped with various categories of communication networks each having different striking features. They are governed by specific set of protocols and implemented through particular technology. Each have a set of advantages, applications and limitations. One of the important aspect of these communication networks is Security which needs a due concern. Every network is prone to one or other threat/attack and each is tackled differently. One among the kitty of communication networks is VANET (Vehicular Ad hoc Networks).It is an emerging technology used in ITS (Information Transportation System).This paper discusses the security issues (attacks and counter measure) in VANETs.**

***Keywords*-Vehicular ad hoc network (VANET), security, mobility, attacks**

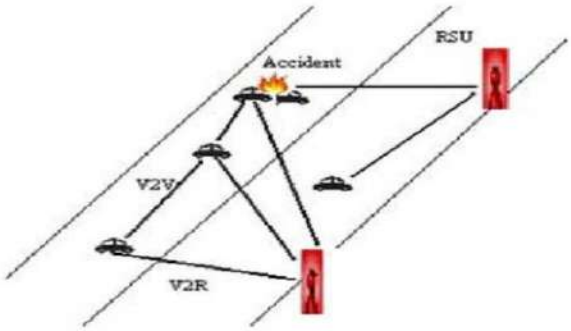

Figure 1: VANET structure

I.INTRODUCTION

VANET (Vehicular Ad hoc Network) is the subclass of MANET (Mobile Ad hoc Network). VANET uses vehicles as a mobile nodes that communicate with each other. In this communication Vehicles are connected but they can move freely and no wired connectivity is required. Here each vehicle has its own platform, self-organize and self-manage information in a distributed fashion. Each Vehicular Device has an ability to connect with any other device in the network. To pave the way for communication between the source and destination each intermediate nodes forwards the message to the next node. Such Networks may operate by themselves or may be connected to a large Internet [4]. In VANET communication can be between vehicles and road side units (V2R), vehicle and vehicle (V2V) in the short range of 100m to 300m [6].

Vehicular Networks System consists of large number of nodes, approximately number of Vehicle exceeding 750 million in the world today [11].

II. Characteristics of VANET

Though VANETs resembles in various aspects with MANETs it possess various distinguish characteristics which are not provided by MANETs. They are as follow:

1. Highly dynamic nature: In VANET the movement of vehicles means that nodes are more mobile and requires a lot of high speed. More dynamic nodes means changes in the topology are rapid. This makes VANETs highly dynamic in nature.
2. Patterns: In VANET Vehicles are restricted by some rules and regulation like traffic rules so different patterns are discovered and few statistical Quality Models for VANET are designed.
3. Inbuilt GPS and navigation system : Vehicle are equipped with GPS and Navigation systems so that information regarding the position , movement direction, current speed, town map and planned movement of vehicles can be determined. [2]

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4. Higher power capacity and Memory storage: VANET includes less energy constraints, higher machine power and memory capability, compared to other Ad hoc Networks.
5. Large size: VANET Networks are sometimes has a giant size due to some neighboring networks that associates with each other. [2]

III. Applications of VANETs

VANETs provide not only road and traffic safety but also provide comfort to the passengers along with Internet facility. Unlike other ad-hoc networks applications provided by VANETs includes:

- Providing Safety information
- Traffic Management and monitoring
- Toll services
- Location based Services

IV. Attacks and Counter Measures

The communication in VANETS either V2R or V2V is prone to different types of threats/attacks. Each threat/attack has its own nature and poses one or the other complication in secure communication. To tackle these attacks several counter measures are suggested and implemented as and when required. This section concentrates on attacks against the message itself rather than the Vehicle.

a) ***Denial of Service:*** - In DOS the main objective of the attacker is to prevent the legal user from accessing the Network services and from Network resources. DOS attack will occur by jamming the channel system or network so that no authentic Vehicles can access it. The attacker transfers the dangerous or critical information to all the Vehicles that communicate within the Network.

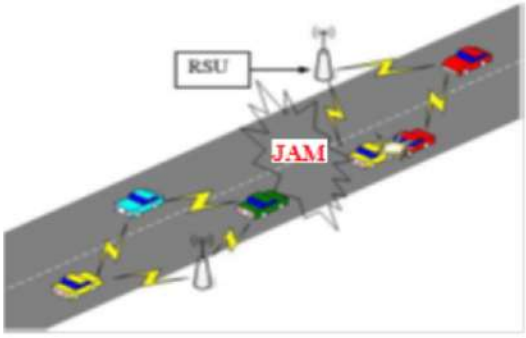

Figure 2. DOS Attack

Counter Measure - : The solution for this type of DOS attack to protect node from attack and if it happens then node should be able to bear it. The operation depends on the use of On-Board-Unit (OBU) that is installed on each Vehicle, so as to make decisions to block a DOS attack, the processing Unit will suggest to the OBU to switch technology, channel, or the use frequency hopping technique. OBU have four options by which it can make decision based on the receives malicious message. After necessary processing and decision, OBU send the information to next OBU in the network.[13]

b) ***DDOS Attack-*** : Distributed Denial of service attack is severe in VANETs. By this attack, the two or more malicious vehicles attacks one target vehicle with different time slots or may be from different locations. The objective of this attack is to slow down the network accessibility through a target vehicle by which whole of the network is congested.

Counter Measure -: To address the security weakness of VANET where a group of malicious entities can launch a DDOS attack exploiting the IEEE 802.11 EDCA (enhanced distributed channel access) vulnerabilities based on small contention window. An attacker can easily synchronize to any periodic transmission in the network. The prospect of launching such an attack, and also suggests different mitigating techniques including larger EDCA parameters for VANET entities. Such as randomizing the RSU schedule, increasing the Contention Window & Randomization with Increasing the Contention Window. [15]

c) ***Man in the Middle Attack*** - : In this Attack the attackers reside in the middle of two communicating Vehicles and introduce this attack. It occurs when the attackers control the communication, and the Vehicles assume that they are communicating with each other. The attacker listens the communication and inject false or modified message between the Vehicles as shown In fig.3

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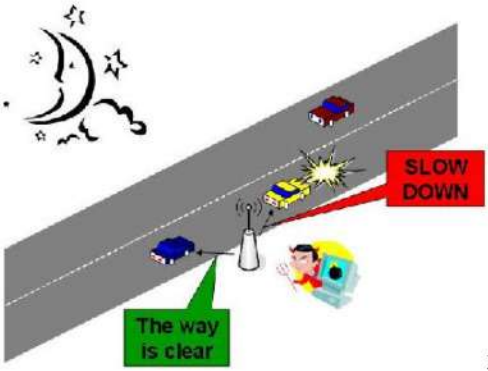

Figure 3. Man in the middle Attack

Counter Measure- : The counter measure of this attack is the public key Cryptography. Cryptography is the practice and study of techniques for secure communication in the presence of third parties [4]. Public key cryptography is a technique which distributes the public key to each vehicle and make it as a unique. Cryptography performs two types of functions i.e. encryption and decryption . In which one vehicle encrypts their message with its pubic key and send to the another vehicles onto the network that tries for the communication, these vehicles decrypts the message and acquire the original message.

d) Brute Force Method Attack - : The Brute Force Method exploit the Cryptography technique. By which the attacker can find the cryptography key.

Counter Measure-: The solution of this problem is use of another technique like steganography. **Steganography** hides the original message with the best way so nobody can see the original message when both parties communicate in secret. The information that is encrypted is easy to remove but embedding it within the contents of the files is not possible to remove as shown in fig.4 itself.

Fig.4 Steganography

e) Replay Attack- : Replay Attack is the form of network attack in which the attacker retransmit the valid data. It gets data from the Originator or the Sender who intercept the data and retransmit their modified form. Fig.5 shows Alice(vehicle1) want to send the packets P1 and P2 to the Bob (vehcle2). The Alice(vehicle1) transmit the message onto the network and the attacker catch that Packets before they arrive at the Bob's(vehicle2) end and modified that Packets and retransmit again that Packets to the Bob's.(vehicle2)

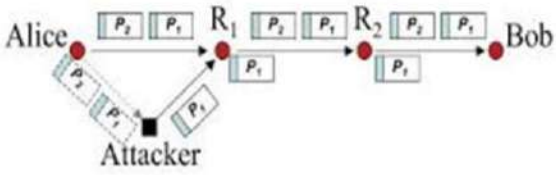

Figure 5. Replay Attack

Counter Measure- :A way to handle the replay Attack is by Using the Session Tokens. Alice(vehicle1) sends a token to Bob(vehicle2), to transform the Message or Password to the Bob(vehicle2). On the Bob's end ,he also perform the same computation. If and only if the tokens are matched the login is successful. Now if the third party try to captured the Alice's(vehicle1) token and modified that token it will be different from the Bob's token.

f) Sybil Attack - **:** In the attack, the attacker generates a large number of false identities and pretends it as a hundred of vehicles, and tell to other vehicles there is jam ahead , and ask them to take the another route. Fig6

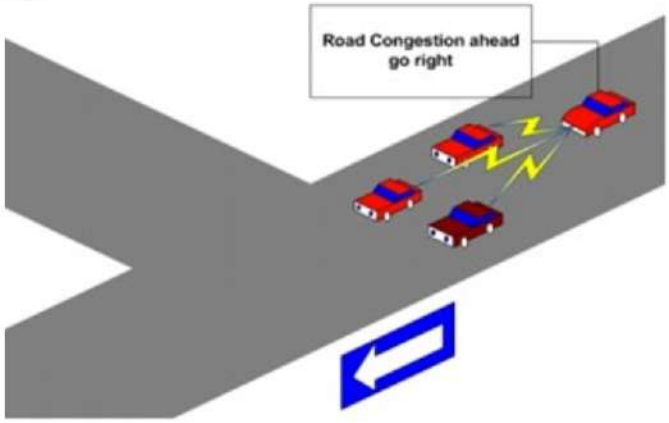

Figure6. Sybil Attack

***Counter Measure* - :** There are two methods to detect Sybil Attack. Passive Ad hoc Sybil Identity with group detection. At the back this technique record the identities and build a profile for each of the identity that are running simultaneously, and performed computation between vehicles with an affinity function to reveal the attacker. The attacker and the false identities which appear and disappear simultaneously, these are revealed by the affinity function.

g) ***Alternation Attack*-**: In this attack the attacker catches the communication between the two Vehicles. This causes the delay of transmission of messages between the two ends. To hide this delay from the vehicles the attacker will retransmit the earlier messages, so that the receiving node continuously receive the message and within that time the attacker will modified the original message.

For instance, when the road is congested the attacker will send the message to the vehicles that the road is clear.

***h) Black Hole Attack*-:** In this attack, the vehicle does not show any interest to participate on to the network or when an established Vehicle drops out to form a black hole. By these reasons, all the traffic onto the network redirected towards the specific Vehicle which actually does not exist which causes data lost.

CONCLUSION

The above write up discussed various security attacks and their counter measures in VANET environment. In simple mode a VANET communication may be influenced under a single attack/threat which can be tackled by applying one of the counter measures and little amount of effort. But the situation becomes worse when a VANET communication is influenced under a more than one threat/attack simultaneously. To overcome this scenario huge amount of effort is needed. Many counter measures have been suggested and many new have to be found. As it is a continuous process of attack and counter attack, VANET communication may come under many new types of attacks which will further give rise to new technique to counter them.

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OSS and software evolution: a review

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***Abstract* — This study presents a review on the rise of open source software's. The focus is directed on understanding the open software development efforts, and how they are different from traditional software engineering. The study also put light on the Software Maintenance and Software Evolution. This paper summarizes the eight laws of Software evolution. At the end, the review of open source software (OSS) evolution is presented. A comprehensive overview and synthesis of related studies is presented as well.**

Keywords: **Open source software, Software Maintenance, Software Evolution.**

I. INTRODUCTION

The Open Source (OS) model of software development has gained the attention of both the business, the practitioners 'and the research communities. F/OSSD is a relatively new way of building and deploying large software systems on a global basis, and differs in many interesting ways from the principles and practices traditionally advocated for software engineering. Software maintenance and evolution are characterized by their huge cost and slow speed of implementation, yet they are inevitable activities. All those software that are useful and successful stimulates user-generated requests for change and improvements. The aim of this study is to review the research on software maintenance and evolution.

II. FREE/OPEN SOURCE SOFTWARE

Open source software (OSS) includes operating systems, application software, and programs in which the source code is published and made available to the general public, enabling anyone to copy, modify and redistribute that code without paying money or fees. Any individual as well as group of persons or companies can evolve Open source "products" with cooperation. An open source license permits anybody in the community to study, change and distribute the software for free and for any purpose[4].

Free software and open source software (OSS) are the two terms used interchangeably. Beside this there are important differences between them with regards to the licenses assigned to these software. Free software generally appears licensed with the general public license (GPL), while OSS may use either the GPL or some other license that shows its integration and tells that it is not free software. Free software is a social movement whereas open source software development (OSSD) is a software development methodology. However, free software is always available as OSS, but OSS is not always used as free software. That is why it is sometimes called ***libre software.***

The very basic questions that can come to any one's mind about open source software are, First why will software developers join and put their efforts in such projects where they will not be rewarded with salaries. The answer is that, the developers got the opportunity *to learn and to share what they know* about software system functionality, design, methods, tools, and practices associated with specific projects or community leader [4] by participating in it. Open source software is a place for learning for individuals, project teams, and large learning organizations which can continuously improve or adapt their processes and practices. The other doubt is how could the participation of developers reflects in a open source project in terms of which processes are engaged as well as how the recruitment for new developers into open source projects operate. The answer to this question is that the developers appear to really enjoy their free/open source software work and recognized as reputable contributors. Moreover the developers can self select their technical roles in which they will participate on, instead of assigned the role against their liking as in traditional SE project environment.

III. SOFTWARE MAINTENANCE AND SOFTWARE EVOLUTION

Software maintenance is defined in IEEE Standard 1219 [IEEE93] as: The modification of a software product after delivery to correct faults, to improve performance or other attributes, or to adapt the product to a modified environment. A similar definition is given by [ISO95], again stressing the post-delivery nature. So, The Software *maintenance* is referred as post-delivery activities, and Software *evolution* as a change in particular phase in the staged model. The model summarized below has five distinct stages with each has a specific meaning to it[5].

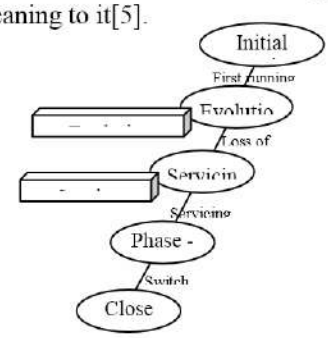

Fig. 1. Example of a figure caption. *(figure caption)*

In the first stage Initial development, the software system is developed and can have many shortcomings with respect to the features in it, but the *architecture which it holds* remains the same the rest of the life of the program. Software *evolution* takes place only when the initial development was successful. Evolution makes possible to change the software without affecting architecture. If it does not happens, the program is no longer evolvable and enters the stage of *servicing. In the servicing stage very* small tactical changes for e.g. change of code etc are possible. If during this stage the knowledge required for evolution is lost, the changes in the software will lead to a faster deterioration of the software. During phase-out stage no more servicing is being undertaken, but the system still may be in production [5]. At the close-down stage the software is no longer in use and the replacement is needed. When considering the difference between maintenance and evolution, it is important to distinguish between retaining the system in a state in which the possibility to accommodate the changes that were not specified earlier can be entertained. There are a number of ways that a system can adapt to changes in its requirements. The best form of evolution is one that does not change a system's architecture. If change can't be met by the current design, the next best scenario is assimilation i.e. changing the systems design within the bounds of the architecture in order to meet new demands. So the *Evolvability is the ability of a system to adapt to, or cope with change in requirements, environment and implementation technologies* .The qualities, which turns out to be evolvability as an overall system quality, can in turn form the taxonomy of change. Following table defines the terms of taxonomy [3].

Generality	Accommodating change within existing architectural design and implementation
Adaptability	Accommodating change through exchange of system components within current architecture without having to modify other components or their integration solution.
Scalability	Accommodating change via incremental changes in system capability by inclusion of components that have been planned for and included in architectural design.
Extensibility	Accommodating the need for extra functionality or new system properties through major architectural change

TABLE I. FACTOR DESCRIPTION FOR SOFTWARE CHANGE

The above discussion redefines the definition of resolvability i.e. The Evolvability is an attribute that bears on the ability of a system to accommodate change in its requirements throughout the system's lifespan with the least possible cost while maintaining architectural integrity [6].

IV. LAWS OF SOFTWARE EVOLUTION

Law I- Continuing Change	An E-type program that is used must be continually adapted else it becomes progressively less Satisfactory.
Law II- Increasing Complexity	As a program is evolved its complexity increases unless work is done to maintain or reduce it.
Law III - Self Regulation	The program evolution process is self regulating with close to normal distribution of measures of product and process attributes.
Law IV - Conservation of Organizational Stability (invariant work rate)	The average effective global activity rate on an evolving system is invariant over the product life time.
Law V - Conservation of Familiarity	During the active life of an evolving program, the content of successive releases is statistically invariant.
Law VI - Continuing Growth	Functional content of a program must be continually increased to maintain user satisfaction over its lifetime.
Law VII - Declining Quality	E-type programs will be perceived as of declining quality unless rigorously maintained and adapted to a changing operational environment.
Law VIII - Feedback System	E-type Programming Processes constitute Multi-loop, Multi-level Feedback systems and must be treated as such to be successfully modified or improved.

TABLE II. LAWS OF SOFTWARE EVOLUTION

V. DEVELOPMENT OF OPEN SOURCE SOFTWARE

The term "open source" is relatively new term, but the fundamental ideas behind it are older. The basic theme behind the open source software system is that its source code must be freely available to anyone who wishes to examine it or change it for their own purpose. It is more accurate to say that the user must always be able and allowed adapt or evolve the system for his/her personal needs. The open source software (OSS) are developed by collaboration and and the developers are often geographically dispersed. Many corporations and individuals have developed source code in-house as a proprietary project only to release later it as "open source" or with a license that allows great freedom for personal use of the system. Some of the examples of OSS are Netscape web browser (*i.e.,* the Mozilla project)

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and Sun's Java Development Kit. There are lot of differences in the open source development (OSD) model and traditional commercial development processes[11]. First, the main aim of an open source project is to create a system that is useful or interesting to those who are working on it irrespective of any commercial void. The developers are normally unpaid volunteers who participate in the project as a hobby and in return, they receive peer recognition and whatever personal satisfaction their efforts bring to them. The developers concentrate only on those parts or the program which they feel interesting rather than what is more essential. Since the project owner holds little power over the contributing developers, it can be difficult to direct development toward particular goals. This liberty also means that it can be difficult to convince developers to perform essential tasks, such as systematic testing or code restructuring, that are not as exciting as writing new code. The main features of open source development include:

Scheduling: There is no commercial pressure to follow any time limits and most OSD developers have "day jobs" that take up most of their time. While this may entail longer development cycle. So the system need not be released until the project owners are satisfied that the system is mature and stable.

Code quality: *The code quality and* standards can vary widely. Since code is contribution from many developers, it is not possible to follow any specific standards.

Planned evolution, testing, and preventive maintenance may suffer while developing open source software, since OSD encourages active participation but not follow careful reflection and reorganization. Code quality is maintained largely by "massively parallel debugging" where, many developers are using each other's code rather than by systematic testing or other planned, prescriptive approaches.

VI. OSS EVOLUTION

In this category the main focus is on investigating OSS evolution trends and patterns. Based on this, the studies were further classified into three subcategories [1]:

(i) Software growth
(ii) Software maintenance and evolution economics
(iii) Prediction of software Evolution.

Software growth:

In this sub-category main focus on software growth and changes are measured by large number of metrics for e.g. Number of packages, number of classes, total lines of code, number of statements, Initial size, current size, modules (folders),modules (files), average module size, number of directories, total size in Kbytes, average and median LOC for header and source files, number of modules (files) for each subsystem and for the system as a whole etc.

System growth: is measured by using the metric of percentage growth over time.

System change: *It is quite difficult to* separate the characterizations of system growth and system change. But it is possible to count all the different files that have been added, modified and deleted between two subsequent releases in order to measure system changes.

Size: Lehman suggests that using the number of modules to calculate the program size as is more consistent than considering source lines of code.

Software maintenance and evolution economics

The uncertainties in software evolution arise when understanding how OSS would have evolved in terms of costs. Moreover,. Therefore, another perspective in understanding OSS evolution trends is to analyze how software has evolved in terms of development and maintenance costs. Capra et al analyzes the quality degradation effect, i.e., entropy of OSS by measuring the evolution of maintenance costs over time.The function point metric is the best used in this study[1].

Prediction of software evolution

The history data of OSS can be utilized to predict its evolution on timely basis. It has been mentioned that modeling software growth is essential for developing software evolution prediction models. There are many studies of monitoring OSS growth, and very few of them actually utilize the historical evolution data for the purpose of predicting its evolution. Herraiz et al describe using data from source code management repository to compute size of the software over time. This information is used to estimate future evolution of the project. SLOC is used for counting program text that is not a comment or blank line regardless of the number of statements.

VII. CONCLUSION

This review paper reports on a study that investigates the open source software development projects Based on the research topics of those studies, A number of conclusions can be drawn from the findings presented. First, this study sought to describe the open source software and then it defines the software evolution. We started by expressing the view that much more empirical knowledge about software maintenance and evolution is needed. Some artifacts that characterize how the requirements for developing open software systems are developed. Solutions are going to be essential to meet the needs of businesses where change is constant and urgent. So we can expect software evolution is be positioned at the centre of software engineering.

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Pocket algorithm with ratches: a neural network technique

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Abstract: **Many constructive methods use the pocket algorithm as a basic component in the training of multilayer perceptron. This is mainly due to the good properties of the pocket algorithm confirmed by a proper convergence theorem which asserts its optimality. Unfortunately the original proof holds vacuously and does not ensure the asymptotical achievement of an optimal weight vector in a general situation. This inadequacy can be overcome by a different approach that leads to the desired result. Moreover, a modified version of this learning method, called pocket algorithm with ratchet, is shown to obtain an optimal configuration within a finite number of iterations independently of the given training set. Besides the minimization of the error scored on a given training set an effective learning technique for supervised neural networks must pursue another important aim; the optimization of the number of weights in the final configuration. It is basically used for clustering neurons. There exist no feedback from the system to indicate the desired outputs in network & unsupervised learning can judge how similar a new pattern is to typical pattern already exist in the database. It is based upon supervised learning algorithms which are applicable when the desired result is known for the samples in the training data. It consists of only layer of multiple nodes at which computation is performed with one node to another in the samples. Which can be used randomly in the algorithm? The main limitation of this algorithm is that it can't work for multilayer neural network. So, it works for the separation of samples that we are using in the algorithm. The same principle adopted in the network for the identification of winner neuron. If tie occurs, then we can select by extend with external parameters. This technique is called competitive network. So; we can say that only one neuron in competitive group will among all neurons.**

1. INTRODUCTION

An important possibility is offered by the pocket algorithm it runs on Perceptron learning iteratively and holds the weight vector which has remained unchanged for the greatest number of iterations in memory. A proper convergence theorem ensures that the pocket algorithm is optimal if the components of the input patterns in the training set are integer or rational. In this case the probability that the saved weight vector, called *pocket vector*, is optimal approaches one when the number of iterations increases. This important theoretical property has been widely employed to show the good qualities of some constructive methods which use the pocket algorithm as a basic component [1]. In classification problems a reasonable measure of error is given by the number of input patterns of the training set misclassified by the given neural network. Unfortunately, the pocket algorithm does not ensure that the error associated with the current pocket vector is smaller than previously saved configurations. Thus, its convergence properties can be improved if a proper check is executed before saving a new weight vector; this version of the method is called pocket algorithm with ratchet. We now have a feed-forward neural network model that may actually be practical to build and use.

2. RATCHING APPROACH IN NN

Unlike the back-propagation algorithm which works on a fixed architecture and is therefore unable to optimize the resulting configuration, constructive methods generate the desired neural network by consecutively adding units to the hidden layers only when necessary[2]. This allows obtaining in a direct way the optimal or near-optimal number of weights needed to solve a given problem. In most cases the execution of a constructive method requires the repeated application of a training algorithm for single neuron which provides proper values for the weights of the unit that is going to be added to the network. Such an algorithm must have good convergence properties which lead to a high compactness of the final configuration. For this aim the pocket algorithm is often used, since a favorable theorem ensures the achievement of an optimal weight vector when the execution time increases indefinitely. The attraction of neural networks is that they are best suited to solving the problems that are the most difficult to solve by traditional computational methods. Consider an image processing task such as recognizing an everyday object projected against a background of other objects [1]. There exist no feedback from the system to indicate the desired outputs in network & unsupervised learning can judge how similar a new pattern is to typical pattern already exist in the database. It also discusses the similarity between the multiple networks according to the past examples. With neural network technology, we can use parallel processing methods to solve some real-world problems where it is very difficult to define a conventional algorithm. Further, we define that signals flow only in one direction across the network, and we simplify the neuron and synapse design to behave as analog comparators being driven by the other neurons through simple resistors.

3. POCKET ALGORITHM

The present paper has therefore the aim of extending previous results in order to dissipate any doubt on the asymptotical

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optimality of the pocket algorithm. Moreover, a new theorem shows that the version with ratchet is finite-optimal, i.e. it reaches the desired configuration within a finite number of iterations. It has been an important motivation for the employment of this learning procedure. If we use the definition introduced in the previous section this theorem asserts that the pocket algorithm is optimal when the training set *S* contains a finite number of samples and all their inputs are integer or rational. Nevertheless, a correct interpretation of the corresponding proof requires the introduction of some additional quantities which are used in the mathematical formulation. As a matter of fact the convergence relations are characterized by the number *N* of generations (visits) of an optimal weight vector instead of the corresponding number *t* of iterations. The value of *N* does not take into account the permanence's obtained by a given weight vector after each generation [3]. Then, let *MN* be the greatest number of generations scored by a non-optimal configuration during the same training time *t*; it can be shown that the ratio *M* remains finite when the number *t* of iterations increases indefinitely. The main limitation of this algorithm is that it can't work for multilayer neural network [3]. So, it works for the separation of samples that we are using in the algorithm. These are two types of separation used in mathematics.

5. ALGORITHM

Start with a randomly chosen weight vector *WQ;*
Let *k = 0, best. run-length* = 0; *current-run-length = 0;*
While *k* < maximum allowed number of presentations do
Increment *k;*
Let i be a randomly selected input vector;
Let *Xk = class(i).i;*
If w*-i *jt>0,
Then increment *current-run-length;*
Else
if *(best-run-length < current-run-length)* and if *Wk-i*
Misclassifies fewer samples than current
Pocket contents
then replace pocket contents by w*_i and
Best-run.length by *current-run-length;*
End-if
Update the weight vector to *wt* = w*-i + »?**;
End-if
End-while.

6. IMPLEMENTATION

The program implements the process just described. Networks are assumed to be feed forward only, with no recurrence. The network is specified in terms of a set of pools of units [2]. If the number of training samples is finite, and samples are presented randomly, then running the pocket algorithm long enough will ensure that the optimal set of weights is discovered with high probability. A further variation of the pocket algorithm attempts to guard against the possibility that a lucky run of several successes allowed a poor solution to replace a better solution in the pocket. This approach, called the pocket algorithm with *ratchet,* ensures that the pocket weights always "ratchet up": a set of weights *w* in the pocket is replaced by a set of weights *wj* with a longer successful run only after testing (on all training samples) whether W2 does correctly classify a greater number of samples than *w*. While there is no guarantee of reaching the optimal weight vector, in a reasonable number of iterations, empirical evidence suggests that the pocket algorithm gives good results. The ratchet check is expensive if there are many samples, but needs to be invoked less frequently as the quality of the solution in the pocket improves. This suggests the alternative of using the ratchet only in later stages of computation, after several iterations with the training data have been conducted and a reasonably good solution has been moved into the pocket. Connections among units are specified by projections. Projections may be from any pool to any higher numbered pool; since the bias pool is pool(1) it may project to any other pool, although bias projections to input pools will have no effect since activations of input units are clamped to the value specified by the external input. Projections from a layer to itself are not allowed. Weights in a projection can be constrained to be positive or negative. These constraints are imposed both at initialization and after each time the weights are incremented during processing. These are typically 0's and 1's but may take any real value. Next, activations are computed. For each non input pool, the net inputs to each unit are computed and then the activations of the units are set.

7. CONCLUSION

In summary, a neural network is presented with a pattern on its input nodes, and the network produces an output pattern based on its learning algorithm during the training phase. Once trained, the neural network can be applied to classify new input patterns. This makes neural networks suitable for the analysis of gene expression patterns, prediction of protein structure, and other related processes in bioinformatics. According to different users, it may produce the same value but totally mismatch of iterations because of randomly chosen value of input neurons. One possibility for future work is to update the system, so that it can read the past stock data automatically from the web. In this way the system will become Internet ready for predicting any stock market and is ready at any time. In this way the system can eventually become Internet ready to be used anywhere in the world at any time. It is also possible to make the fuzzy neural Web-based stock prediction system as a commercial application by updating such that it gives more user-friendly functionality and by giving more valuable information to the users on palm machine.

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PROBABILITY BASED APPROACH TO RECOGNIZE EMAIL SPAM

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Abstract **-** Email refers to Electronic mail, consists of messages which are sent and received using the internet. E-mail messages are usually encoded in ASIB XLCII text. You can also send non-text files, such as graphic images and sound files, as attachments sent in binary streams. E-mail was one of the first uses of the Internet and is still the most popular use. A large percentage of the total traffic over the Internet is e-mail. E-mail can also be exchanged between online service provider users and in networks other than the Internet, both public and private. But today email spam is a very popular term. The unwanted emails which are residing in the inbox are known as spam mails or junk mails. There are many reasons for sending spam but commonly people use spam for attacks such as viruses, malware, Trojan horse etc. In this Paper we introduce an approach which is used to filter emails and block spams with the help of techniques which has the probability approach to recognize this type of email spams.

Keywords: *Case-Based Approach, Case-Based Reasoning, Spam Filtering, Checksum-based filtering, Collaborative filters, Rule-based filtering, Competence based editing.*

I. INTRODUCTION

Email consists of messages which are sent and received using the Internet. While there are many different email services available that allow you to create an email account and send and receive email and attachments, we have chosen to focus this class on the services available through Gmail and Yahoo! Mail because they are free and are two of the more popular email services available.[7]

ADVANTAGES OF EMAIL

- E-mail is a fastest communication method. Most messages are delivered within minutes – sometimes seconds – around the world without the inconvenience and cost of using a postal service. In fact, postal service is often referred to as "snail mail" by email users.
- While the nature of email is informal, its efficiency is an excellent substitute for telephone conversations.
- The sender and the receiver don't have to be working at the same time. Email avoids problems such as telephone tag or trying to contact someone in a different time zone.
- Email makes it easy to keep a record of your communication. You can save and refer to later copies of the emails you send as well as those you receive.
- You can reach a lot of people at once. It is possible to send one message to hundreds of recipients at once, or you can send a private message to one individual.[15]

DISADVANTAGES

- Junk Mail (also referred to as spam). This is as annoying in email as it is with traditional mail. Most email services now filter incoming mail and sort email messages that are most likely advertisements or scams into a folder called "spam."
- Friendly spam. Try not to forward unnecessary messages to friends who may not appreciate hearing the latest list of "Top Ten Things…"
- Email messages can be passed on to others. You should always count on the possibility of your message ending up in the inbox of someone it wasn't intended for. [15]

1.1 EMAIL SPAM

Most of us receive large amounts of unsolicited commercial email, commonly called "spam". The amount of spam being carried on the internet is far more than an annoyance. It is costing you time and money. Lots of space in your mailbox is occupied by these junk mails. Sometimes it eats up your valuable space so that the genuine mails are bounced back to the sender if the whole lot of space is occupied by the junk mails. Hence there comes a necessity to filter out those junk mails from your mailbox.

1.1.1 How spam affect to the normal e-mail communication?

Spam affects the normal email communications in many ways. The spam puts unnecessary load on the network traffic. It is not possible to reduce this load anyway. Moreover if you get lot of spam in your inbox it takes a lot of time to clear those junk emails. This takes away lot of your precious time in clearing your inbox. There is need to search your inbox if you are to reply to some important email immediately. [14]

1.1.2. How to recognize a typical spam?

Spams are being sent out in a clever manner as days pass out. Some of the easy ways to identify a spam are to look for the following signs in the email that is sent to your inbox. The subject line of the emails would be very bad and they mostly have

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grammatical errors and spelling errors. This is clearly an indication of a spam. Some junk letters in an inappropriate combination would be seen in the subject line. An example of this would be something like "FW: FA: STE: RE: CT: US Temucut". The words in the subject line may not be connected and it may be irrelevant. Sometimes the subject lines include some user id and password requesting you to go to some website. Some of the spams would have attachments that are not intended for you. If you download these attachments and open those in your system the system may behave erratically. There is a possibility that the attachments may have some virus or worms in them, which may send out sensitive information from your system to somebody in the world. The best way to deal with this type of spam is to simply delete the emails that are not for you, without even opening it. It is better to have anti-virus software installed and updated in your system. Never open the attachments if you suspect it is a spam.[16]

1.1.3. Why do spammers send junk e-mails?
Spammers send junk emails to the users mostly to market some product or a service. Some of the spams are meant to reconfirm that the email address is a valid one, so that they can sell those addresses to someone else or to send some product information to you. There are many individuals who are contracted for this purpose of sending emails to the persons they have in the mailing list. There are direct marketers who genuinely market their products from a particular email address only. Some of the junk emails are from the websites you would have registered and requested some content or newsletter from them as a part of the registration process.[16]

II. BACKGROUND STUDY

Pádraig Cunningham1, Niamh Nowlan1, Sarah Jane Delany2, Mads Haahr1 "A Case-Based Approach to Spam Filtering that Can Track Concept Drift",2008 There are a few key benefits of a case-based approach to spam filtering. First, the many different sub-types of spam suggest that a local learner, such as Case-Based Reasoning (CBR) will perform well. Second, the lazy approach to learning in CBR allows for easy updating as new types of spam arrive. Third, the case-based approach to spam filtering allows for the sharing of cases and thus a sharing of the effort of labeling email as spam. In this paper we introduce a case-based approach to spam filtering and present preliminary evidence of the first two of these advantages.

Ahmed Obied "Bayesian Spam Filtering",2009 With the enormous amount of spam messages propagating on the Internet these days, anti-spam researchers and developers are trying to build spam filters to get rid of such unsolicited messages as accurately as possible. In this paper, I describe a machine learning approach based on Bayesian analysis to filter spam. The filter learns how spam and non-spam messages look like, and is capable of making a binary classification decision (spam or non-spam) whenever a new email message is presented to it.

Alan Gray and Mads Haahr, "Personalised, Collaborative Spam Filtering",2009 The state of the art sees content-based filters tending towards collaborative filters, whereby email is filtered at the MTA with users feeding information back about false positives and negatives. While this improves the ability of the filter to track concept drift in spam over time, such approaches make assumptions implicit in centralized spam filtering, such as that all users consider the same email to be spam. We present an architecture for personalized, collaborative spam filtering and describe the design and implementation of proof-of-concept, peer-to-peer, signature-based system based on the architecture. The evaluation is based on real-world users employing the system as their spam-filtering tool.

III. PROBLEM AND APPROACH

Which are used to recognize email spam and different types of approaches to filtering email spam?

3.1 Case-Based Approach to Spam Filtering that Can Track Concept Drift

Step1. Gather training sets of spam and non-spam mail messages.
Step2. Remove stop-words and stem the remaining words.
Step3. Generate vocabularies of words occurring in the spam and non-spam emails. Count the frequencies of each word in the training data and update the vocabularies with this count.
Step4. Sort the vocabularies based on the odds-ratio described below.
Step5. Select the top l terms (typically 40) from each vocabulary to be part of the feature representation.
Step6. Augment this feature list with some features (currently 6) extracted from the mail header.
The odds-ratio is calculated as follows:

$$OR(w, c_i) = \frac{P(w \mid c_i) \times [1 - P(w \mid \bar{c}_i)]}{[1 - P(w \mid c_i)] \times P(w \mid \bar{c}_i)}$$

Where $P(w|c_i)$ is the probability of word w occurring in category (i.e. spam or non-spam) c_i. When a word does not occur in a category the associated probability is assigned a small fixed value so that the odds-ratio can still be calculated. Words that are equally likely to occur in spam and non-spam have an odds-ratio close to 1 while words that are indicative of a category have a value greater than one. Thus the feature selection process described in Steps 4&5 above selects the top l

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features predictive of spam and the top m features predictive of non-spam. So each mail message is represented by a feature vector of length 1+m+n in the classification process (n is the number of features extracted from the header). [7]

3.2 Spam Filtering with Naive Bayes

From Bayes' theorem, the probability that a message with vector $\vec{x} = (x_1,...,x_m)$ belongs in category c is:

$$p(c \mid \vec{x}) = \frac{p(c) \cdot p(\vec{x} \mid c)}{p(\vec{x})}.$$

Since the denominator does not depend on the category, NB classifies each message in the category that maximizes p(c).p($\vec{x}$|c). In the case of spam filtering, this is equivalent to classifying a message as spam whenever:

$$\frac{p(c_s) \cdot p(\vec{x} \mid c_s)}{p(c_s) \cdot p(\vec{x} \mid c_s) + p(c_n) \cdot p(\vec{x} \mid c_n)} > T,$$

with T=0.5, where c_n and c_s denote the ham and spam categories. By varying T, one can opt for more true negatives (correctly classified ham messages) at the expense of fewer true positives (correctly classified spam messages), or vice-versa. The a priori probabilities p(c) are typically estimated by dividing the number of training messages of category c by the total number of training messages. The probabilities p($\vec{x}$|c) are estimated differently in each NB version.

$$p(\vec{x} \mid c) = \prod_{i=1}^{m} p(t_i \mid c)^{x_i} \cdot (1 - p(t_i \mid c))^{(1-x_i)},$$

and the criterion for classifying a message as spam becomes:

$$\frac{p(c_s) \cdot \prod_{i=1}^{m} p(t_i \mid c_s)^{x_i} \cdot (1 - p(t_i \mid c_s))^{(1-x_i)}}{\sum_{c \in \{c_s, c_n\}} p(c) \cdot \prod_{i=1}^{m} p(t_i \mid c)^{x_i} \cdot (1 - p(t_i \mid c))^{(1-x_i)}} > T,$$

where each p(t|c) is estimated using a Laplacean prior as:

$$p(t \mid c) = \frac{1 + M_{t,c}}{2 + M_c}, \qquad [2]$$

3.3.1 Checksum-Based Filtering

Checksum-based filter exploits the fact that the messages are sent in bulk, that is that they will be identical with small variations. Checksum-based filters strip out everything that might vary between messages, reduce what remains to a checksum, and look that checksum up in a database which collects the checksums of messages that email recipients consider to be spam (some people have a button on their email client which they can click to nominate a message as being spam); if the checksum is in the database, the message is likely to be spam.

3.3.2 Rule-Based Filtering

Content filtering techniques relied on the specification of lists of words or regular expressions disallowed in mail messages. Thus, if a site receives spam advertising "herbal care", the administrator might place these words in the filter configuration. The mail server would thence reject any message containing the phrase.

Header filtering is the means of inspecting the header of the email, the part of the message that contains information about the message. Spammers will often spoof fields in the header in order to hide their identities, or to try to make the email look more legitimate than it is; many of these spoofing methods can be detected. Also, headers that violate the RFC 2822 standard on how the email header is to be formed are frequently rejected.

Disadvantages of filtering are threefold: First, it can be time-consuming to maintain. Second, it is prone to false positives. Third, these false positives are not equally distributed: since content filtering is prone to reject legitimate messages on topics related to products frequently advertised in spam. A system administrator who attempts to reject spam messages which advertise mortgage refinancing, credit or debt may inadvertently block legitimate e-mail on the same subject. [12]

3.3.3 Country-Based Filtering

Some e-mail servers expect to never communicate with particular countries from which they receive a great deal of spam. Therefore, they use country-based filtering - a technique that blocks e-mail from certain other countries such as India. This technique is based on country of origin determined by the sender's IP address rather than any trait of the sender.[8]

3.3.4 Statistical Content Filtering

Statistical filtering, once set up, requires no maintenance instead, users mark messages as spam or non-spam and the filtering software learns from these judgments. Thus, a statistical filter does not reflect the software author's or administrator's biases as to content, but it does reflect the user's biases as to content; a biochemist who is researching herbal oil won't have messages containing the word "Herbal oil" flagged as spam, because "Herbal oil" will show up often in his or her legitimate messages. Spam emails containing the word "Herbal oil", however, do get filtered because of their unique content compared to legitimate messages. A statistical filter can also respond quickly to changes in spam content, without administrative intervention. Statistical filters should also look at message headers thereby considering not just the content but also peculiarities of the transport mechanism of the email. Spammers have attempted to fight statistical filtering by inserting many random but valid "noise" words or sentences into their messages while attempting to hide them from view, making it more likely that the filter will classify the message as neutral. Attempts to hide the noise words include setting them in tiny font or the same colour as the background. However, these noise

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countermeasures seem to have been largely ineffective. Software programs that implement statistical filtering include Bogofilter, DSPAM, SpamBayes the e-mail programs Mozilla and Mozilla Thunderbird, Mailwasher, and later revisions of SpamAssassin. Another interesting project is CRM114 which hashes phrases and does bayesian classification on the phrases. There is also the free mail filter POPFile which sorts mail in as many categories as you want (family, friends, co-worker, spam, whatever) with bayesian filtering.

3.3.5 Collaborative Filters

Collaborative content filtering takes a community-based approach to fighting spam by collecting input from the millions of email users around the globe. Users of these systems can flag incoming emails as legitimate or spam and these notations are reported to a central database. After a certain number of users mark a particular email as junk, the filter automatically blocks it from reaching the rest of the community's inboxes. When a collaborative content filtering system involves a large, active user base, it can quickly quell a spam outbreak, sometimes within a matter of minutes. One potential downside to the collaborative-content method is that if a group of spammers mobilize in large numbers and pretend to be legitimate users of the system, they could skew results by falsely labeling spam emails as legitimate messages.[5]

3.3.6 challenge/response system

Filters that use a challenge/response system block undesirable emails by forcing the sender to perform a task before their message can be delivered. For instance, if you send an email to someone who's using a challenge/response filter, you'll likely receive an email right back that asks you to visit a Web page and enter the code displayed there into a form. If you successfully complete this task, your email (and all future emails) will be delivered to the recipient. If you don't complete the challenge after a certain time period, the message is rejected. This system works to fight spam because the "challenge" is typically only one that a human can solve. Spammers usually rely on automated mailing programs to send out millions of emails at once, and they rarely check to see what emails come back in response. And even if they did see a challenge message, they aren't likely to respond and risk revealing themselves as a spammer.

However, challenge/response filters might also block email newsletters you subscribe to, as these messages are typically sent by automated programs. Another downside is that some of your organization's constituents may not take the time to complete the challenge or may not understand the challenge email, meaning that their messages will not reach the recipient. And there's always the slight chance that if both the sender and recipient are using challenge/response systems, their anti-spam applications will continue to challenge each other, locking the email in an undeliverable loop.[10]

IV. METHODOLOGY ADOPTED

4.1 Case Based Spam Filtering With Machine Learning

In this we explain the Case base filtering by one figure 1.1 which is given below. In this figure the Mail User Agent (MUA) is allowed the user to labeled the messages as spam and non-spam. There is a Case Retention Process that maintains a personalized case base of spam. In this process, select the appropriate features to represent spam and non-spam messages and also select the cases which give the best coverage. Finally there is a spam classifier that intercepts the download of email and tags the spam.

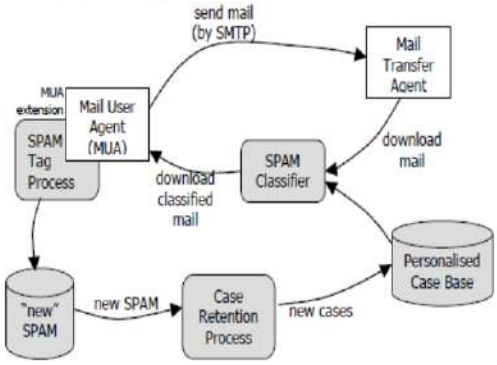

Figure 1.1 components of a Case-Based spam filtering system

It is clear that Naive Bayes is popular classification mechanism for spam filtering. This is probably due to its ability to deal with high dimension data. A spam classifier can use words in the text augmented with features extracted from header and aggregated features from the text. In addition to its advantages of a local learner in spam filtering, the case-based approach also has advantages for concept drift because it is a lazy learner. There are two situations in which case based spam filter can be retrained: Full Retraining and Continuous Retraining.

The process of identifying the disposition of a presented text into a particular category is known as text classification. In this we implemented a statistical text classifier (filter) in Vb.Net that is based on Bayesian analysis. The filter classifies an email message into one of two categories: spam or non-spam. I used a supervised learning approach to enable the filter to build a history of what spam and non-spam messages look like. Give two classes C=<C1 = spam, C2=non-spam> and features f_1, f_2, ..., f_n, the probability that these features belong to a certain class using naive Bayesian can be expressed as follows:

$$P(C \mid f_1, f_2, \ldots, f_n) = \frac{P(C \mid f_1, f_2, \ldots, f_n \mid C)P(C)}{P(f_1, f_2, \ldots, f_n)}$$

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Assuming conditional independence, one can compute P(f1, f2, ..., fn|C) as follows:

$$P(f_1, f_2, ..., f_n \mid C) = \prod_{i=1}^{n} P(f_i \mid C)$$

To classify an email message as spam, one can check if it exceeds a specific
Threshold:

$$\frac{P(C_1 = spam \mid f_1, f_2, ..., f_n)}{P(C_2 = non-spam \mid f_1, f_2, ..., f_n)}$$

4.2 Feature Extraction

The feature extractor in the filter is used to extract features $v_j = f_1, f_2, f_3, ..., f_n$ from an email message and construct feature vectors $V =< v_1, v_2, v_3, ..., v_i >$ that can be used in the classification phase. A feature can be anything in an email message. It can be a word, a phrase, a number, an HTML tag, etc. The way the features are represented can affect the filter's accuracy to some extent. An email message contains two parts: a header and a body. The header consists of fields usually including at least the following:

- From: This field indicates the sender's email address.
- To: This field indicates the receiver's email address.
- Date: This field indicates the date and time of when the message was sent.
- Subject: This field indicates a brief summary of the message's content.
- Received: This field indicates the route the message took to go from the sender to the receiver.
- Message-ID: This field indicates the ID of the message. Every email message has a unique ID at a given domain name: id@senders-domain-name.

On the other hand, the body of an email message contains the actual content of the message. The header and the body of an email message is separated by an empty line. To extract features from an email message, I do the following:

1. Parse an email message and extract the header and the body parts.
2. Remove the fields from the header of the message since they appear in every email message.
3. Extract features from the header by tokenizing the header using the following delimiter: \n\f\r\t\ /&%# {}[]! +=-() “”*?:;<>
4. Extract features from the body by tokenizing the body using the following delimiter: \n\f\r\t\ . /&%# {}[]! +=-() “”*?:;<>
5. Ignore features of size strictly less than 3 digits.

To store the features in the training phase, I use a hash table of nodes. Each node stores the following information:

- Number of occurrences in spam messages (initialized to 0).
- Number of occurrences in non-spam messages (initialized to 0).
- Probability (initialized to 0).

Every time a feature is extracted, I check if the email is spam or non-spam. If it is spam then the number of spam occurrences is incremented by one. Otherwise, if it is non-spam then the number of non-spam occurrences is incremented by one. After extracting all the features from the training set and filling the hash table with such features, I start enumerating through the elements of the hash table to compute the probability for each feature. To compute the probability P for a feature f, I use the following formula:

$$P_f = \frac{\frac{s}{t_s}}{\frac{s}{t_s} + \frac{kn}{t_n}}$$

s is the number of occurrences of feature f in spam messages, t_s is the total number of spam messages in the training set, n is the number of occurrences of feature f in non-spam messages, and t_n is the total number of non-spam messages in the training set. k is a number that can be tuned to reduce false positives by giving a higher weight to number of occurrences of non-spam features.

V. CONCLUSION

More than half of all email traffic we see on the Internet these days is spam. Although a number of anti-spam techniques have been used to counter spam, none of these techniques have the potential to deal with the way spam evolves over time except the anti-spam techniques that are based on machine learning approaches. These techniques are essentially text classifiers but instead of classifying a given text into different categories, they classify a given text (email message) into two categories (spam or HAM). In this Paper, a machine learning approach based on Bayesian analysis to filter spam. The filter learns of what spam and HAM messages look like and can make binary classification decisions (spam or HAM) based on what it has learned. The filter does not require any heavy maintenance.

Contribution to spam filtering - The main case-based spam filtering application that learns from new examples of spam and legitimate email. As a lazy, local learner CBR offers distinct advantages over alternatives eager approaches to spam filtering such as naive Bayes or support vector machines, approaches that are more common in commercial filters. It provides capabilities to learn seamlessly without the need for a separate process. Also, the fact that spam is a diverse concept makes CBR, a local learner, an appropriate choice.

Contribution to machine learning - Our objective in this Paper was the application of instance-based learning to handle concept drift. We chose the domain of spam filtering and demonstrated that spam filtering is classification problem with

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significant concept drift. Our most significant contribution to machine learning in this thesis is the development of a case-base maintenance strategy that can handle concept drift in spam filtering. We presented in this Paper a new case-editing technique; Competence based editing (CBE). It has two stages, a noise reproduction phase called Blame Based Noise Reduction and a redundancy elimination phase called Conservative Redundancy Reduction.

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Role of machine learning in software engineering

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***Abstract*—Learning is the construction and revision of a model in response to observations of the real world. Human behavior is about learning from experience whereas machines behavior is about learning from data. Learning is what gives flexibility to adapt and accept to new circumstances and learning new tricks to handle them. This is what makes learning the most useful process to adjust with the situations. The process of learning not only affects human adjustability, rather, is concerned with intelligence factor of machines. The art of learning and adapting the new situations and then modeling and implementing them in respective systems, is the process of machine learning. The role of machine learning in the process of software engineering is evolutionary to meet the manipulated routine demands of customers regarding the real need of evolutionary and innovative software.**

I .INTRODUCTION

Machine Learning is the study of how to build computer programs that improve their performance at some task through experience. The hallmark of machine learning is that it results in an improved ability to make better decisions. Machine Learning usually refers to the changes in system that performs tasks associated with artificial intelligence. Such tasks involve recognition, diagnosis, planning, control, prediction etc. Machine learning algorithms have proven to be of great practical value in a variety of application domains. There are some broad categories of machine learning process to be applied as-

A. Supervised Learning

Supervised learning is the technique of learning that deals with learning a target function from labeled examples of previous study. In it, a set of training examples with correct responses are provided and the various logic schemes realizes to generate correct responses for given possible input values.

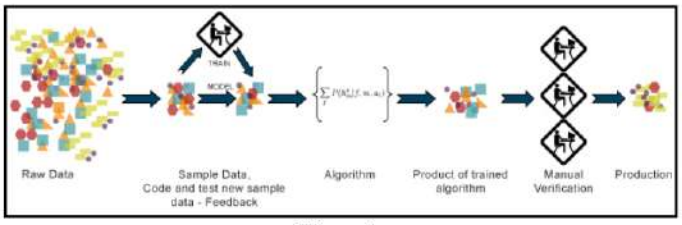

Figure-1

Figure-1 depicts complete learning process of default scheme of supervised learning methodology.

B. Unsupervised Learning

Unsupervised learning is the technique to learn patterns and related associated attributes from a given set of objects without classified labels. In it, correct responses are not provided rather various algorithmic logics try to identify similar patterns between the inputs.

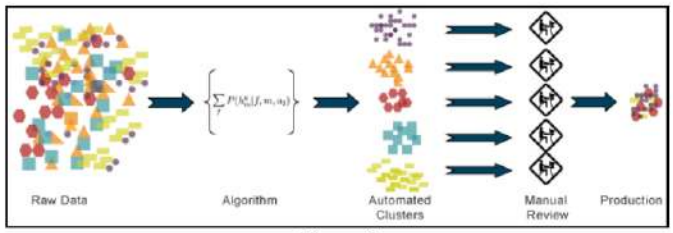

Figure-2

Figure-2 depicts complete learning process of default scheme of unsupervised learning methodology.

C. Reinforcement Learning

It is in between learning process of supervised and unsupervised learning. It is used to describe a control policy through effective environment reinforcement.

Despite of learning methods, there are various algorithmic approaches of machine learning that can be applied to various production tasks of products, processes and resources in optimized manners. Basic approaches and algorithmic methods used in machine learning are –

1. Decision Tree Learning
2. Association Rule Learning
3. Neural Networks
4. Inductive Logic Programming
5. Support Vector Machines
6. Clustering
7. Bayesian Networks
8. Generic Programming
9. Generic Algorithms
10. Reinforcement Learning

Some machine learning systems eliminate the need of human intervention in data analysis while other adopts a collaborative approach of human and machine.

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II. MACHINE LEARNING AND SOFTWARE ENGINEERING

To meet the challenge of developing and maintaining large and complex software systems in a dynamic and changing environment, machine learning methods have been playing an increasingly important role in many software development and maintenance tasks. Many evolutionary or incremental improvements have been made or proposed with each attempting to address certain aspects of essential difficulties. The application of Artificial Intelligence techniques to software engineering has produced some encouraging results. As a subfield of AI, machine learning deals with issue of how to build computer programs that improve their performance at some task through experience. The field of software engineering turns out to be a fertile ground where many software development and maintenance tasks could be formulated as learning problems and approached in terms of learning algorithms. Machine learning algorithms offer a viable alternative and complement to the existing approaches to many software engineering issues. There is related and emerging area of research under the umbrella of computational intelligence in software engineering. Research in this area utilizes fuzzy sets, neural networks, genetic algorithms, genetic programming and rough sets to tackle software development issues.

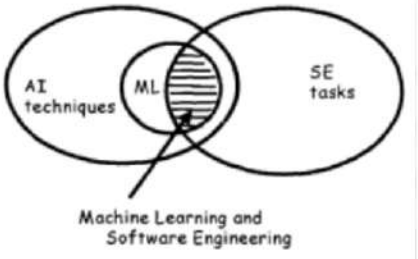

Figure-3

To better use machine learning methods as tools to solve real world software engineering problems, one should have clear understanding of both the problems and tools & methods utilized. Since many SE development or maintenance tasks rely on some function to predict, estimate, classify, diagnose, discover, acquire, understand, generate or transform certain qualitative or quantitative aspects of software artifact or software process, application of machine language to software engineering boils down to how to find (through the learning process) such a target mapping or modeling function that can be utilized to carry out SE tasks.

A. Target Modeling Functions

Target functions are the desired modeling functional equations to be achieved as final point. It can be represented in different language formalisms (e.g. decision trees, bit strings or rules, conjunctions of attribute constraints etc.). When a target function is not explicitly defined, the learner can generate its value for given input queries and is said to be implicitly defined. Based on its output, a target function can be utilized for SE tasks that fall under the categories of binary classification, multi-value classification and regression. Evaluating a target function focuses on many considerations - predictive accuracy, interpretability, statistical significance, information content and trade-off between its complexity and degree of fit to data.

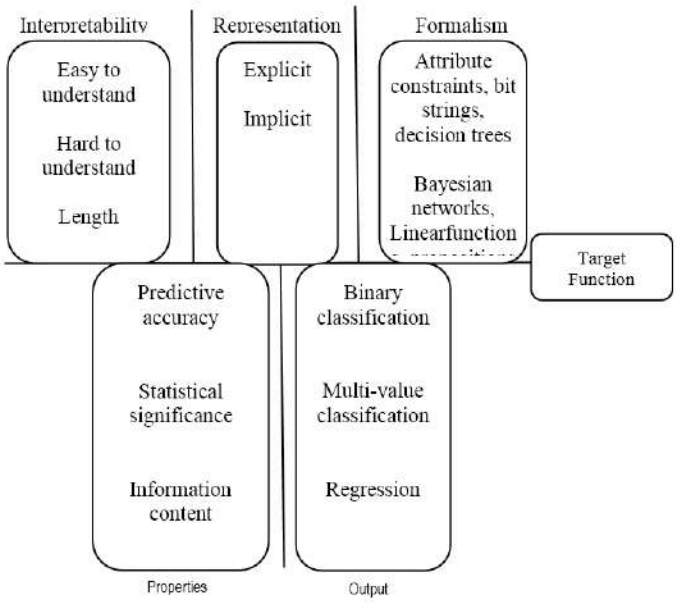

Figure-4

B. Search and Bias

There are stable and unstable learning algorithms depending on sensitivity to changes in the training data. For unstable algorithms, small change in training data will result in algorithms generating significantly different output functions. On the other hands, stable algorithms are immune to small changes in data.

C. Prior or Background Knowledge

Prior knowledge about the problem domain plays a key role in many learning methods. A major motivation role played by machine learning in this context is due to advantage of stochastic learning (Bayesian learning) and inductive logic programming is their ability to utilize background knowledge from problem domain in learning algorithm.

III. APPLICATION OF MACHINE LEARNING IN SOFTWARE ENGINEERING TASKS

In software engineering, there are three categories of entities, named Processes, Products and Resources. There are internal and external attributes for entities of aforementioned categories. Internal attributes describe an entity itself whereas external attributes characterize the behavior of entities. SE tasks that lend themselves to ML applications include:

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1. Predicting or estimating both internal and external attributes of entities (processes, products and resources).
2. Transforming products to achieve some desirable attributes.
3. Reusing products or processes.
4. Enhancing processes.
5. Managing products with full on testing procedures applications.

On the explanation edge, the role of machine learning is unbeatable in each software engineering task which defines the key role of each ML activity in concerned SE task as:

A. Prediction and Estimation

In it, machine learning methods are used to predict or estimate measurements for either internal or external attributes of entities. These include – software quality, software size, software development cost, maintenance task effort, software reliability, defect, reusability and testability of program modules.

Software Engineering Task	Machine Learning Method
Software quality	GP, NN, CBR, DT, CL
Software size	NN, GP
Software development cost	DT, CBR, BL
Maintenance task effort	NN, DT
Software reliability	NN
Software defect	BL
Software reusability	DT
Testability of program modules	NN

Table -1

B. Discovery of essential model property

Various machine learning methods are used to discover useful information about software entities. The state of the program variables at a given point in the execution represents positive examples for the condition associated with point in the program. In it, neural network method under machine learning is used to identify objects in procedural programs as an effort to facilitate many maintenance (reuse, understanding) activities.

C. Transformation

In it, the method of generic programming is used that can transform a serial program into functionally parallel programs. The functional identical property between input and output of he transformation can be proven which greatly enhances the opportunities of the system being utilized in commercial environments.

Software Engineering Task	Machine Learning Method
Transform serial program to parallel programs	GP
Improve software modularity	NN, CBR
Mapping object oriented applications to heterogeneous distributed environment	GA

Table -2

D. Generation and Synthesis

In it, a test case generation method is applied that is ILP. An appropriate test set is generated as a result of inductive learning of programs from finite set of input/output programs. A GP based approach is used to select and evaluate test data. Also, GA is used to help in generation of test data for various program paths.

Software Engineering Task	Machine Learning Method
Test case / data	ILP, GA, GP
Test resource	GA
Project management rules	GA, DT
Design schemas	IBL
Data structures	GP
Project management schedule	GA

Table -3

E. Requirement Acquisition

In it, a CL method is used to support scenario based requirement gathering and acquisition of various concerned resources. This method is based on learning algorithm that takes scenario as examples and generates goal specifications as temporal rules.

Software Engineering Task	Machine Learning Method
Deriving system goals specification	CL
Extraction software specification	ILP
Acquiring knowledge for specification	ILP, NN

Table -4

In summary, all the software engineering tasks can be implemented using various machine learning methods that can be depicted using following methodology chart schema as :

	NN	IBL CBR	DT	GA	GP	ILP	EBL	CL	BL	AL	IAL	RL	EL	SVM
Prediction	√	√	√	√	√	√		√	√					
Discovery	√					√	√		√					√
Transformation	√	√		√	√									
Generation		√	√	√	√	√	√	√		√				
Reuse		√	√	√			√							
Acquisition	√		√			√	√	√						
Management		√												

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The application of machine learning techniques to software engineering has produced ever encouraging results to build computer programs that improve their performance at some task through experience only. This software development paradigm enhancement will enable software engineering to become the discipline of capturing and automating currently undocumented domain and design knowledge.

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Routing protocols of Manets: a survey

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***Abstract*—MANET is a self organized and self configurable network where the mobile nodes move arbitrarily. Routing is a critical issue in MANET and hence the focus of this paper along with the performance analysis of routing protocols. The growing interest in mobile ad hoc network technique has resulted in many routing protocol proposal. The objective of this paper is to create taxonomy of the mobile ad hoc routing protocols, and to survey and compare representative examples for each class of protocols. Ad hoc networks are characterized by multi-hop wireless connectivity, frequently changing network topology and the need for efficient dynamic routing protocols. We compare the performance of two prominent on-demand routing protocols for mobile ad hoc networks — Dynamic Source Routing (DSR)and Ad Hoc On-Demand Distance Vector Routing (AODV).**

***Index Terms*—MANET, Q0S, Routing, Routing protocols, Time Complexity.**

I. Introduction

In an ad hoc network, mobile nodes communicate with each other using multi-hop wireless links. There is no stationary infrastructure; for instance, there are no base stations. Each node in the network also acts as a router, forwarding data packets for other nodes. A central challenge in the design of ad hoc networks is the development of dynamic routing protocols that can efficiently find routes between two communicating nodes. The routing protocol must be able to keep up with the high degree of node mobility that often changes the network topology drastically and unpredictably. Such networks have been studied in the past in relation to defense research, often under the name of packet radio networks. Recently there has been a renewed interest in this field due to the common availability of low-cost laptops and palmtops with radio interfaces. Interest is also partly fueled by growing enthusiasm in running common network protocols in dynamic wireless environments without the requirement of specific infrastructures. A mobile ad hoc networking (MANET) working group [13] has also been formed within the Internet Engineering Task Force (IETF) to develop a routing framework for IP-based protocols in ad hoc networks.

Routing approaches in Mobile Ad Hoc Network

- In ad hoc mobile networks, routes are mainly multi hop because of the limited radio propagation range and topology changes frequently and unpredictably since each network host moves randomly. Therefore, routing is an integral part of ad hoc communications.
- Routing is to find and maintain routes between nodes in a dynamic topology with possibly uni-directional links, using minimum resources.

II. Taxonomy for Routing Protocols in MANET

A routing protocol is needed whenever a packet needs to be transmitted to a destination via number of nodes and numerous routing protocols have been proposed for such kind of ad hoc networks. These protocols find a route for packet delivery and deliver the packet to the correct destination. The studies on various aspects of routing protocols have been an active area of research for many years. Many protocols have been suggested keeping applications and type of network in view. Basically, routing protocols can be broadly classified into two types as **(a)** Table Driven Protocols or Proactive Protocols and **(b)** On-Demand Protocols or Reactive Protocols .

- Table Driven or Proactive Protocols: In Table Driven routing protocols each node maintains one or more tables containing routing information to every other node in the network. All nodes keep on updating these tables to maintain latest view of the network. Some of the existing table driven or proactive protocols are: DSDV [6], [19], DBF [7], GSR [12], WRP [23] and ZRP [12], [13].
- On Demand or Reactive Protocols: In these protocols, routes are created as and when required. When a transmission occurs from source to destination, it invokes the route discovery procedure. The route remains valid till destination is achieved or until the route is no longer needed. Some of the existing on demand routing protocols are: DSR [8], [9], AODV [4], [5] and TORA
- Hybrid Routing Protocols: Purely proactive or purely reactive protocols perform well in a limited region of network setting. However, the diverse applications of ad hoc networks across a wide range of operational conditions and network configuration pose a challenge for a single protocol to operate efficiently. Researcher's advocate that the issue of efficient operation over a wide range of conditions can be addressed best match these operational conditions [5]. Representative hybrid routing protocols include: Zone Routing Protocol (ZRP) and Zone-based Hierarchal Link state routing protocol (ZHLS).

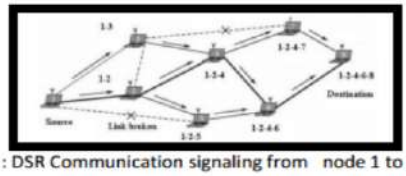
III. Description of Protocols

A. DSR

The key distinguishing feature of DSR [2, 11] is the use of source routing. That is, the sender knows the complete hop-by-

hop route to the destination. These routes are stored in a route cache. The data packets carry the source route in the packet header. When a node in the ad hoc network attempts to send a data packet to a destination for which it does not already know the route, it uses a route discovery process to dynamically determine such a route. Route discovery works by flooding the network with route request (RREQ) packets. Each node receiving a RREQ rebroadcasts it, unless it is the destination or it has a route to the destination in its route cache. Such a node replies to the RREQ with a route reply (RREP) packet that is routed back to the original source. RREQ and RREP packets are also source routed. The RREQ builds up the path traversed across the network. The RREP routes itself back to the source by traversing this path backwards.

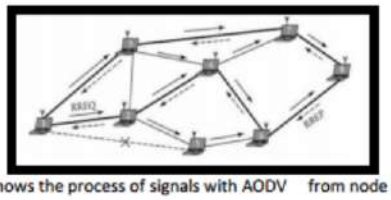
- The route carried back by the RREP packet is cached at the source for future use. If any link on a source route is broken, the source node is notified using a route error (RERR) packet. The source removes any route using this link from its cache. A new route discovery process must be initiated by the source, if this route is still needed. DSR makes very aggressive use of source routing and route caching. No special mechanism to detect routing loops is needed. Also, any forwarding node caches the source route in a packet it forwards for possible future use. Several additional optimizations have been proposed and have been evaluated to be very effective by the authors of the protocol [14], as described in the following. (i) Salvaging: An intermediate node can use an alternate route from its own cache, when a data packet meets a failed link on its source route.
- Gratuitous route repair: A source node receiving a RERR packet piggybacks the RERR in the following RREQ. This helps clean up the caches of other nodes in the network that may have the failed link in one of the cached source routes. (iii) Promiscuous listening: When a node overhears a packet not addressed to itself, it checks whether the packet could be routed via itself to gain a shorter route. If so, the node sends a gratuitous RREP to the source of the route with this new, better route. Aside from this, promiscuous listening helps a node to learn different routes without directly participating in the routing process.



: DSR Communication signaling from node 1 to node 8

Ad hoc On Demand Distance Vector (AODV) routing

The AODV is a reactive [3, 4] protocol derived from Dynamic Source Routing and DSDV and DSR it combines the advantages of both protocols. Its route discovery procedure is similar to DSR. When a node has a packet to send to a particular destination, if it does not know a valid route, it broadcasts a route request packet, by specifying the destination address. The neighbors without a valid route to the destination establish a reverse route and rebroadcast route request packet. The route maintenance is done by exchanging beacon packets at regular intervals. This protocol adapts to highly dynamic topology and provide single route for communication.



: shows the process of signals with AODV from node 1 to node 8.

To establish a connection, source node 1 searches in its table for a valid route to destination node 8. RREQ reaches the destination for the first time through path 1-2-4-6-8. The destination then issues a RREP packet to the source. After a while, the destination receives another RREQ, this time through path 1-3-7-8. The destination evaluates this path, and finds that path 1-3-7-8 is better, and then issues a new RREP packet, telling the source to discard the other reply. The advantage of AODV is it reduces control overhead. The connection setup delay is lower and provide loop free Routing. Periodic beaconing leads to unnecessary bandwidth consumption. It has high route discovery latency for large network scalability problem). Delay caused by route discovery process.

B. Associativity Based Routing (ABR)

The Associativity Based Routing (ABR) is a uniform, destination-based, reactive protocol. ABR uses end-to-end topology information in route selection, preferring routes that react long-lived associations. However, only destination-vectors are maintained during routing. When an intermediate node receives the request, it appends Route discovery is as follows: When a source has no route to a destination, it broadcasts a route request's ID to the route request and re-broadcasts it (silently ignoring duplicates). The associatively of each hop is accumulated in the route request. Routes with high threshold and aggregate associatively are considered superior, even if there are shorter routes. The destination sends a route reply back to the source along the selected route. Each intermediate node activates the appropriate forwarding information in its routing table. The route maintenance process is quite complex. Nodes downstream of the link failure send route error messages toward the destination, deleting invalid route entries. If the query fails to find a new partial route, the next node upstream is so informed and initiates a local request. If the process traverses too much of the distance back to the source, it is abandoned and a route error is sent to the source, which reinitiates the route discovery process. Consistent behavior is dependent on the most recent request suppressing earlier attempts. Fewer paths will break which reduces flooding (bandwidth). The advantage is in ABR a broken link is repaired locally, so the source node won't start a new path-finding-

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process when a broken link appears. Stability information's are only used during the route selection process. Sometimes the chosen path may be longer than the shortest path, because of the preference given to stable paths, which are not necessary. Local query broadcasts may result in high delays during the route repair.

C. QoS parameters in mobile ad hoc networks

The As different applications have different requirements, the services required by them and the associated QoS parameters differ from application to application. For example, in case of multimedia applications time, bandwidth requirement, power requirement, probability of packet loss, the variation in latency (jitter), Route acquisition Delay, Communication Overhead, Scalability are the key QoS parameters, whereas military applications have stringent security requirements. For applications such as emergency search and rescue operations, availability of network is the key QoS parameter. In WNs the QoS requirements are more influenced by the resource constraints of the nodes. Some of the resource constraints are battery charge, processing power, and buffer space.

- Time complexity is defined as the largest time that can elapse between the moment T when the last topology change occurs and the moment at which all the routers have final shortest path and distance to all other routers.
- Delay is the time elapsed from the departure of a data packet from the source node to the arrival at the destination node, including queuing delay, switching delay, propagation delay, etc. Jitter is generally referred to as variations in delay, despite many other definitions. It is often caused by the difference in queuing delays experienced by consecutive packets.
- Scalability: It is the ability of a computer application or product (hardware or software) to continue to function well when it (or its context) is changed in size or volume in order to meet a user need.
- Packet loss rate is the percentage of data packets that are lost during the process of transmission.

IV. COMPARISON OF ROUTING PROTOCOLS IN MOBILE AD HOC NETWORKS

Parameter	Table Driven(Proactive)	Demand Driven(Reactive)	Hybrid
Routing Structure	Flat and hierarchical structure	Mostly Flat	Hierarchical
Bandwidth requirement	High	Low	Medium
Power requirement	High	Low	Medium
Route acquisition delay	Lower	Higher	Lower for Intra-zone; Higher for Inter-zone
Control Overhead	High	Low	Medium
Communication Overhead	High	Low	Medium
Scalability	Up to hundred nodes	Up to few hundred nodes	Designed for up to 1000 or more nodes
Topology dissemination	Periodical	On-Demand	Both

On-Demand	TORA	DSR	AODV	ABR
Routing Structure	Flat	Flat	Flat	Flat
Overall complexity	High	Medium	Medium	High
Frequency of update transmission	Event driven	Event driven	Event driven	Periodically
Updates transmitted to	Neighbors	Source	Source	Source
Overhead	Medium	Medium	Low	High
Loop Free	Yes	Yes	Yes	Yes
Utilize hello messages	No	No	Yes	Yes
Multiple route support	Yes	Yes	No	No
Routing metric	Shortest path	Shortest path	Freshest & Shortest path	Associatively & shortest path & others

V. CONCLUSION

We have compared the performance of DSR and AODV, two prominent on-demand routing protocols for ad hoc networks. DSR and AODV both use on-demand route discovery, but with different routing mechanics. In particular, DSR uses source routing and route caches and does not depend on any periodic or timer-based activities. DSR exploits caching aggressively and maintains multiple routes per destination. AODV, on the other hand, uses routing tables, one route per destination, and destination sequence numbers, a mechanism to prevent loops and to determine freshness of routes. We used a detailed simulation model to demonstrate the performance characteristics of the two protocols. The general observation from the simulation is that for application oriented metrics such as delay and throughput, DSR outperforms AODV in less "stressful" situations, i.e., smaller number of nodes and lower load and/or mobility. AODV, however, outperforms DSR in more stressful situations, with widening performance gaps with increasing stress (e.g., more load, higher mobility). DSR, however, consistently generates less routing load than AODV. Mobile ad-hoc networks (MANETS) are expected to play an important role in the deployment of future wireless communication systems. Routing is an essential component of communication protocols in mobile ad hoc networks. The design of the protocols are driven by specific goals and requirements based on respective assumptions about the network properties or application area. Therefore, it is extremely important that these networks should be able to provide efficient quality of service (QoS) that can meet the vendor requirements. To provide efficient quality of service in mobile ad-hoc networks, there is a solid need to establish new architectures and services for routine network controls. The time delay is the main concern for QoS of routing protocols demanding that real time data be transmitted within a definite time interval. QoS support is essential for supporting time critical traffic sessions. In this chapter we have comparison of proactive and reactive and hybrid routing protocols based on significant QoS parameter like throughput, bandwidth, time complexity, Power requirement, Route acquisition delay, Control overhead, Routing Structure, Communication Overhead, Scalability etc. The survey tries to review typical routing protocols and reveal the characteristics and trade-offs.

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Segmentation in Devnagri script recognition

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Abstract— **An optical character recognition (OCR) is the process of converting scanned images of machine printed into computer readable codes. Character recognition systems can contribute tremendously to the advancement of the automation process and can improve the interaction between man and machine in many applications including post offices, defense organizations, office automation, cheque verification and a large variety of banking, business, data entry applications and commercial data processing applications. Recognition of Hindi (Devnagari) characters has been an area of research for many peoples and large numbers of research paper and reports have been published in this area**

This generalized way for developing OCR system of any script involves various phases that include preprocessing, segmentation, feature extraction & classification and Post processing. In this paper, these various phases are discussed in detail along with the techniques used.This paper describe mainly on segmentation phase of OCR which play very important role in the recognition of davnagri characters. The techniques used for segmentation of davnagri characters involve horizontal and vertical projection methods for separating characters.

OCR system has never achieved a 100% perfect recognition rate and has certain limitations

Key words: Devangari script, Preprocessing, Segmentation, Feature extraction, Classification,Post processing, OCR engine, Horizontal projection, Vertical projection, linear scanning.

I. INTRODUCTION

OCR is the acronym for Optical Character Recognition. A human eye can read the characters of any language written correctly by person or when it is printed. Making the computer do the same is called the problem of character recognition. This technology allows a machine to automatically recognize characters through an optical mechanism. OCR (optical character recognition) is the process of converting scanned images of machine printed or handwritten text or hand printed text into computer readable codes. Character recognition systems can contribute tremendously to the advancement of the automation process and can improve the interaction between man and machine in many applications including post offices, defense organizations, office automation, cheque verification and a large variety of banking, business, data entry applications and commercial data processing applications [4]. The main goal of OCR is to imitate the human ability to read in a very fast rate. The OCR technologies became so popular in middle of 1950 with the development of digital computers and improved scanning devices

II. Steps involves in developing general OCR

The process of OCR of any script can be categories as follows

a) Pre-processing
b) Segmentation
c) Feature Extraction
d) Classification
e) Post processing

a) Pre-processing

This stage takes digitized image (after scanning) as input, reduce noise and distortion, remove skew ness perform skeletonizing or thinning of the image and hence simplify the processing of remaining stages.

b) Segmentation

The segmentation stage take as input the page image and separate its different logical parts like lines of the paragraph, words of a line, characters of a word using vertical and horizontal projection methods.

c) Feature Extraction

This is the third stage of OCR. The feature extraction stage analyzes a text segment (character) and selects a set of features or descriptors that can be used to uniquely identify the text segment. The selection of proper set of feature is most important stage of OCR.

In most of the Indian language like Hindi and Punjabi, every character has certain features that distinguish it from another character. A good feature set containing discriminating information, which can distinguish one object from another object. Some of the features used for recognizing devanagri language are:

Presence of vertical side bar
Number of junction with headline
Presence of loop
No loop formed with headline
Number of endpoints and their location
And so on…

Every distinct feature has given a unique number. The features are used to design a tree classifier where the decision at each node of tree is taken based on presence/absence of a particular feature.

d) Classification

The classification stage is main decision-making stage of an OCR system and uses the features extracted in the previous stage to identify the text segment according to preset rules. One method use for character recognition is binary tree classifier. A

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binary tree classifier, based on presence/absence of some feature, separates most of the characters.

e) Post-Processing

The post-processing stage, which is the final stage, improves recognition by refining the decisions taken by the previous stages and recognizes words by using context. The objective of post processing is to correct errors or to resolve ambiguities in OCR results by using contextual information. In current commercial OCR systems, word-level post processing methods, such as dictionary look up, have been applied successfully.

III. Some properties of Devnagari Script

The devnagari script is derived from ancient bramhi script through transformation. Many Indian scripts also have the same origin and hence hey are quite similar in shape.

In devnagari script, there are eleven vowels and 38 consonant characters. In modern devnagari alphabet, they are called basic characters as shown in fig.1. The concept of upper and lower case character is absent in devnagari. From fig. 1, there are many characters that have a horizontal line at the upper part. This line is called headline. Some characters have a signature extended above the headline

Figure 1. Devnagari alphabet basic shape

A vowel following a consonant takes a modified shape, which depending on the vowel is placed to the right, top or bottom of the consonant. In devnagari, the modified characters are called matras. Only one modified shape can be attached to a consonant at a time. Fig 2 shows vowels, modified shapes and their attachments with a consonant character

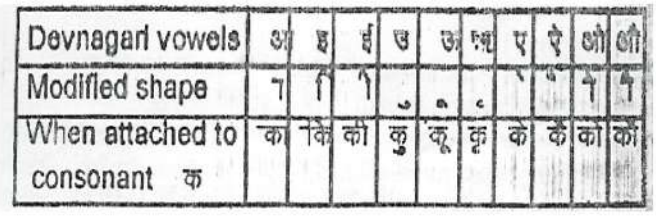

Figure 2. Vowel Modifiers (Matras)

A word in Devnagari script can be partioned into three zones. The upper zone denotes the region above the head line, the middle zone cover the portion that lies below the head line where the consonants are present. The lower zone represents the area below middle zone where modified characters can reside.

A majority of the characters have a horizontal line at the upper part. The characters of words are connected mostly by this line called head line and so there is no vertical inter-character gap in the letters of a word. The words are, however, separated with blank spaces.

IV. Segmentation of Devnagari script

The segmentation stage take as input the page image and separate its different logical parts like lines of the paragraph, words of a line, characters of a word. Text segmentation of a script proceeds in three stages: line segmentation, word segmentation and character segmentation. Line segmentation is defined as the process of extracting the individual lines of words from a document. Word segmentation is the process of extracting words from a given line. Character segmentation is the process of extracting the individual characters that constitute the word unit.

Horizontal projection of a document image is most commonly employed to extract the lines from the document. If the lines are well separated and not tilted, the horizontal projection will have well separated peaks and valleys [1]. These peaks and valleys can be detected using histogram which is computed by row-wise sum of pixels. These valleys are easily detected and used to determine the location of boundaries between lines. A text line can be found between two consecutives boundary lines as shown in the figure 3.

Figure 3. Histogram for line segmentation

There is need to identify different zones of a word. The upper zone can be separated from the middle zone of a text line by head line.

The middle zone can be separated from the lower zone of a text line using a technique that can be explained as follows. Consider an imaginary straight line say L that horizontally divides the text line region in to equal halves. Consider only component below L and connected to L. For each connected component below L, the lowermost pixel is labeled. The horizontal line which passes through maximum number of such

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labeled pixels is the separator line between the middle and the lower zone and is called the base line.

For Word segmentation, Vertical projection of a line image is employed in the extraction of words in a line, analogous to the process of line segmentation [2]. The document is scanned vertically and column wise sum of pixel for a line is calculated. In one vertical scan, if two or less black pixels(1) are encountered then the scan is denoted by zero(o) else the scan is denoted by number of black pixels. This is the way how vertical scanning histogram is constructed as shown in following figure.

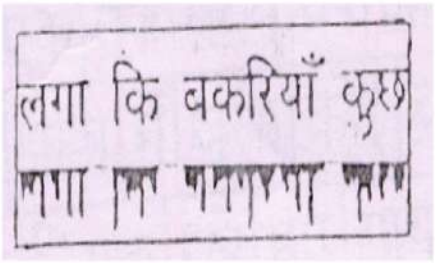

Figure 4. Histogram for word segmentation

Ifthe value of the pixels so calculated comes 0 for k1 consecutives columns then the midpoint of it is considered as boundary of a word. This is the way how consecutive two words are separated from each other. The value of k1 depend upon the height of text line segment

For Character segmentation we consider only the middle zone of text. As characters in a word are mostly connected through headline, Character segmentation from a word is a important task in Devnagari OCR. The technique used for character segmentation is linear scanning that ignores the head line by start scanning in the vertical direction from the lower most row of head line (noted earlier) and reach to the base line. If in linear scanning, we can reach to the base line without touching any black pixel(1) then this scan marks a boundary between two characters. This method is efficient for segmenting most of characters present in a word [7].

V. CONCLUSION

This paper describe scheme for segmented Devangari script by separating it into different logical parts like lines of the text using horizontal projection, words of a line using vertical projection by constructing histogram. Characters of a word are separated from words by using linear scanning method. By using the segmentation techniques that I have discussed in this paper, approximately 80% accuracy for recognizing devnagari machine printed characters can be achieved. However, for recognizing handwritten devnagari characters that may have the problem of touching character, the segmentation techniques discussed in this paper need to be modified.

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Text Segmentation of Machine printed Gurmuhki Script by G S lehal, Chandan singh

Software requirement specification of ATM system

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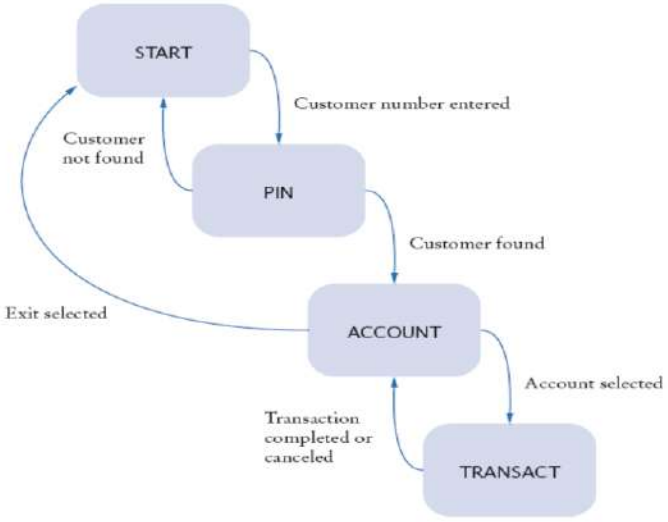
***Abstract*—: A common fundamental Predicate about many specification approaches is that programs are modeled as algebraic or model-theoretic structures. In this paper I have proposed formal reasoning about an Automated Teller Machine (ATM) as a safety-critical interface. The formal models of ATM will serve as a formal design paradigm of real-time software systems. Efforts are being made to make Model Theoretic approach as benchmark so that we can somehow minimizing downtime with increased throughput.**

***Index Terms*—: Software Engineering, design engineering, ATM, Formal Specification, correctness, FSM.**

INTRODUCTION

An ATM system is a real-time front terminal of automatic teller services with the support of a central bank server and a centralized account database. This paper models an ATM that provides money withdraw and account balance management services. The architecture of the ATM system, as shown in Fig. 1, encompasses an ATM processor, a system clock, a remote account database, and a set of peripheral devices such as the card reader, monitor, keypad, bills storage, and bills disburser.



Scope: This document describes the software requirements and specification for an automated teller machine (ATM) network. The document is intended for the customer and the developer (designers, testers, maintainers). The software supports a computerized banking network called My Bank. The network enables customers to complete simple bank Account services via automated teller machines (ATMs). The ATM identifies a customer by a cash card and password. It collects information about a simple account transaction (e.g., deposit, withdrawal, transfer, bill payment), communicates the Transaction information to the customer's bank, and dispenses cash to the customer. The banks provide their own software for their own computers. The My Bank software requires appropriate record keeping and security provisions. The software must handle concurrent accesses to the same account correctly

Product Perspective
The ATM network does not work independently. It works together with the banks' computers and the software run by the network's banks.

Communication interface
The ATMs communicate with the banking systems via a communication network.

Software interface
The messages sent via the communication network are specific to the target banking software systems.

Hardware interface
The software will run on an ATM computer.

Specific Requirements

The SRS should contain all of the software requirements and specification.

At a minimum, it should include descriptions of
all interfaces to the system
- Every input (stimulus) into the system
- Every output (response) from the system

All functions performed by the system
- Validity checks on inputs
- Relationship of outputs to inputs
- Responses to abnormal situations (e.g., Overflow, error handling)

Input and output definitions should be consistent among use cases, functional specifications, state machine diagrams, and UIs.

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External Interface:
Input and output definitions should be consistent among use cases, functional specifications, state machine diagrams, and UIs.

- External Interfaces
- Detailed descriptions of all inputs and outputs
- Name of input (or output)
- Description of purpose
- Source of input or destination of output
- Valid range, accuracy, and/or tolerance
- Units of measure
- Timing
- Relationships to other inputs/outputs
- Screen formats/organization
- Window formats/organization
- Data formats
- Command formats

Functional Requirements

- Use case descriptions
- Sequence diagrams
- Domain Model
- Functional Specifications
- State Machine model
- Constraints

Performance Requirements

- Number of terminals to be supported
- Number of simultaneous users to be supported
- Amount and type of information to be handled
- Number of transactions to be processed within a set time
- period
- Normal workload conditions
- Peak workload conditions

Life Cycle Model:

The software life cycle specifies the stages through which software goes from the time it's first conceived to the time it's retired from use. These stages typically include: analysis, design, implementation, testing and debugging, deployment, maintenance and retirement

Several software life-cycle models exist such as Waterfall models perform each stage once in succession Iterative models may repeat one or more stages several times throughout a product's life cycle.

During the analysis stage, systems designers focus on understanding the requirements document to produce a high level specification that describes *what* the system is supposed to do. The output of the design stage a design specification specifies clearly *how* the system should be constructed to satisfy these requirements

We present our own simplified design process

- A system is a set of components that interact to solve a problem.
- System structure describes the system's objects and their interrelationships.
- System behavior describes how the system changes as its objects interact with one another.
- Every system has both structure and behavior designers must specify both.

Future Scope

Formal methods can improve ATM operational specification design constraints. By selecting appropriate FSM System Engineer may somehow invent more accessible interface by minimizing downtime with increased throughput.

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Study of ZiFi - a Zigbee application

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***Abstract*— WiFi networks have enjoyed an unprecedent penetration rate in recent years. However, due to the limited coverage, existing WiFi infrastructure only provides intermittent connectivity for mobile users. Once leaving the current network coverage, WiFi clients must actively discover new WiFi access points (APs), which wastes the precious energy of mobile devices. Although several solutions have been proposed to address this issue, they either require significant modifications to existing network infrastructures or rely on context information that is not available in unknown environments. In this review paper, a system called ZiFi is studied that utilizes ZigBee radios to identify the existence of WiFi networks through unique interference signatures generated by WiFi beacons. A new digital signal processing algorithm called Common Multiple Folding (CMF) is used that accurately amplifies periodic beacons in WiFi interference signals. ZiFi also adopts a constant false alarm rate (CFAR) detector that can minimize the false negative (FN) rate of WiFi beacon detection while satisfying the user-specified upper bound on false positive (FP) rate.**

***Keywords*—Zigbee, Zi-fi (Zigbee-fidelity), Wi-Fi (Wireless fidelity), Digital Signal Processing.**

I. INTRODUCTION

In recent years, 802.11-based wireless LANs, also known as WiFi networks, have enjoyed an unprecedent penetration rate. In particular, they are increasing deployed to provide Internet access in mobile environments. However, due to the limited coverage, existing WiFi infrastructure is only capable of providing intermittent connectivity for the users with high mobility. WiFi-enabled devices (e.g., laptops, PDAs, and smart phones) must actively discover new WiFi access points (APs) once they leave the coverage of current network. However, this approach wastes the precious energy of mobile devices due to excessive listening and scanning operations of WiFi network interface cards (NICs). Several solutions have been proposed to address the a fore mentioned issue. The first approach utilizes a secondary low power radio that communicates with peer radios on WiFi APs to find connectivity opportunities or reduce the energy consumption of data transfers [2]. However, this approach requires significant modifications to existing network infrastructures. The second approach predicts the availability of WiFi based on context information. Cellular cell-tower information [11] or together with Bluetooth contact-patterns [10] have been used to improve WiFi prediction accuracy. However, such a context-aware approach requires extensive training based on historical information and hence is not feasible in unknown environments. In this paper,a system called ZiFi for discovering the availability of WiFi coverage for mobile users is studied. The design of ZiFi is motivated by the fact that low-power radios such as ZigBee and Bluetooth[17] often not only physically collocate with WiFi NICs but also share the same open radio frequency band with them. Leveraging the inter-platform interference caused by such coexistence, ZiFi enables ZigBee radios to identify the unique interference signatures generated by WiFi signals. As a result, a mobile device can use a ZigBee radio to detect the existence of WiFi APs in a purely passive manner, and only wakes up the WiFi NIC when WiFi connectivity is available. To capture WiFi interference signatures, ZiFi utilizes the received signal strength (RSS) indicator available on ZigBee-compliant radios. However, it is observed that the statistics of WiFi RSS samples, such as power magnitude[16][18], time duration, and inter-arrival gap, exhibit surprising resemblance with those of other RF sources, and hence provide little hint about the existence of WiFi. Motivated by this observation, ZiFi is designed to search for 802.11 beacon frames in RSS samples. Periodic beacon broadcasting is mandatory in WiFi infrastructure networks and hence provides a reliable means to indicate WiFi coverage. However, beacons are extremely scarce in normal WiFi traffic as hundreds of data frames are likely transmitted between two beacon instances. Without being able to decode incoming signals, finding beacon frames in RSS samples is like finding a needle in a haystack. To address this challenge, ZiFi adopts novel digital signal processing (DSP) and stochastic signal detection techniques to reliably identify the periodic interference patterns caused by WiFi beacon frames. The second approach predicts the

availability of WiFi based on context information. Cellular cell-tower information [14] or together with Bluetooth contact-patterns [13] have been used to improve WiFi prediction accuracy. The approach of ZiFi to be increasingly feasible as more mobile devices are equipped with both low-power and high-power NICs that work in the same open radio spectrum. For instance, numerous ZigBee modules [6] have USB interface and hence can be easily connected to WiFi enabled laptops. Several cell phone vendors (e.g., Nokia and Pantech & Curitel) also provide smart phones [3] with built-in ZigBee interface or ZigBee modules [7] that can be connected to smart phones (e.g., through mini SD interface). ZiFi can also be easily implemented on other platforms (e.g., some Bluetooth radios [8]) that offer the RSS sampling interface. The implementation of ZiFi [1] involves:

- A novel DSP algorithm called Common Multiple Folding (CMF) that amplifies unknown periodic signals in RSS samples. A key advantage of CMF is that it can minimize the computational cost of processing unknown signals whose possible periods lie in a wide range. Then there was a constant false alarm rate (CFAR) detector that can minimize the false negative (FN) rate of classifying periodic signals as 802.11 beacons while satisfying the user-specified upper bound on false positive (FP) rate.
- An analytical framework that characterizes the detection performance of ZiFi by the FN and FP rates. Our results not only guide the selection of optimal detection thresholds for beacon detector but also allow to predict the opportunities of WiFi coverage based on empirically measured channel parameters
- Implementing ZiFi on two platforms, a Linux netbook integrating a TelosB mote through the USB interface, and a Nokia N73 smart phone [9] integrating a ZigBee card through the mini SD interface. Experiments on a test bed consisting of wireless routers, netbooks, smart phones, and TelosB motes show that, under typical settings.
- ZiFi can detect WiFi APs with high accuracy (< 5% total FP and FN rate), short delay (~ 780 ms), and little computation overhead.

II. ZIFI ARCHITECTURE

ZiFi aims to utilize a ZigBee wake-up controller for mobile-phone or laptop users in order to save battery life, while constantly scanning for Wi-Fi access points. In essence, ZiFi represents the exact opposite goal from what is proposed in this paper. The driving force behind ZiFi is the constant drain that a Wi-Fi radio enacts on a mobile device during its active scanning period. In order to reduce this cost, a secondary low-power ZigBee radio is used to scan the frequency in order to determine the presence of Wi-Fi WAPs in the vicinity, and to wake up the Wi-Fi radio on the client device (typically a mobile phone or laptop). To capture Wi-Fi interference signatures, ZiFi utilizes the received signal strength (RSS) indicator available on ZigBee-compliant radios. However, we observed that the statistics of Wi-Fi RSS samples, such as power magnitude, time duration, and inter-arrival gap, exhibit surprising resemblance with those of other RF sources, and hence provide little hint about the existence of Wi-Fi. Motivated by this observation, ZiFi is designed to search for 802.11 beacon frames in RSS samples. Periodic beacon broadcasting is mandatory in Wi-Fi infrastructure networks and hence provides a reliable means to indicate Wi-Fi coverage [1]. Beacon broadcasting is the method that promotes Wi-Fi WAP discovery, wherein WAPs will release a periodic frame of a short duration containing a succinct homogeneous set of data. The energy signature created by beacon frames is easily spotted given a controlled environment. However, ZiFi operates in a lively RF environment, and as a result the algorithm used must be more robust to noise. ZiFi has the advantage that it may take longer for calculations as users are generally in a WAP's range for an extended period of time, allowing the algorithm to use more data and complex arithmetic operations. The false negative rate is not as crucial for this application, as a false negative in ZiFi represents a user missing the opportunity to utilize a Wi-Fi network; a false negative in the mesh network represents a potential survivor missing access to critical emergency information.The algorithm developed utilizes a special variation of folding to determine Wi-Fi activity with an error rate of below 4.8%[13]. The prototypes developed require additional hardware to be attached to the mobile phones or laptops, which increases power consumption and adds bulky external equipment. However, the goal is to extend this idea to a dedicated piece of hardware inside machines as a functional low-power wake up controller provided the transceiver can be integrated with current technologies.

2.1 High Level Design – Hardware

The design of the hardware is dependent upon two factors: whether or not the ZigBee module will also be used for communication, and

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whether or not the Wi-Fi sensing module will be implemented as a canned-up piece of hardware acting specifically as a wake-up controller, or as software on the client device

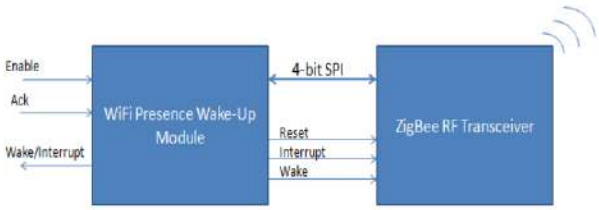
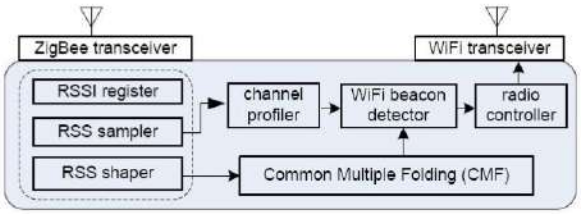


Figure 2.1 Hardware Specification for Wake-Up controller [1]

Figure 3.1 provides an example of how the hardware could be configured. This setup assumes that the microcontroller used for sensing Wi-Fi activity is separate from the application. It also allows for interrupt driven behavior to be modeled using the Interrupt/Ack ports. The enable bit allows for the entire wake-up controller to be asleep while the main system is in use, while the wake-up function would allow the controller to wake up the main system upon Wi-Fi discovery. This hardware specification also keeps the ZigBee Transceiver separate so that the main system may also communicate with it using the SPI interface, or let it sleep when unused as the wake-up time for the ZigBee module is approximately 15ms.



Figur

e 2.2 System Architecture of Zifi[1]

Fig 3.2 shows the system architecture of ZiFi. The RSS sampler reads the built-in received signal strength indicator (RSSI) register of ZigBee radio at a designated frequency. The RSS samples are then processed by a RSS shaper that adjusts the RSS values to mitigate noise (e.g., the data frames) in the beacon detection. The shaped RSS samples are then processed by the Common Multiple Folding (CMF) algorithm. CMF is a digital signal processing algorithm that amplifies the periodic signals in RSS samples. A key advantage of CMF is that it can minimize the cost of amplifying unknown signals whose possible periods lie in wide range. The amplified RSS samples are fed into a constant false alarm rate (CFAR) [1] beacon detector that classifies a periodic signal as genuine WiFi beacons if its amplitude exceeds a threshold. By adopting a theoretically derived threshold, the beacon detector can minimize the false negative (FN) rate while satisfying the user-specified upper bound on false positive (FP) rate. Finally, if WiFi beacons are detected, the radio controller turns on the WiFi NIC. It also present an analytical framework that models the FN and FP rates of beacon detection based on the utilization ratio of wireless channel. The utilization ratio is measured from RSS samples by the channel profiler. The analytical FN and FP models guide the selection of optimal detection thresholds for ZiFi's beacon detector. As discussed above, ZiFi utilizes energy sensing through the RSSI of ZigBee radio to detect the existence of WiFi APs. ZiFi can be easily implemented on other radio that provide the RSSI interface. For instance, a few existing Bluetooth provide RSSI although it isnot a mandatory feature in Bluetooth standard.

III. COMMON MULTIPLE FOLDING (CMF)

A novel algorithm called Common Multiple Folding (CMF) that can minimize the total number of additions required to fold on multiple periods. The design of CMF is based on the observation that the folding result of period P can be efficiently computed from that of period Q if Q is an integer multiple of P, i.e., Q mod P = 0. Formally, given folding result FQ, only Q − P additions are needed to obtain FP . In comparison, total N −P additions are needed to compute FP directly from original N RSS samples. For example, Fig. 3.4 illustrates that the folding result of period 6 can be calculated by an additional folding operation on the result of period 12. For instance, the first element in the folding result of period 6 can be computed by a single addition of the the first and seventh elements in the folding result of period 12, i.e., F6[1] = F12[1] + F12[7]. In total, 12 − 6 = 6 additions are required to fold on period 6 if the folding results of period 12 are already available. In comparison, total N − 6 additions would be needed if the folding is directly applied to the original RSS samples.

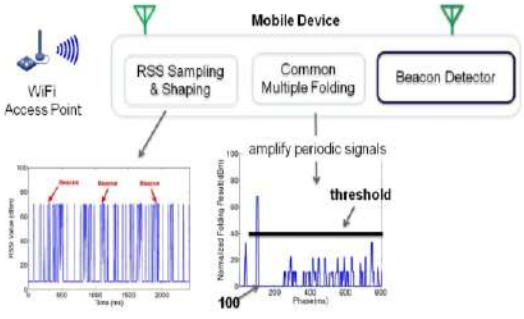


Figure 3.1.1 Common Multiple Folding[1]

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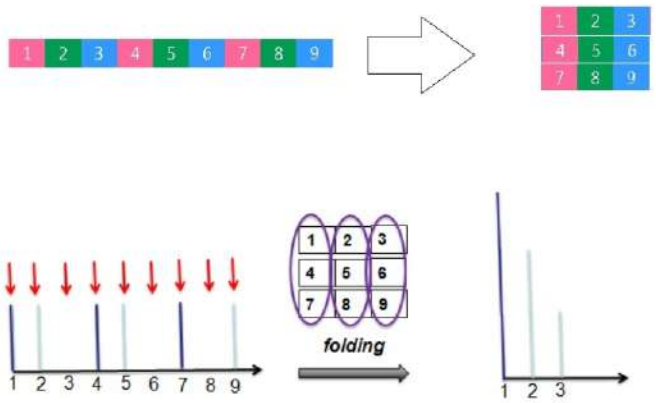

Figure 3.1.2 Folding

3.2 CMF Tree

A promising approach to reducing the computational cost is to first fold on the LCM of all periods in P, and then reuse the results to fold on each of the periods. In order to maximize the utility of intermediate folding results, this idea can be applied recursively by partitioning P into subsets and folding on the LCM of all periods in each subset. This process can be naturally encoded by a tree where a node represents a period set and its LCM and all children of the node constitute the partition of the set. Such a tree is referred as CMF tree. Fig. 3.2.1 shows two CMF trees that differ in how to partition the period set at each node. Some important points:

• Building a tree based on the folding

• Fold based on Least Common Multiplier (LCM)

•In order to maximize the utility of intermediate folding results, folding can be applied recursively by partitioning the result into subsets and folding on the LCM of all periods in each subset

For example, Total N RSSI samples, first fold onto 2520 period

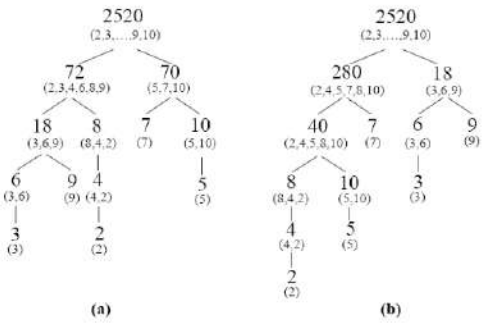

Fig: 3.2.1 CMF Tree [1]

In above figure, two CMF trees are shown as:

The left tree

• N - 2520

2520 – 72

2520 – 70

72 – 18

72 – 8

....

= N +2654 additions

• The right tree

N + 2832 additions

Always better to choose two LCM factors with a min difference.

3.3 CFAR Detector

CFAR is a constant false alarm rate detector that performs the following tasks:

- Consumes the result from the CMF operation
- Calculates the threshold value based on utilization
- Detects the False Positives
- Identifies significant pulses as beacons

IV HIGH LEVEL DESIGN – SOFTWARE

The software, then, is dependent upon how the hardware is specified, and whether or not the controller should act in an interrupt manner, or as a constantly updating value. The basic discovery algorithm is platform independent, and requires only the RSSI stream sent from the ZigBee transceiver. It is assumed for this instance that the sensing module is a separate entity, and it has full control of the RF Transceiver. The behavior of the output bits is dependent upon the platform; therefore, for this instance, we will assume a one bitput that is active highonce Wi-Fi activity is determined.

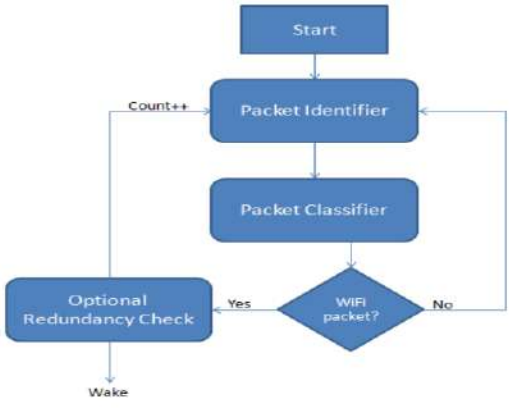

Figure 4.1 High Level Algorithm Specification[1]

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The two main functions within this algorithm are the packet identifier method and the packet classifier method. These two methods take as input the RSSI data stream from the ZigBee module, transforming it into a recognizable data structure that is then classified according to the a priori clustering algorithm defined by the user; finally a determination is made on whether the packet is a Wi-Fi packet, a Bluetooth packet, a ZigBee packet, or noise. If the packet is determined to be a Wi-Fi packet, an optional redundancy check can be used to increase accuracy, but at the cost of speed and possibly causing a false negative result. This optional redundancy check can be defined by the user based on the parameters that are trying to be optimized. ZigBee communication generally occurs on a specific subset of channels in order to avoid the peaks created by Wi-Fi interference[19]. However, if one were to attempt to sense active Wi-Fi access points or users searching for Wi-Fi access, one would instead listen on ZigBee channels correlated most closely with the peaks of Wi-Fi channels 1, 6, and 11. ZigBee channels 12, 18, and 25 would need to be scanned periodically to check for wireless activity. A lack of activity on these channels indicates that there is likely no Wi-Fi presence in the area[15]. However, activity on these channels does not necessitate that there is an active WAP or user searching for Wi-Fi access. Other sources of noise (e.g. microwave radiation, Bluetooth, and other ZigBee components) can emit waves in this frequency, causing a false positive during which it would be a waste of scavenged energy to turn on the Wi-Fi antenna. As a result, cluster analysis was chosen to determine within a relative accuracy whether a given signal belongs to Wi-Fi or to some other signal or noise in the same frequency band.

V. ADVANTAGES

5.1 Advantages of ZiFi over WiFi

Due to the limited coverage, existing WiFi infrastructure is only capable of providing intermittent connectivity for the users with high mobility. WiFi-enabled devices (e.g., laptops, PDAs, and smart phones) must actively discover new WiFi access points (APs) once they leave the coverage of current network. However, this approach wastes the precious energy of mobile devices due to excessive listening and scanning operations of WiFi network interface cards (NICs). On the other hand the approach of ZiFi to be increasingly feasible as more mobile devices are equipped with both low-power and high-power NICs that work in the same open radio spectrum. For instance, numerous ZigBee modules have USB interface and hence can be easily connected to WiFi enabled laptops. ZiFi has following advantages:-

- Low cost
- Low power consumption
- Scalability
- Reliability
- Supports large number of nodes
- Easy to deploy
- Very long battery life
- Secure

Figure 5.1 Zigbee & WiFi

VI.CONCLUSION

WiFi scan can cause a waste of energy if the WiFi interface gets to know the existence of the signal, we can save energy. ZiFi tried to achieve this through RSSI sampling and extracting the beacon information. ZiFi utilizes ZigBee radio to identify the existence of WiFi networks by detecting interference signatures generated by WiFi beacons. A new DSP algorithm called Common Multiple Folding (CMF) amplifies signals with unknown periods in WiFi interference samples. ZiFi also adopts a constant false alarm rate (CFAR) detector that can minimize the false negative (FN) rate of WiFi AP detection while satisfying the user specified upper bound on false positive (FP) rate and a beacon detector to improving stochastic detection performance.

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Wireless network security: (WNS)

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Abstract: **As technology advances in society the need for wired and wireless networking has become essential. Each of these types of networking has their pros and cons according to security. Wired networking has different hardware requirements and the range and benefits are different. Wireless networking takes into consideration the range, mobility, and the several types of hardware components needed to establish a wireless network. A wireless network, which uses high-frequency radio waves rather than wires to communicate between nodes, is another option for home or business networking. Individuals and organizations can use this option to expand their existing wired network or to go completely wireless. We use different types of configurations of networks and the security measures that need to be taken to ensure a secure network.**

Keywords: **Wireless Network, Wired Network, Mobility, Radio Waves, Nodes**

1. INTRODUCTION

Wireless communications offer organizations and users many benefits such as portability and flexibility, increased productivity, and lower installation costs. Wireless technologies cover a broad range of differing capabilities oriented toward different uses and needs. Wireless local area network (WLAN) devices, for instance, allow users to move their laptops from place to place within their offices without the need for wires and without losing network connectivity. Less wiring means greater flexibility, increased efficiency, and reduced wiring costs. Ad hoc networks, such as those enabled by Bluetooth, allow data synchronization with network systems and application sharing between devices. Bluetooth functionality also eliminates cables for printer and other peripheral device connections. Handheld devices such as personal digital assistants (PDA) and cell phones allow remote users to synchronize personal databases and provide access to network services such as wireless e-mail, Web browsing, and Internet access. Moreover, these technologies can offer dramatic cost savings and new capabilities to diverse applications ranging from retail settings to manufacturing shop floors to first responders.However; risks are inherent in any wireless technology. Some of these risks are similar to those of wired networks; some are exacerbated by wireless connectivity; some are new. Network security is a big concern for individuals and organizations because vital information is stored on the network and most critical process of the business are done through the network. If a network is to fail or security is compromised an organization could be completely crippled

.2. Wireless Threats

The transmission of data using radio frequencies; Access points that provide a connection to the organizational network and/or the Client devices (laptops, PDAs, etc.); and Users. Each of these components provides an avenue for attack that can result in the compromise of one or more of the three fundamental security objectives of confidentiality, integrity, and availability.

2.1 Wireless Network Attacks

Intruders use several different ways of gaining access to your network. Some of the most common ones are Trojan horses, denial of service, Sybil attacks, node capture attack, e-mail spoofing, e-mail borne viruses and packet sniffing.

2.2.1 Trojan Horse

Trojan, in computing is a non-self-replicating type of malware program containing malicious code that, when executed, carries out actions determined by the nature of the Trojan, typically causing loss or theft of data, and possible system harm. A Trojan often acts as a backdoor, contacting a controller which can then have unauthorized access to the affected computer. The Trojan and backdoors are not themselves easily detectable, but if they carry out significant computing or communications activity may cause the computer to run noticeably slowly. Malicious programs are classified as Trojans if they do not attempt to inject themselves into other files (computer virus) or otherwise propagate themselves (worm). A computer may host a Trojan via a malicious program a user is duped into executing (often an e-mail attachment disguised to be unsuspicious, e.g., a routine form to be filled in) or by drive-by download

2.2.2 Denial of Service (DoS)

Another common method of intrusion is denial of service (DoS). A DoS is a type of attack on a network that is designed to bring the network to its knees by flooding it with useless traffic. Denial of Service attacks is termed one of the worst attacks and is next to impossible to track. This is an attempt to make a machine or network resource unavailable to its intended users. Although the means to carry out, motives for, and targets of a DoS attack may vary, it generally consists of efforts to temporarily or indefinitely interrupt or suspend services of a host connected to the Internet.

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2.2.3 Sybil Attacks

A type of attacks where a node creates multiple illegitimate identities in sensor networks either by stealing or fabricating the identities of legitimate nodes. It can be used against topology maintenance and routing algorithms; it reduces the effectiveness of fault tolerant schemes such as distributed storage and disparity. Another malicious factor is geographic routing where a Sybil node can appear at more than one place simultaneously.

2.2.4 Node captures attack:

An attacker physically captures nodes and compromises them such that readings sensed by compromised nodes are manipulated or inaccurate. In addition, the attacker may attempt to extract essential cryptographic keys (e.g., a group key) from wireless nodes that are used to protect communications in the very most wireless networks.

2.2.5 Email Spoofing

In a spoofed email, the sender may not be the same as mentioned in the mail. In most of the cases, the sender of the spoofed mail will target to get any personal information of the email user. Sometimes, you may receive mail addressed from the "network administrators", asking for a change in your password or other information.Once you provide your password details, the hackers may start sending mails from your mail account to all the people in your contacts list. Or you may have to click on the given link for a verification process. But if you click the link, it may take you to pages which you do not want to visit. By clicking on the link you may indirectly download any virus. These viruses may infiltrate your computer system and damage the computer parts slowly. You have to be more careful while you reply to these mails which have a bizarre address in the sender details.

2.2.6 Email borne virus

Email-borne viruses are another attempt people will use to gain entry or cripple your network. Email-borne viruses are viruses and malicious code that is sent as an attachment to an e-mail. The most important thing to remember is not to open any attachments without knowing the source. Most times even knowing the source isn't as safe. For example, the Melissa Virus was spread by sending to people in your own address book.

2.2.7 Phishing Attacks

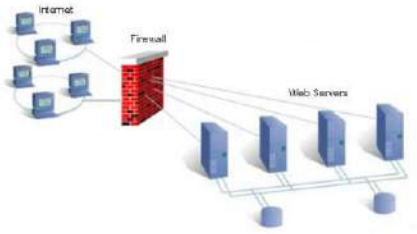
A packet sniffer is a program that captures data from information packets as they travel over the network. That data may include user names and passwords that travel over the network in clear text. With perhaps hundreds or thousands of passwords captured by the packet sniffer, intruders can launch widespread attacks on systems. Installing a packet sniffer does not necessarily require administrator-level access.

3. Some Preventive Methods

Individuals and organizations can take preventative methods to avoid intrusions. Organizations take some step is to protect their valuable information like some defense of lines firewall, encryption techniques, antivirus software, anti spyware software and other methods we can use for the prevention of the intruders.

3.1. Firewall

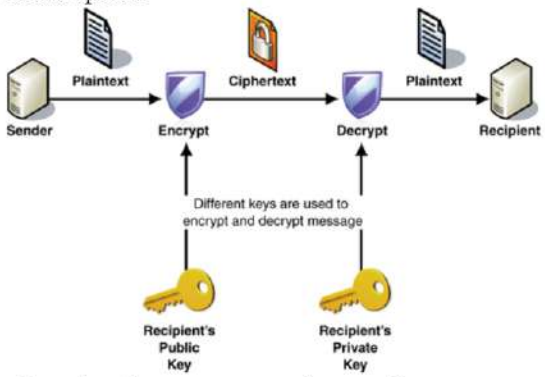
A firewall is a number of security schemes that prevents unauthorized users from gaining access to a computer network or a firewall could be used to monitor transfers of information to and from a network.



Firewalls come in a wide variety of forms. Routers come complete with a built-in firewall and can be used for home networking. Several companies make more powerful, external firewalls which can be used with corporate networks. Firewalls are very effective at preventing attacks and the cost for a firewall is definitely offset by the benefit and security it provides.

3.2 Encryption/Decryption

Encryption/decryption is especially important in wireless communications to prevent some secured data. This is because wireless circuits are easier to tap than their hard-wired counterparts.



Encryption is the process of encoding messages or information in such a way that only authorized parties can read it. In an encryption scheme, the message or information, referred to as plaintext, is encrypted using an encryption algorithm, turning it into an unreadable ciphertext.This is usually done with the use of an encryption key, which

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specifies how the message is to be encoded. Any adversary that can see the ciphertext should not be able to determine anything about the original message. An authorized party, however, is able to decode the ciphertext using a decryption algorithm, that usually requires a secret decryption key, that adversaries do not have access to. For technical reasons, an encryption scheme usually needs a key-generation algorithm to randomly produce keys.

3.2.1Symmetric key encryption

In Symmetric-key schemes the encryption and decryption keys are the same. Thus communicating parties must agree on a secret key before they wish to communicate.

3.2.2 Public key encryption

In public-key encryption schemes, the encryption key is published for anyone to use and encrypt messages. However, only the receiving party has access to the decryption key and is capable of reading the encrypted messages. Public-key encryption is a relatively recent invention: historically, all encryption schemes have been symmetric-key (also called private-key) schemes.

3.3 Anti-virus Software

An anti-virus program is a utility that searches a hard disk for viruses and removes any that are found. Most antivirus programs include an auto-update feature that enables the program to download profiles of new viruses so that it can check for the new viruses as soon as they are discovered. Examples of this type of software are Norton Anti-virus, McAfee Anti-virus and AVG virus protection. Anti-virus software is an essential utility for organizations to have to prevent viruses from infecting their network. Current anti-virus programs have on-demand file scanning which means that every time you access a file it is scanned for a virus. .

3.4 Anti-Spyware Applications

To understand spyware applications you must first understand what spyware is. Spyware consists of computer software that gathers and reports information about a computer user without the user's knowledge or consent. A network can be infiltrated with spyware when an employee visits a website using the network's internet connection. Spyware can go undetected or can be very bothersome to the user. Most often times their will be pop-up ads, unwanted programs and most importantly the network will suffer a huge decrease in performance.Spyware has become very popular and many applications have been created to prevent such computer abuse. Protection utility that can find and delete spyware on demand.

4. CONCLUSION

Wireless networks are very common in the workplace as well as in the home. Technology has been created to store, transmit and receive data through networks at very high rates of speed. Networks have become essential to completing daily business tasks and most business, those who rely heavily on information technologies, would be crippled without their networks and for this particular data we can use some security measures to protect from the intruders.

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Heterogeneous cellular network: a review

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***Abstract* - Continued expansion of cellular networks, coupled with an increasingly restricted mobile spectrum, has established the reduction of communication overhead as a highly important issue. Much of this traffic is used in determining the precise location of individual users when relaying calls, with the field of location management aiming to reduce this overhead through prediction of user location. The availability of multiple technologies, with micro and macro wireless cells, for network access combined with terminals capable of exploiting such diversity in wireless access requires the development of new mechanisms for optimized handover procedures. Appealing solutions should support network controlled handovers through heterogeneous technologies, preferably combined with a cross-layers two/three design. The IEEE 802.21 working group is currently standardizing the methods and the protocol potentially able to provide such a solution. In this paper we analyze the impact of signalling timing on network controlled handovers execution and performance in this environment. Through an extensive simulation study, we obtain results, that can be exploited in both terminal and handover procedure designs. The performance of this scheme is found to improve significantly on current systems where network and user heterogeneity is present, degrading to an optimal static location management scheme for a perfectly homogeneous network. Along with that, the aspect of "Energy Efficiency" has received much attention lately due to ecological as well as economic reasons particularly for network operators.**

***Keywords*— Improving the Macro Network, Design Options, Coordination Potential, Co-Existence of Micro and Low Power Nodes, Energy Awareness.**

I. INTRODUCTION

Mobile broadband traffic has surpassed voice and is continuing to grow rapidly. This trend is set to continue, with global traffic figures expected to double annually over the next five years. By 2014, the average subscriber consumes about 1GB of data per month compared with today's average figures that are around some hundred MB per month .This traffic growth, driven by new services and terminal

Capabilities are paralleled by user expectations for data rates similar to those of fixed broadband. Actual figures per subscriber can vary greatly depending on geographical market, terminal type and subscription type; some users with mobile devices are already creating traffic in the order of gigabytes and predictions are estimated to be several GB per month for some devices and certain user behaviour. The mobile industry is, therefore, preparing for data rates in the order of tens of Mbps for indoor use as well as outside and gigabyte traffic volumes.

II. IMPROVING THE MACRO NETWORK

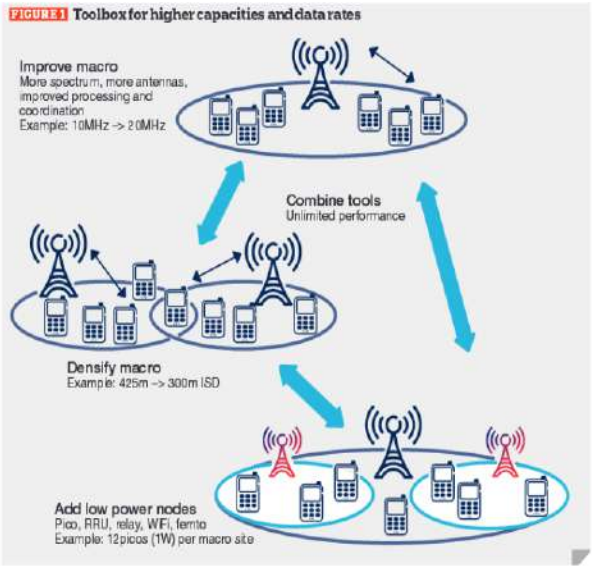

Figure 1: Tool Box For Higher Capacity And Data Rates

There are several approaches that can be taken to meet traffic and data rate demands (see Figure 1.) On a high level, the key options to expand network.

Capacity include: improving the macro layer; densifying the macro layer; and complementing the macro layer with low power nodes, thereby creating a heterogeneous network. These approaches are discussed here in more detail and use the example of a dense urban environment to illustrate achievable performance. Box B details the reference system parameters..Upgrading the radio access (HSPA or LTE) of existing sites enables very high user data rates and improved system capacity 2, which can be further enhanced through the addition of more spectrum, more antennas, and advanced processing within and between nodes. Increasing capacity and data rates in this way is attractive as it alleviates the need for new sites.

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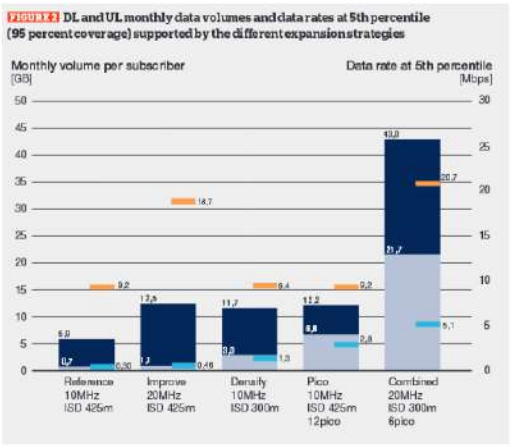

Figure 2: Monthly Data Rate Volumes with Expansion Strategies

Figure 2 illustrates a reference system and the effect of each improvement approach on data volumes. The reference system is a 10MHz HSPA system with an inter-site distance of 425m, achieving monthly data volumes per subscriber of 5.9GB in DL and 0.7GB in UL. By doubling the spectrum to 20MHz, data volumes for the DL approximately double. Figure 2 shows data rates achievable at low load with 95 percent coverage probability. In the DL, data rates of tens of Mbps are achieved. In the UL, however, this data rate is significantly lower (a few 100kbps) and increasing spectrum does not improve the situation. This condition is referred to as power limitation: data rates are limited by relatively low received power, which is due to large attenuation between terminal and base station caused by a combination of distance and challenging radio propagation (such as in indoor locations at the cell edge).At some point, the capacity and/or data rates offered by the existing network with enhanced radio access will no longer be sufficient. If possible, densifying the macro network is an attractive evolution path in these cases. In dense urban areas, networks exist with nter-site distances down to 100-200m. Benefits of densification include: the number of sites is kept relatively low, and network performance is insensitive to traffic location. Figure 2 shows that by doubling the number of macro sites, DL capacity is doubled. The DL capacity per site remains more or less the same, since there are twice as many sites. UL capacity is more than doubled as users become less power limited – better capacity per site, twice as many sites. A significant increase in UL data rates is therefore achieved. Complementing the macro networks with low power nodes, such as micro and pico base stations, has been considered a way to increase capacity for both GSM and CDMA systems for some time now (see references3-4). This approach offers very high capacity and data rates in areas covered by the low power nodes. Performance for users in the macro network improves if low power nodes can serve a significant number of hotspots and coverage holes. Deploying low power nodes can be challenging, as performance depends on close proximity to where traffic is generated. In addition, due to the reduced range of low power nodes, more of them are required. Overcoming these challenges requires proper design and integration of the low power nodes. Figure 2 shows results for the deployment of 12 pico base stations per macro site in traffic hotspots. This yields the same DL capacity increase as the previous two approaches (more spectrum and densification). However, a larger gain is achieved in the UL, which is a result of mitigating the power limitation. The resulting UL data rate improvement is greater than for the other two approaches. The way to meet future capacity demand is by combining all three approaches: improving the macro layer; densifying the macro layer; and adding pico nodes, as indicated by the last example in Figure 2. How these approaches are combined and in what order depends on the existing network, targeted volumes and data rates, as well as the technical and economical feasibility of each approach. Such a heterogeneous network configuration, exploiting macro and low power nodes, can in principle support arbitrary data volumes and very high data rates.

III. DESIGN OPTIONS FOR HETROGENEOUS NETWORK

Several aspects govern effective design of heterogeneous networks. From a demand perspective, traffic volumes, traffic location and target data rates are important. From a supply perspective the important aspects include radio environment, macro-cellular coverage, site availability, backhaul transmission, spectrum and integration with the existing macro network. Commercial aspects, such as technology competition, business models, and marketing and pricing strategies must also be considered. To summarize, Table 1includes guidelines for some of the key design choices operators encounter. Deployment aspects and choice of radio-access

Table 1: Rules of thumb for low power node deployment

Design choice	Decision criteria
Access Open access Closed subscriber group	Deployment conditions Operator deployed User deployed
Deployment Indoor deployment Outdoor deployment	Hotspot spread and position Large indoor hotspot Outdoor hotspot or many smaller indoor hotspots
Type of low power node RRU Conventional pico Relay	Backhaul availability Fiber (P2P or WDM PON) Copper / fiber / microwave No backhaul
Frequency reuse Reuse macro spectrum Separate spectrum	Capacity need and access Capacity is driver Closed subscriber group
Power and cell selection Power Biased cell selection	Hotspot area Cover the hotspot* Cover the hotspot* *value varies significantly

Table 1: Rules Of Thumb For Low Power Node Deployment

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technology .How to best complement the macro network depends on the network scenario. HSPA or LTE operating within the licensed spectrum should be used if the base station is deployed in a public area, or if coverage is important. If the base station is well isolated from interference and range is not crucial – if it is used in a private home, for example – then WiFi exploiting unlicensed or license-exempt bands is an attractive solution. For authentication, simple sign-on, and access to mobile operator services the WiFi access point should be connected to the mobile core network. A 3GPP-based He NB provides little gain over WiFi in such scenarios. On the contrary, HeNBs may create coverage holes or use spectrum that would otherwise be available for the macro layer.In the network-design process, it is important to consider the business model. While a single operator often manages outdoor macro-cellular networks in urban areas, indoor systems are often shared between operators (cf Distributed Antenna Systems). WiFi access points and similar smaller scale solutions are often user-deployed (by individuals, enterprises or a third party), where access can be open for all subscribers or available for certain users only (Closed Subscriber Group) . For public systems, particularly outdoors and in difficult radio environments, open access for all subscribers is important so that users connect to the best base station. This explains the first rule of thumb in Table 1.Local traffic hotspots can cover a wide area, such as an entire block and include several buildings. In such cases, deploying an outdoor low power node that also covers indoor locations would be suitable. If the existing macro-cellular grid is too sparse to meet the traffic demand and provide adequate indoor service, deploying outdoor low power nodes is a useful technique to achieve general coverage improvement. When traffic is concentrated to one specific indoor location, such as a shopping mall, indoor deployment is preferable.

IV. COEXISTANCE OF MICRO AND LOW POWER NODES

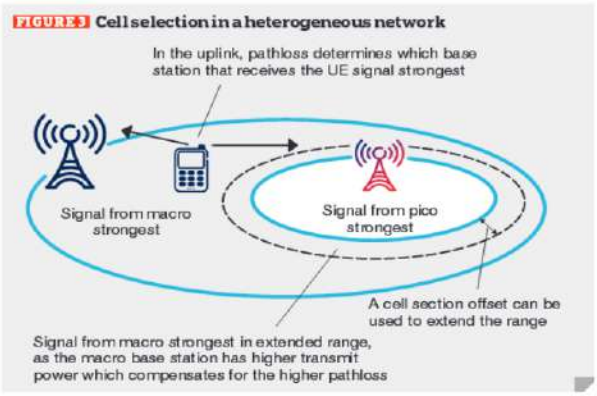

Figure 3: Cell Selection In Network

One of the basic issues with heterogeneous networks is how to determine the spectrum to employ in each cell layer, and for each technology – HSPA and LTE. To attain the highest possible data rates, it is necessary to use at least as much bandwidth as the UE is capable
of handling in each layer. UE capability in terms of frequency bands influences spectrum possibilities: if capacity (high traffic volume) is the driver or
spectrum is scarce, then macro-cellular carrier frequencies should be reused. However, such an approach requires good cell planning and radio resource management schemes to control interference between cell layers. In particular, mobility and control plane quality might be affected.Our focus is on networks where macro-cellular carrier frequencies are reused throughout the network. By definition, a low power node has significantly lower transmission power than its surrounding macro base stations. Cell selection is typically based on DL received power, including the effects of the different base station transmission powers. This leads to an area surrounding the low power node where the macro base station is selected, but where the path loss is lower towards the low power node. In the UL direction, where the transmit power is the same, it would be better to be connected to the low power node also in this area. This is illustrated in Figure 3 By increasing transmission power, the cell size of low power nodes can be increased. However, doing so affects the cost and size of the node, which in turn limits site availability. The range of the low power node can also be increased using a cell selection offset or handover thresholds that favour the selection of the low power node. This leads to the UL being received in the best node (the low power node) and offloads the macro to a greater extent. These benefits, however, come at the cost of higher DL interference for users on the edge of the low power node cell. Without further coordination of macro and low power nodes, there is a trade-off between DL

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and UL performance. In HSPA, soft handover functionality is useful to increase the UL low power node coverage and capacity.

V. COORDINATION POTENTIAL

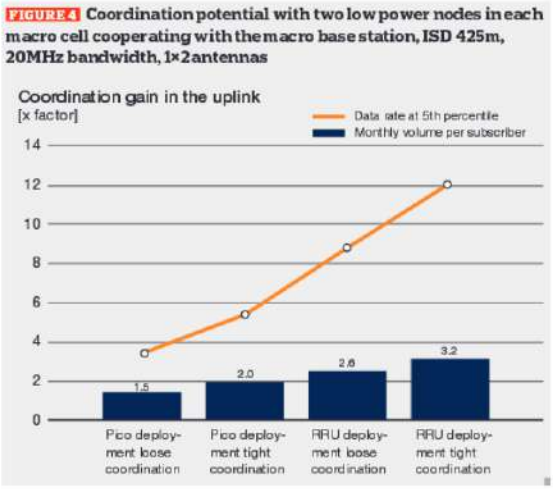

Figure 4: Cordination Potential In Power Nodes

In the situation just described signal strength is imbalanced. A highly promising solution for improving performance in this case is based on cooperation between the macro and the low power nodes within its coverage area. For LTE DL, cooperation supports efficient offloading by extending the range of the low power cell. For UL, cooperation enables the macro base station to exploit UE signals received at pico base stations. This is favourable due to the power-based cell selection (none or small cell
selection offset) which creates a situation where pico base stations are often closer to the macro users than their serving macro base station and consequently, the pico base stations receive better-quality UE signals. There are different types of cooperation schemes, such as coordinated scheduling, coordinated beam forming, as well as joint transmission and reception. With coordinated beam forming, a reduction of the interference caused to a non-served user can be achieved by using an appropriate base station antenna pattern: a so-called beam. Due to their loose backhaul capacity and latency requirements, simplified coordinated beam forming schemes can be applied in a distributed pico-macro setup. However, such schemes offer the highest potential in a centralized RRU deployment that enables more elaborate optimization algorithms. Joint transmission-based cooperation refers to simultaneous transmission from different nodes to the same user. To achieve a coherent overlap of the signals at the receiver, the transmitters must be tightly synchronized in time and frequency. While transmitters can easily reach the required synchronization level in an RRU deployment, additional synchronization equipment at each node (such as a GPS receiver) is needed in a distributed pico-macro setup. Therefore, joint transmission is more easily applied in an RRU deployment. There are diverse joint-reception schemes in the UL, based on more-or-less extensive information exchange between nodes. For WCDMA, the basic functionality of soft and softer handover represents a form of joint reception. In LTE, joint-reception schemes should preferably be applied in a network with a low-latency backhaul as the synchronous uplink HARQ has strict timing requirements. Compared to a heterogeneous deployment with stand-alone nodes, coordinated pico and RRU deployments enable straightforward optimization of joint-reception and joint-scheduling schemes. Examples of achievable gains are shown in Figure 4. Both data rates and capacity (achievable monthly volume per subscriber) can be improved. The figure shows an increase in monthly volume by a factor of 3.2 with a tight RRU deployment compared to an uncoordinated heterogeneous deployment for a fixed required fifth percentile data rate of 0.5Mbps. Alternatively, for a fixed monthly volume per subscriber of 7GB, the improvement in the fifth percentile data rate reaches a factor of 12 with a tight RRU deployment.

VI. ENERGY AWARENESS IN HETROGENEOUS CELLULAR NETWORK

Here discussed the current affairs on energy awareness in different parts of heterogeneous cellular network. The concept of heterogeneous networks had been proposed as an alternative approach to provide higher capacity and coverage for cellular networks. Along with that, the aspect of "Energy Efficiency" had already received much attention lately due to ecological as well as economic reasons particularly for network operators. This study presented a systematic review on the topic of energy efficiency in heterogeneous cellular networks. The review was divided into three parts; first the typical metrics parameters used to measure energy efficiency and tradeoff relationships with respect to network performance were discussed. Next, the existing issues, approaches and challenges to provide energy efficiency in general cellular networks were addressed. Finally we looked into the current efforts on energy awareness in macro, micro, pico and femtocells. By means of discussions, we highlighted different heterogeneous network scenarios in which network planning and optimization techniques were (or not were) advantageous to provide essential understanding for successful deployment of green heterogeneous cellular networks.

Energy efficiency (EE) metrics: According to the purpose of a system, EE can be defined in different perspectives.One way is to define EE as the ratio of efficient output energy to total input energy. The other way is to define EE as the performance per unit energy consumption. EE metrics are classified into two categories: absolute metrics which indicate

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the actually energy consumed for performance and relative metrics which show how EE is improved. For measuring the efficiency of the communication link, several metrics were used in the literatures. The most commonly used metric for the energy efficiency of a communication link was bit per joule E_e which is defined as the ratio of the total network throughput over the energy consumption within a given period, where the unit is bits/Joule (Wang and Shen, 2010):

$$E_e = \frac{R}{P_C} \quad (1)$$

where, R denotes the average date rate provided by a certain base station with consumed power (PC). It can be also measured in bit per second per watt. Although this metric is simple and intuitive, it does not capture network specific aspects such as coverage and user fairness. Also higher layer aspects, e.g., quality of service, were also neglected. Hence, the metric (1) should be complemented by other metrics (Richter *et al*, 2010b). To account for the data rate as well the communication distance, a modified metric of bit meter per joule may be used. This metric described the efficiency of reliably transporting the bits over a distance towards the destination per unit of energy consumed. For a cellular area of coverage, this metric was modified to bits per joule per unit area, so to capture the extent of the coverage area (Auer *et al*., 2010). Mahadevan *et al*. (2009) introduced a concept of Energy Proportionality Index (EPI) which is very important energy measure to illustrate dynamic energy consumption of the equipment. Energy consumption in equipment could be divided into two parts: static energy consumption and dynamic energy consumption. Static energy consumption is energy for maintaining the equipment, independent from processing traffic. Dynamic energy consumption is required energy for processing traffic (Mahadevan *et al*., 2009). However, the standardized energy metrics are usually variations of the following two basic definitions: the energy consumption ratio ECR and the telecommunications energy efficiency ratio TEER (Badic *et al*., 2009; Chen *et al*., 2010a; He *et al*., 2010). The ECR metric is defined as the ratio of the peak power (in Watts) to the peak data throughput, i.e.:

$$ECR = \frac{E}{M} = \frac{PT}{M} = \frac{P}{R} \quad (2)$$

where, E is the energy required to deliver M bits over time T and R = M/T is the data rate in bits per seconds.

This energy metric provides energy consumption in Joules consumed for transportation of one information bit. The ECR metric was evaluated either for the whole Radio Access Network (RAN) as well as for one cell or cell sector of the RAN assuming a given RF average transmission power and a given average throughput in each cell (He *et al*., 2010). The ratio of a system's energy consumption to its capacity (joules/bit) is an indicator of its efficiency and is known as the Energy Consumption Ratio (ECR). A system with a lower ECR is more efficient in its energy use than a system with a higher ECR, as each bit requires less power for transmission (Humar *et al*., 2011). The TEER metric is more general than the ECR metric and it can be written as TEER = useful work/power. The units of the TEER metric depends on the specific quantity considered to be the useful work. It is also possible to express the powers in dB or dBm units and modify the ECR and the TEER metrics accordingly although this possibility is not currently considered in the standards. Also, the standards usually did not explicitly specify the definitions of the power used in the ECR and TEER metrics, e.g., whether or not the power considered accounts for the RF power only (He *et al*., 2010). Parker and Walker (2011) recently proposed an absolute energy efficiency metric (measured in dB) which is given by:

$$dB\varepsilon = 10\log_{10}\left(\frac{\text{Power}/\text{Bit rate}}{KTe\ln 2}\right) \quad (3)$$

where, K is the Boltzmann constant and Te is the absolute temperature of medium. Since, classical thermodynamics bases its analysis of systems on their absolute temperature, the authors contended that it is a suitable and necessary measure that can be applied across the board as a metric for various types of ICT components (Parker and Walker, 2011). Furthermore, the Energy Consumption Gain (ECG) metric has been defined in the Green Radio (GR) project as a ratio of the ECR metrics o f the two systems under consideration, for example, a baseline reference system and a system with a more energy efficient Radio Access Network (RAN) architecture. Consequently, the ECG metric quantifies the energy consumption improvement relative to the common reference system. In some scenarios, the Energy Reduction Gain (ERG) (expressed in percent) is preferable. The ERG metric was derived from the ECG metric as (He *et al*., 2010):

$$ERG\ (\%) = \left(1 - \frac{1}{ECG}\right) \times 100 \quad (4)$$

The classical optimization criterion for wireless network is the areal spectral efficiency, measured in [bit/sec/Hz/m^2] (Alouini and Goldsmith, 1999). Referring to the area spectral efficiency, Richter *et al*. (2009) proposed the concept of the area power consumption for cellular networks. The metric for the area power consumption ρ was defined as (Richter *et al*., 2009):

$$p = \frac{P_C}{A} \quad (5)$$

where, A is the coverage area. The area power consumption figure cannot be the exclusive metric describing energy

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efficiency since it does not take into account the provided additional network capacity and higher system spectral efficiency. Nevertheless, this metric makes it possible to evaluate different network topologies with similar performance figures with regard to energy efficiency (Arnold *et al*., 2010). In order to assess the energy efficiency of the network relative to its size, Wang and Shen (2010) introduced the notion of Area Energy Efficiency (AEE) which is defined as the bit/Joule/unit area supported by a cell. The AEE for a certain station could be expressed as:

$$A_{EE} = \frac{E_e}{A} \quad (6)$$

where, Ee and A denote the energy efficiency in bit/Joule and the area covered by a certain station with the unit of km^2, respectively (Wang and Shen, 2010). Table 2 summarized the typical metrics used to measure energy efficiency but, so far, conventional energy efficiency metrics capture only a small fraction of the overall power budget of the network and may therefore lead to incomplete and potentially misleading conclusions. An up-to-date overview of the energy metrics which were proposed by various standards bodies and then adopted worldwide by the equipment manufacturers and the network operators could be found in (Hamdoun *et al*., 2012).

Energy efficiency tradeoffs: Spectral efficiency SE is a widely used performance indicator for the design of **wireless communication** systems.For instance, the target downlink SE of the 3rd Generation Partnership Project (3GPP) increased from 0.05-5 b sec^{-1} Hz^{-1} the system evolves from GSM to Long Term Evolution (LTE). SE oriented systems were designed to maximize SE under peak or average power constraints which may lead to transmitting with the maximum allowed power for a long period and thus they deviated from energy efficient design (Chen *et al*., 2011b). EE in a communication system is not a simple problem. Information theory reveals some insights on the complexity. According to the Shannon formula, the SE and EE of a communication system based on the Additive White Gaussian Noise (AWGN) channel can be written as (Chen *et al*., 2011a, b):

$$\eta_{SE} = \frac{R}{B} = \log_2\left(1 + \frac{P}{BN_o}\right) \quad (7)$$

$$\eta_{EE} = \frac{R}{P} = \frac{B}{P}\log_2\left(1 + \frac{P}{BN_o}\right) \quad (8)$$

Metric	Abbreviation	Unit
Energy efficiency	E_e	bits J^{-1} or b sec^{-1} W^{-1}
Energy proportionality index	EPI	%
Energy consumption ratio	ECR	W b^{-1} sec^{-1} or J bit^{-1}
Absolute energy efficiency	dBε	dB
Energy consumption gain	ECG	%
Energy reduction gain	ERG	%
Area power consumption	APC	W km^{-2}
Area energy efficiency	AEE	b J^{-1} km^{-2}

Table 2: ABBREVATION AND UNITS

As a result, the SE-EE can be expressed as:

$$\eta_{EE} = \frac{\eta_{SE}}{(2^{\eta SE} - 1)N_o} \quad (9)$$

Where, R is the bit rate of information, P is the received power, B is the bandwidth and N_o is the noise power spectral density.The unit of the EE metric is then bits per joule which indicates the information units transmitted per one energy unit. Equation 8 shows that if N_o is fixed, EE is the function of power density P/B, but the η_{EE} does not monotonically increase with B or P. In a practical system where the bandwidth is a less flexible parameter, the maximum EE of a system is hard to achieve. For a given rate R, using more bandwidth requires less power. If the bandwidth is infinite, the required power is fixed to $P = N_0 R \ln 2$. This gives a hint to trade bandwidth with energy. Further the objective to optimize throughput performance is normally conflict with that to maximize EE. Balancing these two objectives complicates the system design. Note that Eq. 8 gives an EE model for a generic communication system. For a wireless system, EE also depends on distance, carrier frequency, efficiency of antennas and so on. Moreover, interference and fading make EE of a wireless system vary according to the radio environment (Chen *et al*., 2011a, b).From Eq. 9, η_{EE} converges to a constant, $1/(N_0 \ln 2)$ when η_{SE} approaches zero. On the contrary, η_{EE} approaches zero when η_{SE} tends to infinity (Chen *et al*., 2011b). A trade-off can be found between SE and EE by exploiting the available time and frequency resources, the operation and transmit modes of the base stations.

VII. CONCLUSION

Mobile-broadband traffic is increasing. In parallel, new applications are raising expectations for higher data rates in UL and DL. Creating a heterogeneous network by introducing low power nodes is an attractive approach to meeting traffic demands and performance expectations, particularly in situations where traffic is concentrated – in hotspots, or areas that cannot be suitably covered by the macro layer. By combining low power nodes with an improved and densified macro layer, very high traffic volumes and data rates can be

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supported. The nature of the existing network, as well as technical and economic considerations, will dictate which approach improving the macro layer; densifying the macro layer; or adding pico nodes or combination of approaches best meets volume and data-rate targets. Low power nodes give high data rates locally and also offer benefits to macro users by offloading and cooperating with the macro layer. Tight integration of low power nodes with the macro network provides gains over the uncoordinated case through favourable combining of received signals and avoiding. The energy efficiency is critical issue from the viewpoint of cellular network operators in minimizing their operational costs and reducing their energy footprint for environmental reasons. In the context of energy efficiency of cellular networks, this paper outlined the efforts with respect to energy efficiency in cellular networks and the commonly used energy metrics and explored the tradeoffs inherent between energy use and network performance. However, there is a need to define appropriate energy efficiency metrics that capture the overall power budget of the whole network in order to quantify and qualify gains achieved by employing energy aware techniques in network planning. To move towards green cellular network, it is essential to balance between network performance improvement and the required energy consumption in the design of the network. It is anticipated that the heterogeneous network is a significant technique that can improve the energy efficiency of a cellular network. Nevertheless, a careful design for this network is required to avoid reducing the energy efficiency of the macro BS but on the other hand increasing in total energy consumption. Besides, optimization techniques are demanded to find the optimal energy efficiency of the whole networks with respect to the number of all types of base stations, their size and locations.

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Energy efficient routing protocol for mobile ad hoc networks

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***Abstract*-A mobile Ad-hoc network forms the temporary network with the wireless mobile hosts. It is a local area network and doesn't use the base station for the communication [1].Ad-hoc network is used for short range .mobility; energy efficiency and the looping free path are the main part in ad-hoc network. Energy efficient routing protocols are used for the efficient energy to the mobile ad-hoc network. We consider DSR ,MMBCR and AODV protocols and also the performances of routing protocols in terms of life time[2][7][1].**

***Keywords*- Ad-hoc network, AODV, DSR, MMBCR, mobile AD-hoc network.**

INTRODUCTION

An ad-hoc network is used for short range and it is temporary network. Ad-hoc network is used for the local area and the messages can transfer from one end to another. Wireless devices also can communicate with each other with the help of ad-hoc network in local area network. Mobility is the major feature of mobile ad-hoc network. MANET is the end-to-end network and can transfer messages from one end to another and so communication can takes place but in case of large network not all the nodes can directly communicate with each other so the multi-hop is used in ad-hoc network. In this intermediate nodes are used and through these intermediate nodes the communication can takes place from source to destination.ad-hoc network forms the temporary network with the help of wireless hosts. Mobile ad-hoc is a multi hop wireless network because of the mobility of the nodes. The nodes in the ad-hoc network forward packets of data to and from each other this node is also behave like a router that routes the data and can communicate with each other. Mobile ad-hoc network is dynamic in nature.

The main drawback of ad-hoc network is that devices are communicating by passing messages but if the devices or nodes are not there then whole network fails nodes in ad-hoc network uses the limited battery power. So the energy management is the important aspect in ad-hoc network. The energy can be saved with the designing of good protocols so as to decrease the energy consumption. In case of network layer, where the load is distributed to the different paths and then increases the life time. So the routing protocols which selects the path that save the power and increases the life time of the ad-hoc network [1][2][7].

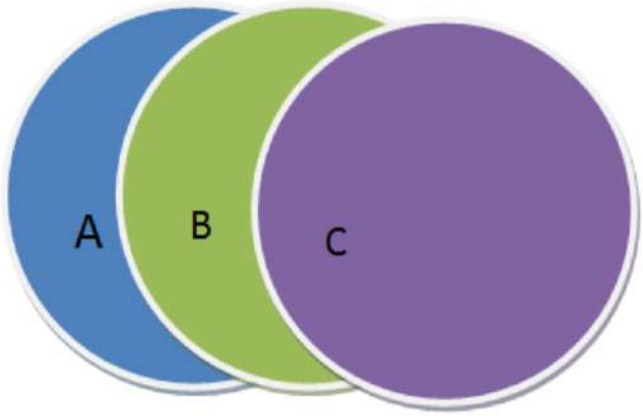

Figure1: Simple Ad hoc Network [2]

CLASSIFICATION OF ROUTING PROTOCOLS

1. Proactive Routing Protocol (table-driven)
2. Reactive Routing Protocol (on-demand)

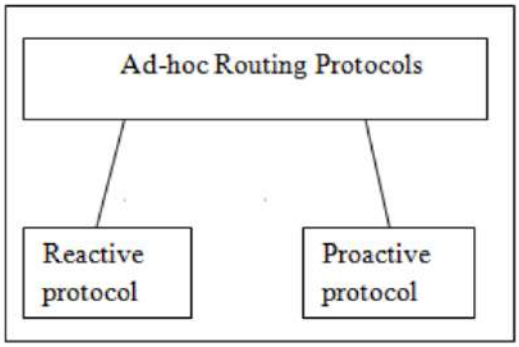

Figure2: Classification of Routing Protocol

Proactive routing protocol or table driven

In Proactive Protocol, the nodes transfer the data packets from one node to the other node and so they update the position of entire node. So the nodes create the Routing table for the other nodes in the network and update the information in the routing table:

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The benefit of these Protocols is that for find the route to a destination node , the source node does not require the travels from the source and the limitation of these protocols is that is creates the routing table which is contains the information but increase overhead of messages, uses the more energy and using output . various table driven protocol are Destination Sequenced Distance Vector Routing (DSDV) ,Wireless Routing Protocol (WRP), Fish Eye State Routing Protocol (FSR), Optimized Link State Routing Protocol (OLSR) Cluster Gate Way Switch Routing Protocol[2].

REACTIVE ROUTING PROTOCOL - (On Demand)

Reactive protocol is also called on demand routing protocol. Reactive protocol is used mostly as compared to proactive protocol the reactive protocol is better. Because, it is on demand protocol AODV, PAAMODV are the reactive protocol [2].

2. DESCRIPTION OF SELECTED ROUTING PROTOCOLS

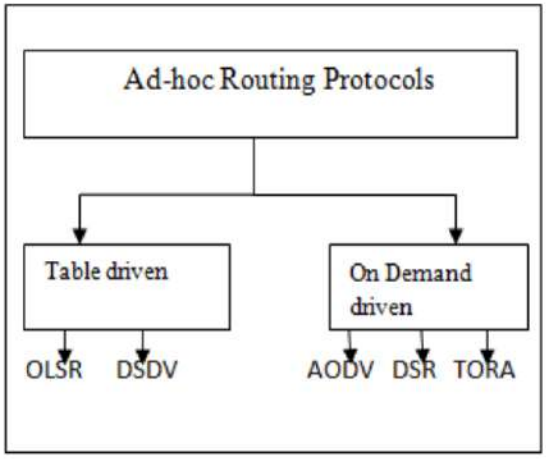

Figure3: Different Routing Protocols

(a)Ad-hoc on demand distance vector (AODV)-

AODV routing protocol is used for ad-hoc network. AODV is also called on –demand algorithm because it maintains the route AODV makes trees and this tree structure create by the group members and all the nodes of the tree connect with each other so the group members connects with each other. In AODV, the messages flows and creates the path and this process is done by first sends the route request (RREQ). The node which receives the request is called intermediate node replies to the requesting the nodes by using the nodes reply message. The intermediate nodes reply to the requesting node. If it has a destination path. The intermediate node replies with the route reply message. The intermediate node which replies to the source node have the sequence number which is greater or equal to the sequence number contained in RREQ and also the node which have to reply the RREQ is either the destination or the path to the destination the nodes which contains the RREQ [2][7]if this node is have processed before than the RREQ will be discard the data packets forwards by the source node , if it receives the RREP from the destination if the data packets the source to destination than the route will be active and if the source node doesn't sends the packets then this link will be deleted from the network but if the link is deleted from the network but the path is active then the route error messages(RERR)[7] will receives by the source node[7].In case of ERS, the RREQ goes to the neighbors in the route. If this request receives by the node for the first time, then it will relay the request otherwise the packets will be drop. So the information about the source and destination wastes so this design propose and makes the efficient design in which some nodes will be silent and these and these nodes doesn't sends the packets so in this way the energy used by the nodes will be efficient and its name after improves is E2AODV i.e. energy efficient AODV[7][2].

Advantages of AODV

AODV protocol is the on demand and finds the route from source to destination &this route will be latest.
The delay is less in AODV protocol. It is on demand so the message overhead is not in case of AODV [2].

Disadvantages

The disadvantages of this protocol is that if the intermediate node does not have latest sequence number then it leads inconsistent routes and also the multiple route reply packets to the one route request packets and this leads to greater overhead[2].

(b)Minimum maximum battery cost routing (MMBCR)

In MMBCR, the selection of route is done on the basis of battery capacity of the nodes which have minimum battery capacity and selects the having the maximum life time or maximum value. If Ci is the cost of battery at any instant t FCIT is the function and the route contains the N nodes then the total cost for the route Ri is the sum of the cost function of all nodes .If f(cit)=1/Git for example the function having higher value ,the more unwilling nodes participating in the route selection algorithm is used for uniform distribution of batteries[7].

(c) DYNAMIC SOURCE ROUTING (DSR)

DSR is the routing protocol. The sender knows the route and the route cache is used to store the route. Data header is used in DSR. The data packets carry the source route in the packet header. When the data packet travel from source to destination and it do not already knows or than it uses the route discovery process to find the route. The route discovery process first it sends the ROUTE REQUEST (RREQ)[7]. The node which receives the RREQ rebroadcast it, whether it is a destination or the route to the destination then RREQ makes

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the path than Route REPLY (RREP) traverse the path backwards. If the link on the route is break than the source node notified by route error (RERR) packet. The source detect the route with the link of error from it cache and new route discovery process starts to find the route [2][7].

ADVANTAGES

DSR is a reactive or table driven protocol. In this, the intermediate nodes use the route cache to reduces the control overhead.

(d)Destination-Sequenced Distance-Vector Routing (DSDV)

DSDV is a proactive protocol i.e. it is a table- driven routing scheme. It eliminates route looping, increase speed and reduces control message overhead. Each node maintains a next –hop table, which exchanges with its neighbours [2].

3. Comparison between DSR, AODV, DSDV

Sr No.	AODV	DSR	DSDV
1	It is Reactive protocol	It is Reactive protocol	It is Proactive protocol
2	It delivers virtually all packets at low mobility	It is very good at all mobility rates.	It performs almost as DSR,but requires transmission overheads of many packets.
3		It has low end to end delay	It has high for pause time 0 but it starts decreasing as time increases.
4	It performs better for larger number of nodes	It performs better for larger number of nodes	It performs better for few number of nodes
5	For real time traffic AODV is preferred		

Table1: Comparison b/w Different Protocols [2]

4. Simulation Tool

The simulation tool for analysis is NS-2 which is highly preferred by research communities [2].NS-2 is suitable for designing new protocols. Comparing different protocols and traffic evaluation.NS-2 is an object oriented simulator written in C++, with TcL interpreter as a fronted. This means that most of the simulations scripts are created in TCL (Tool Command Language) .If the component have to be developed for NS-2 then both TcL and C++ have to be used [2].

5. Simulation Analysis

We creates the network of seven nodes, node 0,1,2,3,4,5&6 with an energy with energy level of 1.5W[7].Initially node 5 has to send the data to node 1,2&3. MMBCR first finds the node having the minimum battery capacity and having the maximum value of the selected route i.e. the route with maximum lifetime is selected. Node 0 has to transmit the data from 0 to 4. These are 0-5-4,0-1-6-4&0-2-3-4[7].MMBCR initiates route discovery process and selects the route with maximum lifetime i.e. MMBCR selects 0-2-3-4 from the route discovery process. Source node is 0 and the Destination node is 4 via route 0-2-3-4.Before the link failure takes place source node 0 initiates the route discovery process and transmit the packet through route 0-1-6-4 for increasing the network lifetime. Thus the DSR does not take into consideration the energy levels of nodes or the lifetime of the network resulting in link failure whereas MMBCR increases the network lifetime by selecting route with maximum battery capacity[7][2].

Simulation Parameter	Value
Simulator NS-2	NS-2
No. of nodes used	7
Selected Route	0-2-3-4
After link failure route will	0-1-6-4

Table2: Parameters Used

CONCLUSION

In this paper, we have considered four routing protocols i.e. AODV, DSR, DSDV & MMBCR and compared the performances of two protocols i.e MMBCR and DSR in terms of network using NS-2.From the simulations we observed that MMBCR selects the route with nodes containing maximum battery value i.e the route with maximum lifetime is selected.DSR does not consider the lifetime of the network and chooses the route based on route discovery process. It is also clear from the result that minimum energy routing protocol should employ a unified link cache graph data structure to store the routing and power information so that it can converge to the minimum energy route faster with reduced overhead[7].

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A review on zone routing protocols in vehicular Ad Hoc networks

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Abstract: - **VANET (Vehicular Adhoc Network) is a novel technology which has taken a large attention in the past decade. Actually VANET is a subclass of MANET (Mobile Adhoc Network). In VANET network, Intelligent Transport System (ITS) is used. It consists of Vehicle to Vehicle communication (V2V) and Road to Vehicle communication (R2V) which is based on the Wireless/Cellular/Adhoc network. There are many protocols available that deals with routing in vanets. This paper is centric around the Zone Routing Protocols (ZRP) in the VANET network. These protocols help to reduce delays and overheads encountered during the routing process. In the Zone Routing protocols Inter Zone Routing and Intra Zone Routing are considered.**

Keywords: **VANET, Zoning, Zoning Process, Inter/Intra Zone Routing**

1. INTRODUCTION

VANET (Vehicular Adhoc Network) is vehicle to vehicle i.e. Inter Vehicle Communication (IVC) and Roadside to Vehicle (RSU) Communication System. The VANET consists of nodes (vehicles) that can communicate wirelessly with each other. In simple words one can say that Vanet is "Networking on Wheels". VANET contains two entities: **access points and vehicles**, the access points are fixed and usually connected to the internet, and they could participate as a distribution point for vehicles. It is autonomous & self-organizing wireless communication network.

2. OBJECTIVE

The core objective of using the VANET network is to provide the security between vehicles, Security warning, Blocking Road Information, Driver Assistance, Map Location etc. In the VANET Networks, OBU (On Board Units) are installed on the Vehicles to communicate with other nodes (i.e. Vehicles). OBU is used to broadcast the updated messages to the nodes that resides in the entire network about the condition of the roads and information about the vehicles to reduce the traffic jamming and accidents that happens on the roads and this OBU also helps in the

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detection of the unauthorized Vehicle on the road that misguides the other nodes by broadcasts the false messages to them because in the VANET network all the vehicles have Unique identity. The Fig. 1 below shows how communication is done between the VANET Network.

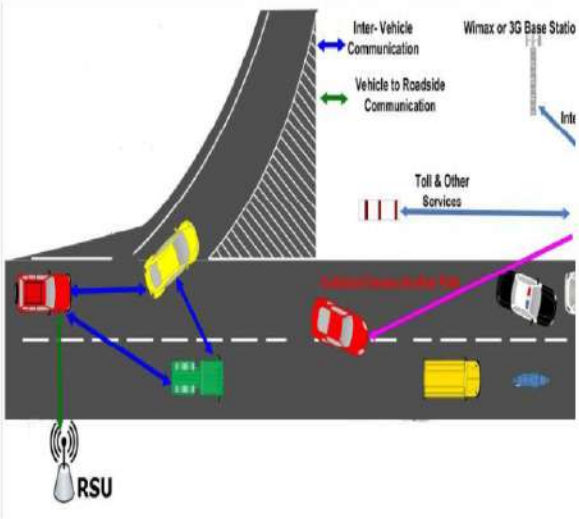

Fig1. Architecture Of VANET

3. CHARACTERISTICS OF VANET

1. It does not need any Infrastructure.
2. It uses the Digital Map.
3. High Mobility nodes.
4. Distibuted Network.
5. Self Organized network
6. No Problem with Power.

4. APPLICATIONS OF VANET

1. Public Safety.
2. Inter Vehicle Collision Warning.
3. Road Blocking alarming.
4. Traffic Information.
5. It also provides data transfer between the nodes in the network.[1]

of checking routing tables along the way by using the reactive protocol to check whether each zone encountered contains the destination node.[2]

Example that shows the zoning of the network

5. ZONING IN VANET

The main objective of writing this paper is to emphasize on the Zone Routing Protocols. Zone Routing Protocols are used in the VANET to overcome the time delay of sending and receiving the messages between the nodes and also uses for the smoothening of network i.e. there is no congestion between the network.

To establish more efficient routing between the nodes, zoning of the network is done. It divides the whole network into different zones of variable sizes. The Zoning of the network can also be done on the basis of Fixed, Disjoint and Regular shape Zones. It can also be based on the localization of the nodes and on the type of nodes.

How zoning can be done?

If a packet's destination is in the same zone as the origin, the proactive protocol using an already stored routing table is used to deliver the packet immediately. If the route extends outside the packet's originating zone, a reactive protocol takes over to check each successive zone in the route to see whether the destination is inside that zone. This reduces the processing overhead for those routes. Once a zone is confirmed as containing the destination node, the proactive protocol, or stored route-listing table, is used to deliver the packet. In this way packets with destinations within the same zone as the originating zone are delivered immediately using a stored routing table. Packets delivered to nodes outside the sending zone avoid the overhead

Suppose we have network of roads in which some are two lane roads and other are four lane roads. In this given scenario zoning can be implemented. We can have two lane roads in the first zone and four lane roads in the second zone and both the zone can communicate with each other

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through INTRAZONE/INTERZONE ROUTING.

5.1 ZONING PROCESS

5.1.1 Division Of Zones

The division of Zones in the region between the source and the destination is to find suitable and shortest route between them. Let the coordinates of source and destination be (x_0,y_0) and (x_1,y_1) respectively and the straight line 'L' between the source and destination is given by

$$Ax+ \quad By+ \quad C=0 \quad (1)$$

Where $A=y_1-y_0$, $B=x_0-x_1$ and $C=x_1*y_1-y_0*x_0$

A Zone is a region bounded by the two lines on their distance to L. A node in the VANET obtains or calculates its distance to L by using the formula.

$$Dist= (Ax_i +By_i +C) / (A^2+B^2)^{1/2} \quad (2)$$

Where (x_i, y_i) be the location of node. The distance can be negative from Formula(2) in order to confirm which zone the node belongs to. [3]

5.1.2 Range in Zones

We assume that there are two different transmission ranges: R_s for Small Range (SR) nodes and R_L for Large Range (LR) nodes. The zoning can be done in any shape whether it is a fixed, disjoint or regular shape.

Suppose, we have to do the zoning in square shape, it will be the combination of SR and LR nodes. If we will do the Large Range Zoning in our network, then we can locate any node anywhere in the network. On other hand, if we will do the Short Range Zoning, then we have to further divide our zone into sub-zones and locate node in that sub-zone only. It can be seen from two aspects of view i.e. Intra-Zone Routing Protocols or Proactive Routing Protocols and Inter-Zone Routing Protocols or Reactive Routing Protocols. Intra-Zone Routing means Communication within the Zone and Inter-Zone means that Communication between one zone with the other zone.[4] These both type of routing is shown with the help of the figure below:

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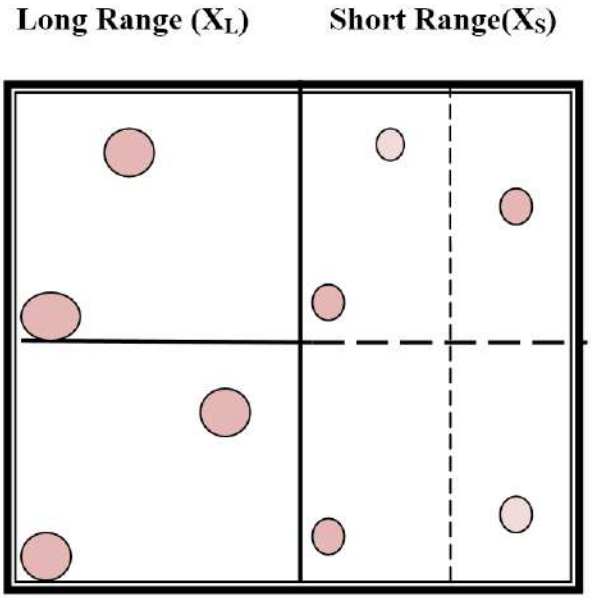

Fig2: Range in Zones

5.1.2 Intra Zone Routing

It is used within a zone. If the destination packet reside in the same zone in which the sender resides, the Proactive protocols uses an routing information already stored in routing table to deliver the packet immediately.

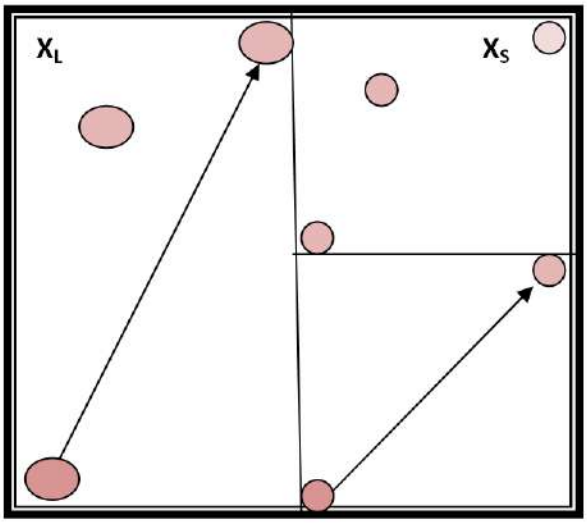

Fig3: Communication through Intra Zone Routing

5.1.2.1 Intra Zone Routing Protocols:

Zone Routing Protocol was the first hybrid protocol. It was introduced by HAAS in 1997. Hybrid protocols combine with both Proactive and Reactive Protocols. Here, firstly we discuss the Proactive routing and its protocols. These types of protocols are used in Intra Zone Routing. These types of protocols are used in same zone area where the sender and the receiver reside. In this type of routing, route requests are done very frequently because nodes will have to communicate with each other in same zones regions. The different types of protocols are STAR, FSR, GSR, DSDV, CGSR, OLSR and WRP.

5.1.2.2 Proactive Protocols:

These are wired networks in which each node has a table that contains the latest information regarding routing of nodes in the network but these protocols are Intra Zone, so they do not support wide network. Due to this, more bandwidth is consumed. The protocol related to it is DSDV (Sequenced Distance Vector Routing).

Sequenced Distance Vector Routing (DSDV): In this type of protocol, a table is maintained because of frequently routing between the nodes. Every vehicle reside in the zone broadcasts its routing table to the neighbor vehicles. The neighbor vehicles update this routing table with the use of **Full Dump Packet** and **Incremental Packet.** Full Dump Packet contains information of every vehicle that resides in that zone. Incremental Packet contains updated information of the vehicle. Routes are selected with the latest entry in the table.

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If the positions of vehicle changes, more full dump packets are needed to be sent in the network which results into the bandwidth.[5]

5.1.3 Inter Zone Routing:

If the sender wants to send the packet i.e. outside from the zone, then a reactive protocol is used to check that the destination packet resides in that zone or not. This reduces the processing overhead for routes. If the route is confirmed or it is confirmed that in which zone, the destination node lies, then with the help of proactive protocol, the routing table send the packet to the destination immediately.

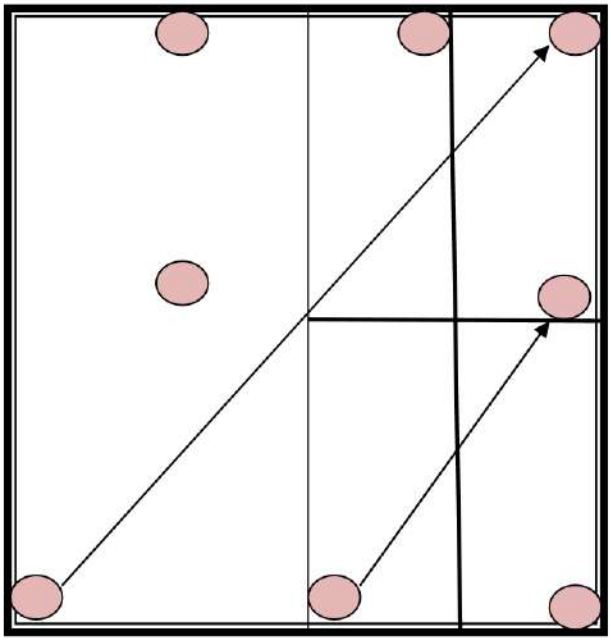

Fig4: Communication through Inter Zone Routing

The protocols used in inter-zoning routing are reactive protocols. These types of protocols are used in when the sender and the destination are present at the different zones.

5.1.3.2 Reactive Protocols

Reactive protocols do not store information at network nodes if there is no communication between the nodes. These types of protocols search for the best possible path and then establish a connection to transmit and receive the packet. In the Reactive protocols, the protocols like AODV and AOMDV are used.

AODV(Adhoc on demand distance vector routing protocol):In the Inter Zone routing, the reactive protocols like AODV searches for an available path to the destination node from its routing table. It establishes a connection when it is needed only. It supports Unicast, Broadcast and Multicast.[5]

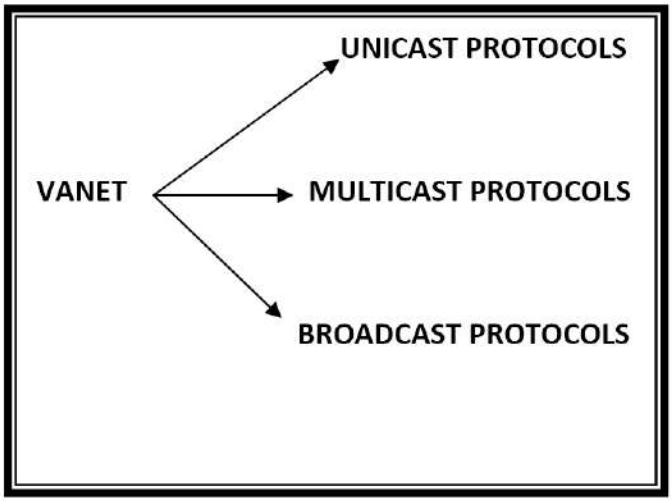

Fig5: Taxonomy of VANET on the basis of

5.1.3.1 Inter Zone Routing Protocol

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6. CONCLUSIONS

Thus ZRP reduces the control overhead for longer routes that would be necessary if using proactive routing protocols throughout the entire route, while eliminating the delays for routing within a zone that would be caused by the route-discovery processes of reactive routing protocols and also conclude that through ZRP it helps in reduce the delay problem of sending the messages between the source and destination by using Zones in the network.

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Using Genetic Algorithms to Schedule a Task in a Parallel Environment: A Review

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***Abstract*—The primary purpose of the paper is to discuss the concept of genetic algorithm to schedule tasks in parallel environment; second to categorize its parameters and finally to propose areas for future research. A total of 100 papers/articles were systematically viewed and analyzed. A number of key findings emerged: the field is a relatively "new" one for task scheduling using genetic algorithms. Research on scheduling emphasizes to focus on genetic algorithms, Parallel environment, task scheduling and scheduling algorithms and negligible attention is given to load balancing algorithms which is one of the key issues in task scheduling due to the involvement of multiple processing units. This paper is an attempt to review to identify various research methodologies of task scheduling using genetic algorithms.**

***Index Terms*—Genetic Algorithm, Task scheduling, Parallel Computing.**

I. Introduction

All The uses of parallel processor and its applications have increased with the improvements with device technology, computer architecture and software tools. Parallel Computing is a promising approach to meet the ever increasing computational requirements [16].A major goal is to speed up the execution of an application through the collaboration of the processing units. Even though the area of parallel computing has existed for many decades, programming a parallel system [19] for the execution of a single application is still challenging job. Scheduling is an important issue in the parallel system because the effectiveness of the scheduling directly corresponds to the parallelization obtained. Scheduling is to simply allocate a set of jobs so that optimum performance could be achieved. As efficiency of execution of parallel program critically depends on the schedule of these tasks this aspect has received considerable attention over the last few decades. The purpose of task scheduling is to obtain the optimal allocation such that the time and cost are minimized and all defined constraints are met [18].The focus here is on deterministic scheduling algorithms-also known as static scheduling algorithms-in which the information related to tasks, their relations towards each other, timing and the number of processors used are all a- prior knowledge. There is also a range of non deterministic scheduling problems where at least some of that information is determined during run time and may change depending on the input sequence [8]. Load-balancing problems arise in many situations, but, most importantly, they play a vital part in the operation of parallel and distributed computing systems. Load-balancing deals with dividing a program into smaller jobs that can be executed simultaneously and mapping each of these jobs to a resource such a processor (e.g., in a multiprocessor system) or a computer (e.g., in a computer network).Load Balancing algorithms are designed essentially to equally spread the load on processors and maximize their utilization while minimizing the total task execution time [3], [18], [26]. In order to achieve these goals, the load balancing mechanism should be fair in distributing the load across the processors. In general, load-balancing algorithms can be broadly categorized as centralized or decentralized, dynamic or static, periodic or no periodic, and those with thresholds or without thresholds [4], [9], [11].In a centralized load-balancing algorithm, the global load information is collected at a single processor, called the central scheduler. This scheduler will make all the load balancing decisions based on the information that is sent from other processors. In decentralized load-balancing, each processor in the system will broadcast its load information to the rest of the processors so that locally maintained load information tables can be updated. As every processor in the system keeps track of the global load information, load balancing decisions can be made on any processor. A centralized algorithm can support a larger system as it imposes fewer overheads on the system than the decentralized (distributed) algorithm. However, a centralized algorithm has lower reliability since the failure of the central scheduler will result in the dysfunction of the load balancing policy. Despite its ability to support smaller systems, a decentralized algorithm is still easier to implement.

Moreover, for static load-balancing problems, all information governing load-balancing decisions is known in advance. Tasks will be allocated during compile time according to a priori knowledge and will not be affected by the state of the system at the time. On the other hand, a dynamic load-balancing mechanism has to allocate tasks to the processors dynamically as they arrive.

II. The Concept of Genetic Algorithms on Task Scheduling

An optimization procedure based on the evolution of nature is Genetic algorithm. The crucial point of utilizing genetic algorithms is based on theory of survival of the fittest which

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was given by Darwin. According to the process of natural selection and the exchange of genetic information, the species with the optimal fitness will rule the world. The genetic algorithm is often used as a search algorithm, which is based on the biological principles of selection, reproduction and mutation. It with the help of these principles improves the fitness of a population of chromosomes (i.e. parameters), and outputs the solution space related to a problem. In this algorithm optimization problems are changed to parameters optimization problems. The purpose of optimization is to find a proper combination of a series of parameters to achieve the greatest level of satisfaction, either minimum or maximum, depending on the requirement of the problem.

A. Units Some differences exist among genetic algorithms and other searching methods, shown as follows:

- The Genetic algorithms don't deal with parameters but deals with parameter code.
- Genetic algorithms search multiple parameters. They search multiple combinations of different parameters. Thus, the probability of obtaining local optima would be reduced. In the functioning of genetic algorithms, combinations of parameters searched simultaneously are called a 'population', which is the basic functioning unit of genetic algorithms.
- Genetic algorithms use information provided by objective function and they don't need any auxiliary mathematical information such as gradients, derivatives, etc. There are wider ranges of applications than mathematical based methods.
- Genetic algorithms exploit the principles of rules for probabilistic transition to find optimal solutions.
- Genetic algorithms are based on the mechanism of natural selection and natural genetics and are stochastic search techniques. Genetic algorithms, are different from conventional search techniques, that they start with an initial set of random solutions called population. Each individual in population is called a chromosome, representing a solution to the problem at hand. A chromosome is a string of symbols, it is usually, but not necessarily, a binary bit string,It can be decimal string too. The chromosomes evolve through successive iterations, called generations. During each generation, the chromosomes are evaluated, using some measures of fitness. To create the next generation, new chromosomes, called offspring, are formed by either (a) merging two chromosomes from current generation using a crossover operator or (b) modifying a chromosome using a mutation operator. A new generation is formed by (a) selecting, according to fitness values, some of the parents and offspring and (b) rejecting others so as to keep the population size constant. Filter chromosomes have higher probabilities of being selected. After several generations, the algorithms converge to the best chromosome, which hopefully represents the optimum or suboptimal solution to the problem.

B. There are only two kinds of operations in genetic algorithm.

- Genetic operations: crossover and mutation.
- Evolution operation: selection.

The process of heredity of genes to create new offspring at each generation is depicted by the genetic operations. The evolution operation mimics the process of Darwinian evolution to create populations from generation to generation. This description is different from the paradigm given by Holland, where selection is made to obtain parents for recombination. GA utilizes a population of solutions in its search, giving it more resistance to premature convergence on local minima be identified by their order of creation, k e N but whereas other local search methods, such as Simulated Annealing or Tabu Search, which are based on handling one feasible solution,. Initial population is the set consisting of N chromosomes. The number of chromosomes, i.e. population size, is one of the important parameters of GA. Members of the initial population (chromosomes) are the parents of the next generations and the efficiency of the algorithm is highly dependent on their quality.

Table 1	**Definition of Genetic Algorithm**	
Sr no.	**Authors**	**Definition of Genetic Algorithm**
1.	Holland(1992)	A GA is a meta-heuristic search technique which allows for large solution spaces to be partially searched in polynomial time by applying evolutionary techniques from nature.
2.	Kwok and Ahmad(1996)	A GA is a meta-heuristic for obtaining high quality solutions for a broad range of combinatorial optimization problems including the task scheduling problem.
3.	Chang et al.(2008)	GA is a feasible optimization method for problem domains thus it is used for an increasing no. of applications.
4.	Chen and Chang (1993), Goldberg (1982),Mayer(1999)	GA is used as a search algorithm which is based on the biological principles of selection, reproduction and

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		mutation.
5.	Holland(1992)	GA is an evolutionary strategy that has been shown to consistently generate more efficient solution than other evolutionary strategies when applied to scheduling in heterogeneous distributed system.
6.	Wang et al.(1997)	GA is the most widely studied guided random search techniques for task scheduling problems.
7.	Chen et al.(2012)	GA is a heuristic search technique that utilizes analogies to natural selection and survival of the fittest.
8.	Alcan and Basligil(2012)	GA is a search technique used in computing to find exact or approximate solutions to optimization and search problems.
9.	Chang et al.(2008)	GA attempt to simulate natural evolution and form a populous selection of possible solutions by exploring the search space in an attempt to find near optimal solutions to optimization problems.
10.	Singh and Singh(2012)	GA approach is being proposed to handle the problem of parallel system task scheduling.

Table 2 Various Parameters of Genetic Algorithms Studied By Different Authors

Sr .no	Parameters	Authors
1.	the population size (Pop Size),the crossover probability (Pc), the mutation probability(Pm), and the maximum evolution generation (Max_G)	Yao,W.,et al(2004)
2.	population size, crossover probability, and mutation probability	Oh,J.,Wu,C.,(2004)
3.	Communication Time & Execution time	Moore,M.,(2004)
4.	Computing Capability,Utilisable rate of node,workload	Li,M.,et al(2006).
5.	Crossover probability, Mutation Probability, Population No.	Min,L.,Cheng,W.,(2006)
6.	Population Size,Generation Number,Mutation Probability	Chang C.K.,et al(2008)
7.	Start time , finish Time No. Of Processors, Makespan, CPU time,Utilization.	Yoo, M.,(2009)
8.	Finish time, start time, no. of processors	Omara,F.A.,Arafa,M.M.,(2010)
9.	Processing Time	Asadzadeh,L.,Zamanifar,K.,(2010)
10.	Processing Time	Balin, S.,(2011)

III. From Task Scheduling to Categories of Task Scheduling

A. Task scheduling can be defined as assigning the different tasks in parallel environment onto a set of homogeneous processor. By doing so it will determine the sequence of execution of the task at each processor. While the make span of the tasks determined by the sequence of the task in which these are processing in a particular order and further the performance of the processors also effects the total finish time. So an execution of task scheduling depends upon four major components:

- The Sequence of the task in particular order.
- Number of processors.
- Evaluation and Performance of the homogeneous processors.
- Scheduling and Mapping of the tasks onto the processors [29].

Above four major components plays vital role in finding the optimized result in solving such type of optimization problem [29]. These all components are interdependent on each other and to compute the optimized results these are not be

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considered individual. Task scheduling in parallel environment having a set of homogeneous processor is being proposed by using the Genetic Algorithm (GA) approach. A GA approach [31] [32] [30] is a heuristic technique which deals with a generation of individual. In this technique a set of genes are generated which further creates a string and a string is encoded as individuals. Such types of strings are known as chromosome. With the help of these generated chromosome (generation by generation) gives us an optimized result. A fitness function is used for generating the set of individuals from which another generation of chromosome be generated. Three major operations selection, crossover and mutation operations [15] part of the GA based on some major attributes such as population of chromosome, fitness function, selection criteria, probability of occurrence of crossover and probability of occurrence of mutation. All these attributes are used for the optimization of task scheduling.

B. Categories of Task Scheduling

- Static Scheduling- If jobs are partitioned into subsystems, and each subsystem is bound statically to a processor, we have a static system. Expect static systems to have inferior performance (in terms of overall response time of the jobs) relative to dynamic systems. But it is possible to validate static systems, whereas this is not always true for dynamic systems. For this reason, most hard real time systems are static
- Dynamic Scheduling-- If jobs are scheduled on multiple processors, and a job can be dispatched from the priority run queue to any of the processors, the system is dynamic.

IV. Discussion and Future Research

It has been observed in the literature that various issues related to genetic algorithms, task scheduling has been discussed in depth. Although computer performance has evolved exponentially in the past, there are many applications that demand more processing power than a single state-of-the-art processor can provide. To respond to this demand, multiple processing units are employed conjointly to collaborate on the execution of one application. So due to involvement of multiple processing units Load Balancing becomes the key issue. So far researchers have explored the mentioned issues like genetic algorithms for task scheduling to minimize make span, to minimize execution time but no literature has been found studying Genetic algorithms for Task scheduling With Load Balancing. It has therefore been considered important to understand the use of Genetic Algorithms for Task Scheduling on Parallel Environment with Load Balancing. So Load Balancing algorithms are designed essentially to equally spread the load on processors and maximize their utilization while minimizing the total task execution time .In order to achieve these goals, the load balancing mechanism should be fair in distributing the load across the processors and load should be equally divided so that no one CPU should remain busy or idle.

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16-Bit Arithmetic and Logic Unit Design Using Mixed Type of Modeling in VHDL

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***Abstract*—This paper explains the design and implementation of 16-bit ALU (arithmetic and logic unit) using VHDL by using mixed style of modeling in Xilinx ISE 8.1i. The ALU takes two16-bits numbers and performs different principal arithmetic and logic operations like addition, multiplication, logical AND, OR, XOR, XNOR. The major focus of concern in this ALU is the multiplication operation using radix-4 booth algorithm and bit-pair recording technique which increases the speed of multiplication operation. We had followed modular programming approach so that our ALU is sub divided into smaller logical block. All the modules in arithmetic and logical unit design are realized using VHDL design [1]. The top level design consists of arithmetic unit and logic unit which is implemented by using mixed type of modeling. Designing of this ALU is done by using VHDL and simulated using Xilinx ISE 8.1i [1].**

I. INTRODUCTION

The main aim of our paper is to design a 16 bit Arithmetic Logic Unit which is a digital circuit that performs arithmetic and logical operations using VHDL [5]. The ALU is a key block of the central processing unit (CPU) of many systems. Field Programmable Logic Arrays (FPGAs) have been growing at a rapid rate in the past few years. FPGA [2] is a special type of logic chip that can be programmed which supports thousand of gates and provide flexibility and low cost which is suitable for implementing a prototype system. Existence of CAD software supports FPGAs that had grown in sophistication and it makes most user designs are now complete system and go to production as an FPGA. This paper will discuss on FPGA design style using a 16-bit ALU as design hardware. The methods that used to implement the 16-bit ALU are using schematic based entry and VHDL based entry. Implementation of 16-bit ALU using VHDL includes a mixed type of description. The top level of design is using a schematic based entry. Finally this paper will discuss the methods that are used in designing the 16-bit A L U in term of the flexibility, timing analysis as well as area consumption. The analysis will give also the user more understanding in designing digital system using FPGA design style and give them a choice which depends on the design requirements [2].

II. DESIGN OF 16BIT- ALU

When designing the ALU we will follow the principle "Divide and conquer" in order to use modules, some of which can be re-used. An Arithmetic unit does the following task: Addition, Addition with carry. Now first of all we start with making one bit Full Adder, then a 4-bit Carry look ahead Adder using four numbers of Full Adder and at last a 16-bit Carry look.

III. ARCHITECTURE OF 16-BIT-ALU

The proposed 16-bit ALU consists of one arithmetic unit and logic unit. Using the principle of regularity, the arithmetic unit is divided into different blocks which perform the operations such as: addition & multiplication. But, the main focus of concern in this arithmetic unit is on addition & multiplier unit. We have used carry look ahead adder for addition because Carry Look Ahead Adder is in between the spectrum of all adders, having a proper tradeoff between time and area complexities, and for multiplication we use Radix-4 Booth algorithm and bit pair recording techniques.

The reason for choosing this technique is to Boost up the speed of 16-bit ALU. Similarly, the logic unit is also divided into various blocks which perform the operations i.e. AND, OR, XOR, XNOR, Complexity and propagation Delay for n-bit Carry Look Ahead structure.

ACLA = O (n) = 14n

TCLA = O (log n) = 4 log2n.

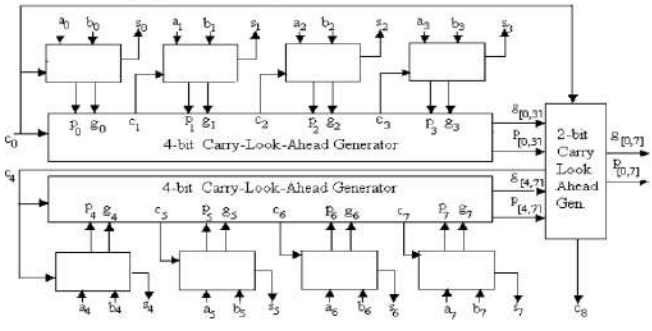

Fig. 1. 8-Bit Carry Look Ahead Generator (Using 2-Bit CLA).

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IV. MULTIPLIER UNIT

Booth Multiplication Algorithm (Radix – 4) [4]

One of the solutions realizing high speed multipliers is to enhance parallelism which helps in decreasing the number of subsequent calculation stages. The previous version of Booth's multiplier (Radix – 2) had two drawbacks [6].

- The number of add / subtract operations became variable and hence became inconvenient while designing Parallel multipliers
- The Algorithm becomes inefficient when there are isolated 1s.

This problem is bypass by using Radix 4 Booth's Algorithm which can scan strings of three bits with the algorithm given below [3].

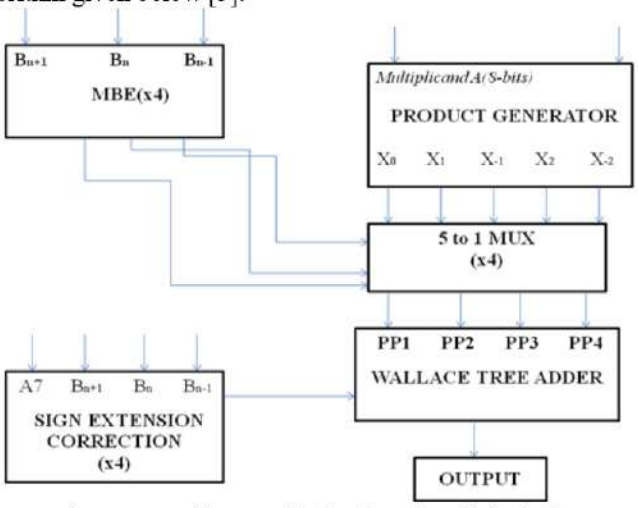


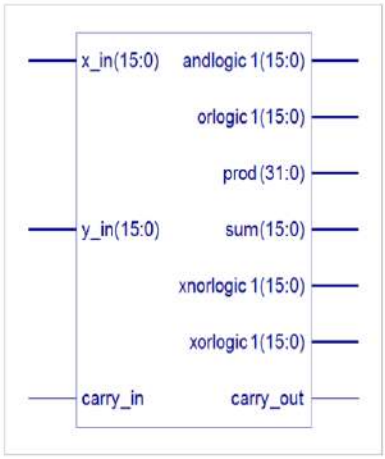
Fig. 2. Architecture of designed Booth Multiplier in the Paper.

TABLE I. RADIX-4 RECODING

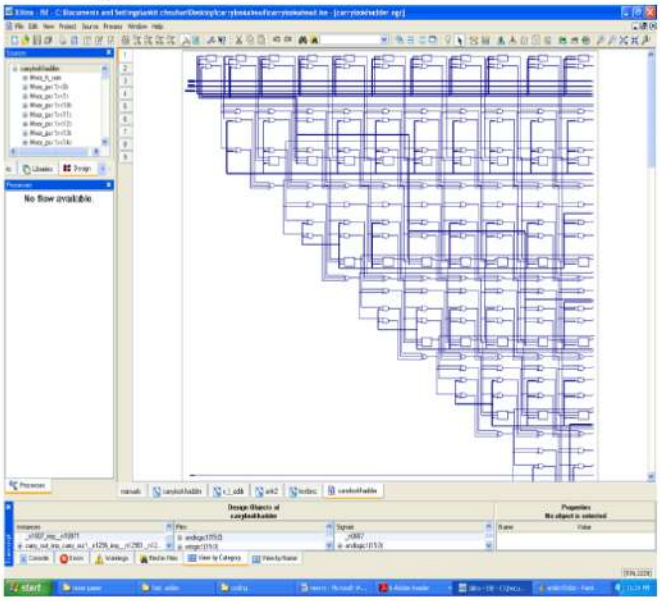
Quartet value	Signed digit value
000	0Y
001	+1Y
010	+1Y
011	+2Y
100	-2Y
101	-1Y
110	-1Y
111	0

V. SYNTHESIS RESULT

A. RTL view



B. Technology View



C. Simulation

Behavioral simulation is shown below:

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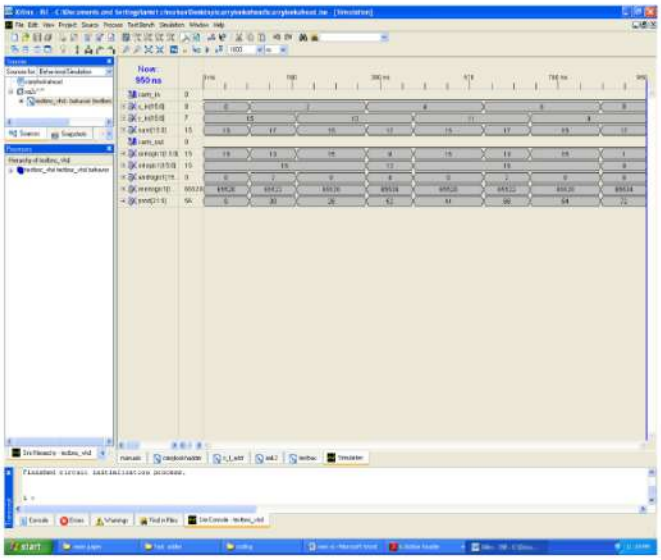

VI. FPGA DESIGN ENTRY

The ST102 has been designed specifically to work with Xilinx ISE CAD tools including the free Web pack tools available from the Xilinx website. The low cost standard expansion connectors allow new peripheral board, including wire-wrap or manually soldered boards to be quickly designed and used. The ST102 board ships with a power supply, so designs can be implemented immediately without the need for any extra additional cable. [7]

The ST102 board has been designed to offer an unembellished, low cost system for designers who need a flexible platform to gain exposure to the Spartan 2 device, or for those who need to rapidly prototype FPGA-based design. The ST102 board provides only the essential supporting device for the Spartan 2, and routes all available FPGA signal to standard expansion connectors and included on the board are 2.5V DC and 3.3V DC regulators, a JTAG configuration circuit that uses a standard parallel cable for programming [9].

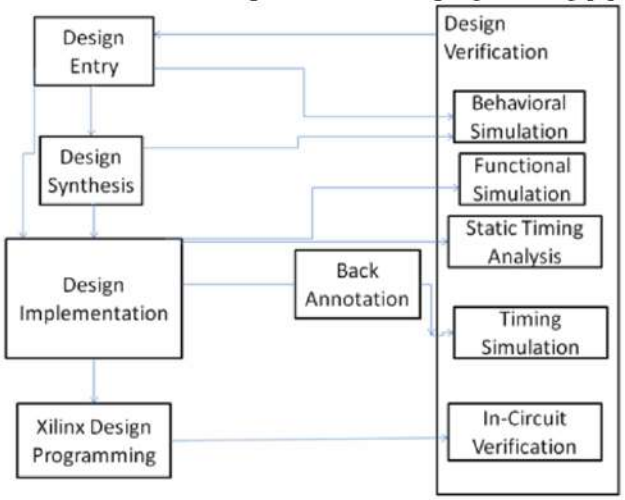

Fig. 3. FPGA Design Entry

Fig. 4. ST102 Block Diagram

CONCLUSION

This paper presented a new idea to design 16-bit ALU of a processor. This has been implemented in SPARTAN-3E FPGA device. FPGA design offers greater design flexibility. The design is compact and is upgradable without any change in hardware. Here, the synthesis tool optimizes the design architecture of the FPGA for the ALU. Hence, additional features can be added to the existing design without any changes in hardware. The ALU is synthesized and simulated. The ALU of a processor is configured using each block designed.

The main advantage of the proposed 16-bit ALU design is the achievement of increase in the speed of ALU operation so that the time consumption will be reduced. This is because of the fact that the proposed ALU performs the addition by using carry look ahead adder instead of convolution adder & also multiplication operation is performed by Radix-4 booth algorithm and bit-pair technique which reduces the number of multiplier bits to half (here 16-bit to 8-bit) so that the number of partial products generated will be reduced by a factor of 2 as compared to normal multiplication using general algorithm [8].

Thus the time required to perform the addition of the partial products will be reduced to half so that the speed of multiplication will be enhanced. Therefore, the overall speed of the 16-bit ALU is increased.

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A Concept of Virtual Keyboard

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Abstract—**The Virtual Keyboard is the latest development these days. It is just another example of today's computer trend of 'smaller and faster'. Computing is now not limited to desktop and laptops, it has found its way into mobile devices like palm tops and even cell phones. The Virtual keyboard uses sensor technology and artificial intelligence to let users work on any flat surface as if it were a keyboard. The present paper depicts the conceptual study of virtual keyboard which is no doubt finding vital application in the upcoming technology.**

Keywords—**Mapping, Scanning, Sensors, Detection Technique, Calibration**

I. INTRODUCTION

At their most basic, all keyboards, whether they're physical or virtual, are input devices -- once you type in a certain series of keystrokes, you're telling the keyboard to deliver a command to your computer.

When you type on a virtual laser keyboard, there aren't any switches involved. In fact, there aren't any mechanical moving parts at all. The device projects the image of a QWERTY keyboard onto a flat, non-reflective surface using a diode laser. The laser, similar to the kind you see on those cheap laser pointers people wave at rock concerts, shines through a Diffractive Optical Element (DOE), which is simply a tiny image of the keyboard. The DOE, along with special optical lenses, expands the image to a usable size and projects it onto a surface. But a simple image. Of a keyboard won't get you anywhere -- something needs to analyze the information you type in. Manufacturers used different ways to sense the typed character of virtual keyboard. Light made full size keyboards on mobile devices like PDAs, palmtops and other portable computing devices enables a keyboard to be projected onto a flat surface using a beam of light, which can then be typed on. Key Glove by Won, Lee et al [7], suggested the user to wear a tethered glove to recognize signal variations caused by the movement of fingers. Scurry System [9] used an array of Gyroscopes attached to user hands to detect the movement of fingers and wrist. Sense board [8], virtual keyboard system is based on two devices made of a combination of Rubber and Plastic. Using Infrared Camera's [2] we can detect the interaction between the fingers and a projected image from a Laser Diode. Virtual keyboard uses sensor technology and artificial intelligence [3] to let users work on any surface as if it were a keyboard. There are flashlight size gadgets that project an image of a keyboard on any surface and let's people input data by typing on the image. The device detects movement when fingers are pressed down. Those movements are measured and the devices accurately determines the intended keystrokes and translates them into text. The Virtual keyboard uses light to project a full –sized computer keyboard onto almost any surface, and disappears when not in use. Once the keystrokes have been decoded, it is sent to the portable device either by cable or via wireless. The surface must be smooth, non glossy, static one .That background must be free of other objects. While developing the system using digital image processing, having this type of background is a must.

A. Module design

Virtual Keyboard is based on the vision based human-computer interaction concept, namely Image Capturing, Character Identification and device emulation module. In image processing technique, the background must be free of other objects and the surface must be smooth, non glossy, static one.

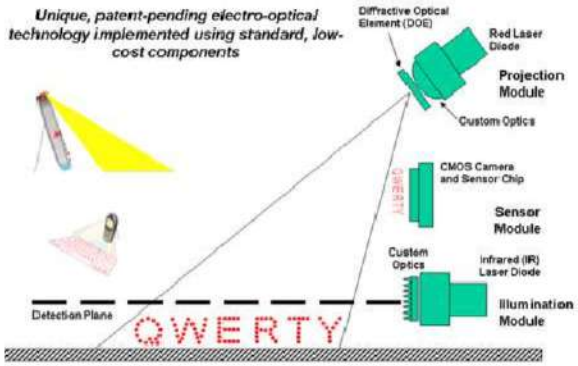

Fig.1. Module Design [3]

a) Image capturing module: This module is involving with sequentially capturing images of the touching movements and storing those images in a buffer, which is acting as a queue. This module comes into play after the user selected the particular device that he / she wants to input data using this virtual keyboard at the user interface. Images are popping one by one from the buffer to use for the character identification module.

b) Character identification module: Image-Capturing module sends the images to this module. Then one image goes through several image processing

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techniques to extract relevant information in each level. After detecting the edges of the keyboard from the first start-up image, it calculates the height and width of the keyboard. Thereafter it calculates the height of one column and width of one raw of the keyboard and calculates the key coordinates of each key and stored in a global array with virtual key codes.

c) Device emulation module: Character identification module sends the virtual key code to the server. Server O/S accepts the signal from the keyboard buffer and forwards the signal to the keyboard device driver. Then keyboard device driver sends the signal to the appropriate window, which has the input focus.

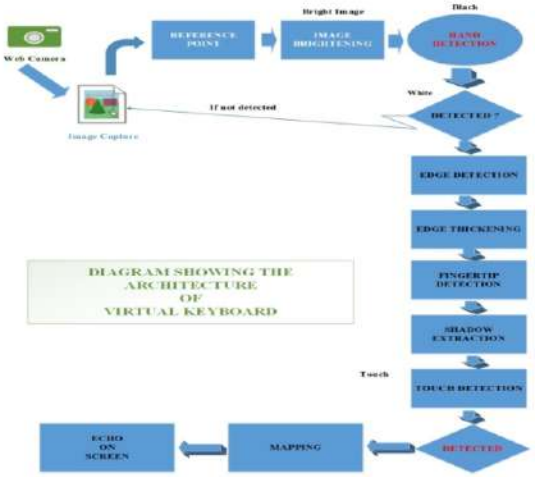

Fig .2. Virtual Keyboard Architecture [6]

B. Image processing technique

Image processing includes some of the goals like compression of image, enhancement of image, manipulation and image editing, detecting feature, storing the image and understanding it. The most important is segmentation. Segmentation is nothing but set of pixel value. Image segmentation is one of the fundamental approaches of digital image processing; It is a pre processing step in many algorithms and practical vision system. In image segmentation, digital image divided into multiple set of pixels so as to locate and identify objects and boundaries in an image. First the image i.e. character is capture by the webcam through sensor then that image is store temporarily. Now given image converted into black and white color using Grayscale algorithm. Grayscale digital image is an image in which the value of each pixel is a single sample. Then Thresholding algorithm is apply on the Grayscale image to differentiate the object from the background. Thresholding is the simplest method of image segmentation. To find out object from the background the following steps are takes place in the Thresholding algorithm [4]:

Threshold T is selected; this selection can be done randomly.

Grayscale image is segmented into two sets-

$$S1 = \{f'(x,y) : f'(x,y) > T\} \quad (1)$$

$$S2 = \{f'(x,y) : f'(x,y) < T\} \quad (2)$$

Where, S1 is the set of object pixel value And S2 is the set of background pixel value

f'(x,y) is value of pixel located in xth column and yth row.

Then, average of each set is computed

n1= average value of S1

n2= average value of S2

A new threshold is created that is the average of n1 and n2

$$T' = (n1+n2)/2 \quad (3)$$

Repeat above four steps until new Threshold value matches the one before it. So this is how with the help of Threshold algorithm we can identify the character given by user. When the user wants to press a key, what he has to do is simply place his finger at the appropriate position in the frame, in other words on the virtual keypad and the desired key will be pressed.

C. Detection technique

Various Detection that enable user to detect finger movement are as follows:

a) Keyboard detection: keyboard detection detects the virtual keyboard end points using color differentiation technique. Blue color has been putted at the endpoints of the keyboard so as to determine the end points of keyboard.

Fig.3. Keyboard Detection [2]

b) Hand detection: In this number of hand images has been used with three colors Red, Green, and Blue

called RGB values which helped in observing the images. In the end, detected regions are threshold to white color while rest black in color.

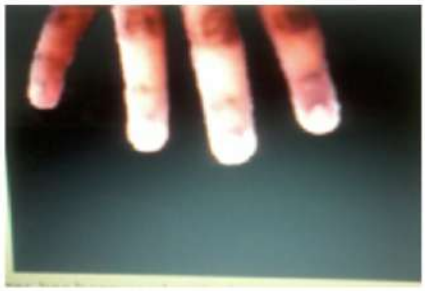

Fig.4. Hand Detection [6]

c) Edge detection: The edges could be detected with the help of any technique that is, Sobel, Prewitt, Zero Cross and Canny. But Sobel Technique is more appropriate than any other. Sobel technique helps in identifying the points in an image where the brightness changes. When the edge is obtained it will thicken it to remove the discontinuities and finally resulted in complete traversal in hand edge. It helps in the enhancing the vision technique of the computer system.

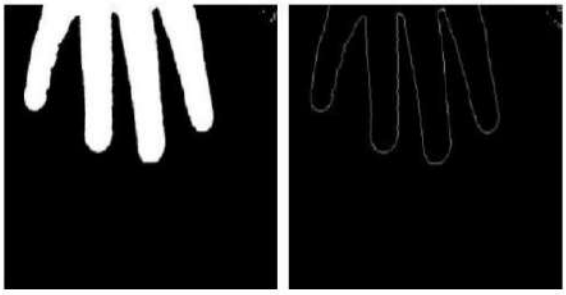

Fig.5. Edge Detection [2]

d) Shadow extraction: The image will be brightened according to the lightning situations. This helps in eliminating all background noises. After that hand is obtained which is to be subtracted from the image. This will allow having hand shadow.

Fig.6. Shadow Extraction [6]

II. NEED OF CALIBERATION AND TUNING

There is a need to calibrate and tune your laser projection keyboard before use. It will make your laser projection keyboard perform well.

A. Basic power on check

After assembling the laser projection keyboard kit, connect it with PC or any device in which you wants to do work with the help of USB cable or Bluetooth. If all is correct then you will see the projected keyboard pattern on the desk surface.

B. Connecting with the signal processing software

Signal processing software will process the input video signal and transforms it to the related keyboard input events.

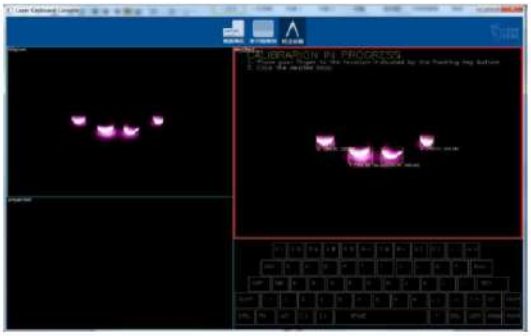

Fig.6.Keyboard Events shown on screen [2]

C. Camera focus adjustment

Adjust the focus by tuning the camera lens and watch the image displayed on the signal processing software window .If there is a clear image of the finger top ,then focus adjustment is finished.

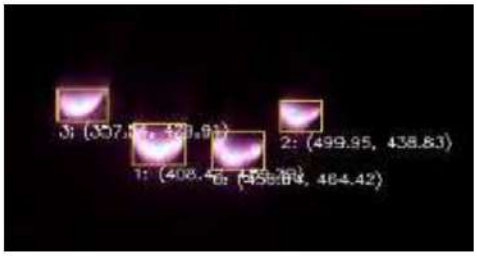

Fig.7. Camera Focus Adjustment [2]

D. Adjust the projected keyboard pattern

A good projected keyboard should look like

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Fig.8. Projected Keyboard Pattern [2]

E. Camera angle adjustment

It is check by placing the four fingers on the 4 corner of the projected keyboard pattern image on the desktop one-by-one and check whether the illuminated finger top has been captured by the camera.

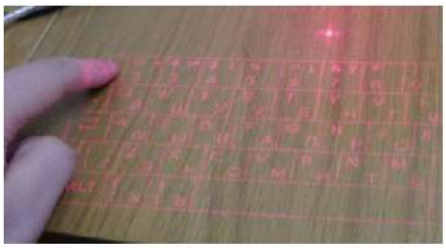

Fig.9.Camera Angle [2]

F. Laser adjustment

The line strip generated by the laser should be parallel to the desk surface to make laser keyboard work.

Fig.10. Adjustment of laser [6]

G. Final Caliberation

Final Caliberation is done with the help of signal processing software. Place your finger to the required place, please do not move the finger. Press key 10 times, the Caliberation process is completed. There is no need to recalibrate your keyboard as long as the laser keyboard won't change.

CONCLUSION

With the growing popularity of small mobile devices, There is a need for convenient data entry units that are easy to use and considerably flexible to handle. So various Virtual Keyboards are designed. This paper successfully demonstrates the usage of sensor technology and artificial intelligence to let users work on any smooth surface as if it were a Keyboard.

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A REVIEW ON IMAGE ENHANCEMENT TECHNIQUES

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Abstract — **Extensive research has been done on image enhancement and hence it has become essential to categorize the research outcomes and provide an overview of the available enhancement techniques. In this paper different image enhancement techniques with their conceptual details are reviewed. Image Enhancement is one of the most important and difficult techniques in image research. The aim of image enhancement is to improve the visual appearance of an image, or to provide a "better transform representation for future automated image processing. Many images like medical images, satellite images, aerial images and even real life photographs suffer from poor contrast and noise. It is necessary to enhance the contrast and remove the noise to increase image quality. One of the most important stages in medical images detection and analysis is Image Enhancement techniques which improves the quality (clarity) of images for human viewing, removing blurring and noise, increasing contrast, and revealing details are examples of enhancement operations. The enhancement technique differs from one field to another according to its objective. The existing techniques of image enhancement can be classified into two categories: Spatial Domain and Frequency domain enhancement**.

Keywords: **Image Enhancement, Frequency based domain enhancement, Spatial based domain enhancement, Histogram Equalization.**

I. INTRODUCTION

Digital Image Processing (DIP) is one of the Digital Signal Processing application having a wide range of applications such as space exploration, Image transmission and storage for business applications, medical processing, radar, sonar and acoustic image processing, robotics and automated industrial inspection[1].The areas of DIP being quite heterogeneous, to gain a basic knowledge of these areas it is essential to classify images according to their sources like electromagnetic energy spectrum, acoustic, ultrasonic and electronic or synthetic images generated by computer [2]. All these applications involve different processes and they require images with good visual perception. Developing images with good perceptual quality by highlighting the obscured details or certain features of interest in an image is the basic idea behind image enhancement. Image enhancement involves techniques to accentuate or sharpen the image features such as edges, boundaries or contrast to make a graphic display more useful for display and analysis. Such images with good contrast and visual quality are required for all important areas of image processing. The inherent information content is not increased by applying Enhancement techniques but there is an increase in the dynamic range of chosen factors [1]. With the growing research in the field of Image enhancement it has made it very essential to categorize the image enhancement methodologies. Section II discusses the development of various enhancement techniques. Section III presents histogram processing.

II. IMAGE ENHANCEMENT TECHNIQUES

Image enhancement techniques acting as an important part in image processing. Person click image from common environment with elevated dynamic range include both dark and bright regions. Due to go beyond in dynamic range of human eyes sensing, those image are not easy to distinguish by human eyes. Image enhancement is a general approach to get better quality of those images in terms of human visual observation[5]. Figure 1 is showing the poor visible input image. It is clearly shown in the image that it will not give much information to observers and, it may contain poor results for further processing.

Figure 1. Input image [4]

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Figure 2 is showing the enhanced image. It is clearly shown in the figure that all the objects are enhanced and image is now providing quite more information to the observers.

Figure 2. Enhanced Images [4]

Image enhancing techniques can be broadly classified into spatial and frequency domain methods.

A. Spatial Domain Methods

In spatial domain techniques [3], we directly deal with the image pixels. In spatial domain for getting desired output the pixel vales are manipulated. Basically in spatial domain the value of pixel intensity are manipulated directly as equation (1)

$$G(x, y) = T[f(x, y)] \quad (1)$$

Where f (x,y) is input image, G(x, y) is output image and T is an operator on f, defined over some neighborhood of f(x,y).

Methods in this domain refer to image plane itself and the image processing methods are based on direct manipulation of pixels in an image. Two principal categories of spatial processing are available such as, intensity transformation and spatial filtering.

1) Intensity Transformations:

This transformation processing technique is based on a single pixel of an image. This transformation consists of brightness control; contrast stretching, thresholding, histogram equalization, gamma correction and histogram modification.

2) Spatial Filtering:

It is deals with performing operations by working in a neighborhood of every pixel in an image. These are mask processing operations since they can take into account neighboring pixel intensities in the original image for computing the intensity value in the resulting image. Spatial filtering performs operations such as image sharpening, Noise reduction, edge enhancement. These filters can be linear or nonlinear. If the operation performed on the pixels is linear then the filter is called a linear filter otherwise it is a nonlinear filter.

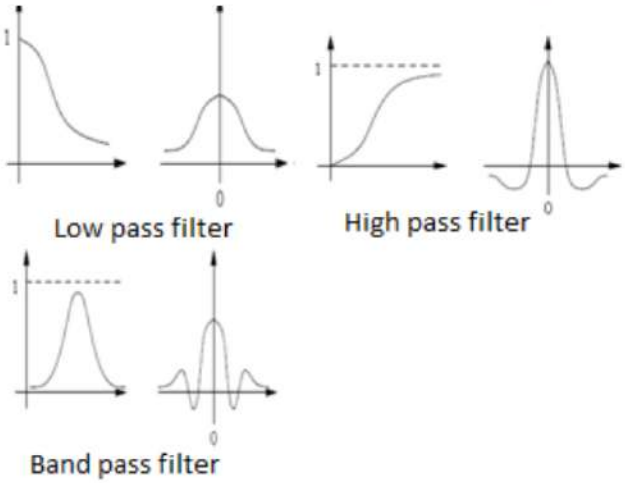

Figure3. Examples of spatial filtering

B. Frequency Domain Methods

For processing in frequency domain, operations are performed on Fourier transform of an image rather than on the image itself. The techniques that fall under this category include Low pass filtering, High pass filtering, Homomorphic filtering, Linear and root filtering. Homomorphic filtering is applied on low contrast images and the High pass filter is used as a surround function. The principle idea of Homomorphic filtering is to remove the illumination in the image. But this technique destroys some part of the image which does not require enhancement and that part is recovered using a threshold after applying Homomorphic technique [13]. Wavelet analysis has proven to be a powerful image processing tool in recent years. When images are to be viewed or processed at multiple resolutions the wavelet transform is the tool of choice [14]. Frequency domain methods introduce certain artifacts and cannot simultaneously enhance all parts of the image very well and it is difficult to automate the image enhancement procedure.

Understanding frequency domain concept is important, and leads to enhancement techniques that might not have been thought of by restricting attention to the spatial. Image enhancement techniques in frequency domain are based on modifying the Fourier transform of an image. All the enhancement operations are performed on the Fourier transform of the image and then the Inverse Fourier transform is performed to get the resultant image. In the frequency domain the image enhancement can be done as shown in equation (2):

$$G(u, v) = F(u, v)\, H(u, v) \quad (2)$$

Where G (u, v) is enhanced image, F (u, v) is input image and H (u, v) is transfer function.

1. Compute F (u, v), the DFT of input image.
2. Multiply F (u, v) by a filter function H (u, v) as G (u, v) = H (u. v) F (u, v).
3. Compute inverse DFT of the result by applying inverse Fourier transform.
4. Obtain real part of inverse DFT.

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III. HISTOGRAM EQUALIZATION (HE)

Histogram equalization (HE) is one of the image enhancement techniques in spatial domain which is considered to be most popular because of its simplicity and comparatively better performance on all types of images [3]. Histogram equalization is a transformation that stretches the contrast by redistributing the gray level values uniformly. However, histogram equalization suffers from major drawbacks especially when implemented to process digital images. Firstly, histogram equalization transforms the histogram of the original image into a flat uniform histogram with a mean value that is in the middle of gray level range.

Accordingly, the mean brightness of the output image is always at the middle – or close to it in the case of discrete implementation – regardless of the mean of the input image. For images with high and low mean brightness values, this means a significant change in the image outlook for the price of enhancing the contrast. Secondly, histogram equalization performs the enhancement based on the global content of the image and in its discrete version large bins cannot be broken and redistributed to produce the desired uniform histogram In other words, histogram equalization is powerful in highlighting the borders and edges between different objects, but may reduce the local details within these objects, especially smooth and small ones. Another consequence for this mergence between large and small bins is the production of over enhancement and saturation artifacts [6]. Some researchers have also focused on improvement of histogram equalization based contrast enhancement such as mean preserving bi-histogram equalization (BBHE) [10], equal area dualistic sub-image histogram equalization (DSIHE) [11] and minimum mean brightness error bi-histogram equalization (MMBEBHE) [10], [12]. BBHE separates the input image histogram into two parts based on input mean. After separation, each part is equalized independently. This method tries to overcome the brightness preservation problem. DSIHE method uses entropy value for histogram separation. MMBEBHE is the extension of BBHE method that provides maximal brightness preservation. Though these methods can perform good contrast enhancement, they also cause more annoying side effects depending on the variation of gray level distribution in the histogram [15]. Recursive Mean-Separate Histogram Equalization (RMSHE) [9] is another improvement of BBHE. However, it also is not free from side effects [7].

A) Histogram Equalization Algorithm:

Let's suppose that X={X(i, j)} denotes a digital image, where X(i, j)denotes the gray level of the pixel at (i, j) place. The total number of the image pixels is N, and the image intensity is digitized into L levels that are {Xo,X1, ..., XL-1}. So it is obvious that X(i, j){Xo, X1, ...,XL-1} suppose nk denotes the total number of pixels with gray level of Xk in the image, then the probability density of Xk will be

$p(Xk) = nk/N, k=0, 1, \ldots, L-1$ (1)

The relationship between p(Xk) and Xk is defined as the probability density function (PDF), and the graphical appearance of PDF is known as the histogram. Based on the image's PDF, its cumulative distribution function (CDF) is defined as

c(Xk) = (2)

Where k=0, 1, ... , L-1, and it is obvious that c(XL-1)=l.

Thus the transform function of histogram equalization can be defined as

f(Xk)= X0+(XL-l-X0)c(Xk), k=0,1,….,L-1 (3)

Suppose **Y**={Y(i,j)} is defined as the equalized image then

Y=f(**X**)={f(X(i,j))|X(i,j) **X**}

Conventional histogram equalization however results in images that have unnatural look due to excessive contrast enhancement. Researchers have focused on improvement of the HE based contrast enhancement and new forms of histograms for contrast enhancement have been developed.

IV. PROPOSED TECHNIQUE

The main objective of algorithm which will provide better results than existing algorithms to enhance the images. Dynamic image restoration using adaptive gamma correction and also adaptive smoothing technique will be integrated to the non linear enhancement method to provide more accurate results. By doing this we can hope that the detailed variance and background variance will be increased and decreased respectively. However dynamic restoration may come up with some potential overheads so we will try to reduce them[17].

Figure 4 is showing the various steps to achieve the objectives.

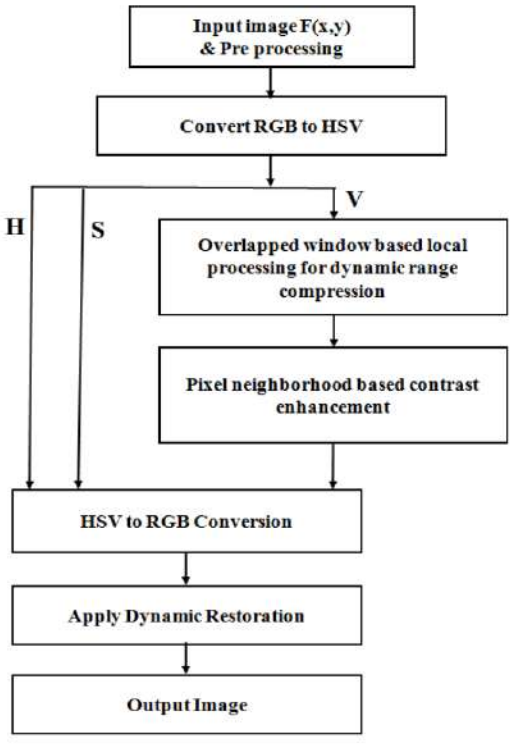

Figure4. Proposed Algorithm

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Step 1:
In step 1 image is passed to the system and some pre-processing operations are applied on it.
Step 2:
In step 2 image is converted in HSV plane.
Step 3:
As H and S component stay constant but V is the only factors which need some alteration while enhancing the images.
Step 4:
Now overlapped window based local processing for dynamic range compression will be applied on V component.
Step 5:
Now pixel neighborhood based contrast enhancement is applied on the image.
Step 6:
Now re-convert given image to HSV to RGB again.
Step 7:
Now apply dynamic restoration algorithm.
Step 8:
Get output image.

V. REAL-TIME APPLICATIONS OF IMAGE ENHANCEMENT TECHNIQUES

Image enhancement techniques have contributed to exploration advancement in a various fields.[8] Some of the areas where Image Processing has wide application
are as follows:
1. In forensics, For instance is used for designation, evidence gathering and monitoring. Images obtained from _nger-mark detection, security videos analytic thinking and crime scene inspections are enhanced to help out with identification of culprits along with protection of victims.
2. In atmospheric sciences, For example is used to slow up the effects of haze, fog, mist and turbulent weather conditions for meteorological observations.
It can help in detecting shape and also structure of remote physical objects in environment sensing. An artificial image from satellites requires image restoration, enhancement and other filtering methods to remove noise.
3. Astrophotography faces challenges on account of light and noise contamination that can be lessened by IE. For real-time sharpening and contrast enhancement several cameras have throughout-built IE functions. Furthermore, numerous software, allow editing such images to over better and vivid final results.
4. In oceanography the study of images reveals interesting highlights of water low, sediment density, geomorphology and bathymetric behaviour to name a couple of. These features are to a greater extent clearly observable in graphics that are digitally boosted to overcome the issue of moving targets, scarcity of light and obscure surround.
5. Medical imaging uses image processing techniques for noise reduction in addition to sharpening the visual representation and details of an image. Since minute details perform a critical role inward diagnosis and treatment involving disease, it is vital to highlight important features spell displaying medical images. This this way image processing techniques becomes an important aiding tool for MRI, echography and x-rays images. A number of other fields including law enforcement, microbiology, biomedicine, bacteriology, etc., reap the benefits of various IE methods.

VI. CONCLUSION

It is seen that image enhancement encompasses a collection of techniques which improve the perception of an image or convert it to a form suitable for analysis by human or automated image processing technique. These techniques offer a wide variety of approaches and the choice depends on the specific task, image content, and observer characteristic and viewing conditions. Despite the effectiveness of spatial domain techniques when applied separately, in practice a combination of such methods can be used to achieve more effective image enhancement. Secondly, spatial and frequency domain methods have their merits and shortcomings but researchers are developing new methods which have the best properties from both spatial and frequency domain. Comparatively, histogram equalization provides better result regarding image contrasts. Histogram equalization is a transformation that stretches the contrast by redistributing the gray-level values uniformly.

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A Survey on Temporally Ordered Routing Algorithm (TORA) for MANET

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Abstract- **The Temporally Ordered Routing Algorithm (TORA) is a highly adaptive, well-organized,efficient, scalable anddistributed routing protocol based on a "link reversal" algorithm being best-suited for Mobile Ad hoc Networks (MANET) which do not have pre-existing infrastructure in the form of communication network. There are many other routing protocol in MANETS like AODV, DSDV, OLSR, DSR etc. However, each protocol has its own advantages as well as its disadvantages making it suitable for some applications and not for others. The major Banefit of TORA is its excellent support for multiple routers and multicasting. It was intentionally build for fast changing network topologies. This paper provides an overview of Temporally Ordered Routing Algorithm (TORA).The TORA provides multiple loop-free routes to any destination on-demand using the route creation, maintenance and erasure functions.**

Index Terms **- MANET, TORA, IMEP, AODV, DSR, DSDV, OLSR.**

I. INTRODUCTION

The Temporally Ordered Routing Algorithm (TORA) is an adaptive routing protocol for multi hop networks. TORA is an example of hybrid , distributed routing protocol based on a "link reversal" algorithm for routing data across Mobile ad-hoc networks. The basic idea behind link reversal algorithms is as follows. Whenever a link failure at a node causes the node to lose all downstream links to reach the destination (and thus no longer in a destination oriented state), a series of link reversals starting at that node can revert the DAG back to a destination-oriented state.[24] The actions taken by TORA can be described in terms of waterflowing downhill towards a destination node through a network oftubes that models therouting state of the real network. The tubesrepresent links between nodes in the network, the junctions of tubesrepresent the nodes, and the water in the tubes represents the packetsflowing towards the destination. Each node has a height with respectto the destination that is computed by the routing protocol. If a tubebetween nodes A and B becomes blocked such that water can nolonger flow through it, the height of A is set to a height greater thanthat of any of its remaining neighbors, such that water will now flowback out of A (and towards the other nodes that had been routingpackets to the destination via A). It is a source-initiated on-demand routing protocol. It finds multiple routes from a source node to a destination node. The main characteristic of TORA is that the control messages are restricted to small set of nodes in the neighborhood of the occurrence of a topological change. To attain this, the nodes maintain routing information about adjacent nodes.[4]TORA routing protocol does not uses the concept of shortest path for creating paths from source to destination as it may itself take huge amount of bandwidth in the network. Instead of using the shortest path for computing the routes the TORA algorithm maintains the "direction of the next destination" to forward the packets.[13]The destination-oriented nature of the routing structure in TORA supports a mix of reactive and proactive routing on a per-destination basis. During reactive operation, sources initiate routes to a given destination on-demand. This mode of operation is advantageous in dynamic networks with relatively sparse traffic patterns, since it may not be necessary (or desirable) to maintain routes between every source/destination pair at all times. At the same time, selected destinations can initiate proactive operation, resembling traditional table-driven routing approaches. This allows routes to be proactively maintained to destinations for which routing is consistently or frequently required.[8]So TORA is offering following characteristics[27]

- Distributed execution
- Loop-free routing
- Multi-path routing
- Reactive or proactive route establishment and maintenance
- Minimization of communication overhead via localization of algorithmic reaction to topological changes.

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II BASIC MECHANISM IN TORA

TORA perform three operations such as Route Creation, Route Maintenance, Route Erasure.The creating routes operation is responsible for selecting proper heights for routers and forming a directed sequence of links leading to the destination in a previously undirected network.[9] The maintaining routes procedure is the operation that responds to network topology changes. The operation of erasing routes is used to set routers' heights to NULL and set links to undirected. It maintain [17] at least one route to destination in the routing tables. The initiation of route searching happens only when the source wants to send data packets to the destination.[14]

A. Route Creation

Creating routes requires use of the QRY and UPD packets. Initially, all nodes start off with a null height and links between the nodes are unassigned. When a node requires a route to a destination, it initiates route creation where *query* packets are flooded out to search for possible routes to the destination. Eventually, a *query* packet reaches either a node that has a route or the destination itself, and the node replies with an *update* packet. When a node receives an *update* packet, it sets its link as directed from itself to the sender of the *update* packet. This setting of directional links eventually reaches the node which requires the route and provides it with at least a route to the destination.

B. Route Maintenance

Route maintenance occurs when a node loses all of its outgoing links (thus all of its possible routes to a destination). This can be caused by either the detection of a link failure or link reversal following the receipt of an *update* packet. When the detection of a link failure causes a node to lose all of its out-going links, the node propagates an *update* packet which reverses the links to all of its neighbouring nodes. Intermediate nodes that receive the *update* packet then reverse the links of their neighbouringnodes. Links are reversed only for neighbouring nodes that do not have any out-going links and have not performed link reversal recently. The link reversal needs to be repeated until each node has at least one out-going link. This entire process ensures that the DAG is maintained such that all nodes have routes to the destination. The route maintenance function of TORA is the main problem as this function produces a large amount of routing overhead. This large amount of routing overhead causes the network to be congested thus preventing data packets from reaching their destinations. As mentioned earlier, route maintenance is initiated upon the discovery of a link failure that causes a node to lose all of its out-going links.

C. Route Erasure

In the event that a node is in a network partition without a route to the destination, route erasure is initiated. The detection of a network partition is undertaken by the node that first initiated route maintenance (i.e. due to a link failure causing the loss of all its out-going links). During route maintenance, the node sends out *update* packets to reverse links to all its neighbouring nodes and attempts to find a route to the destination. It is able to determine the presence of a network partition if a similar update packet is sent back to it by another node. This means that all nodes in the current network partition cannot find a route and are trying to find a route through the original node. Route erasure is then performed by the node by flooding clear packets throughout the network. When a node receives a clear packet, it sets the links to its neighbours as unassigned. Eventually, these clear packets propagate through the network and erase all routes to that unreachable destination.[8]

Three packets are used to perform these operations:

- QUERY (QRY),
- UPDATE (UPD),
- CLEAR (CLR)

Initially to create a route, the node broadcasts a QUERY packet to its neighbors. This QUERY is re-broadcasted through the network until it reaches the destination or an intermediate node that has a route to the destination. The recipient of the QUERY packet then broadcasts the UPDATE packet which lists its height with respect to the destination. When this packet propagates in the network, each node that receives the UPDATE packet sets its height to a value greater than the height of the neighbor from which the UPDATE was received. This has the effect of creating a series of directed links from the original sender of the QUERY packet to the node that initially generated the UPDATE packet. When a node discovers that the route to a destination is no longer valid, it will adjust its height so that it will be a local maximum with respect to its neighbors and then transmits an UPDATE packet. If the node has no neighbors of finite height with respect to the destination, then the node will attempt to discover a new route.[20]
As shown in fig.1, node 6 does not propagate QUERY from node 5 as it has already seen and propagated QUERY message from node 4 and the source may have received a UPDATE each from node 2, it retains that height. When a node detects a network partition, it will generate a CLEAR packet that results in reset of routing over the ad hoc network. The establishment of the route is based on the DAG mechanism thus ensuring that all the routes are loop free. Packets move from the source node having the highest height to the destination node with the lowest height like top-down approach.

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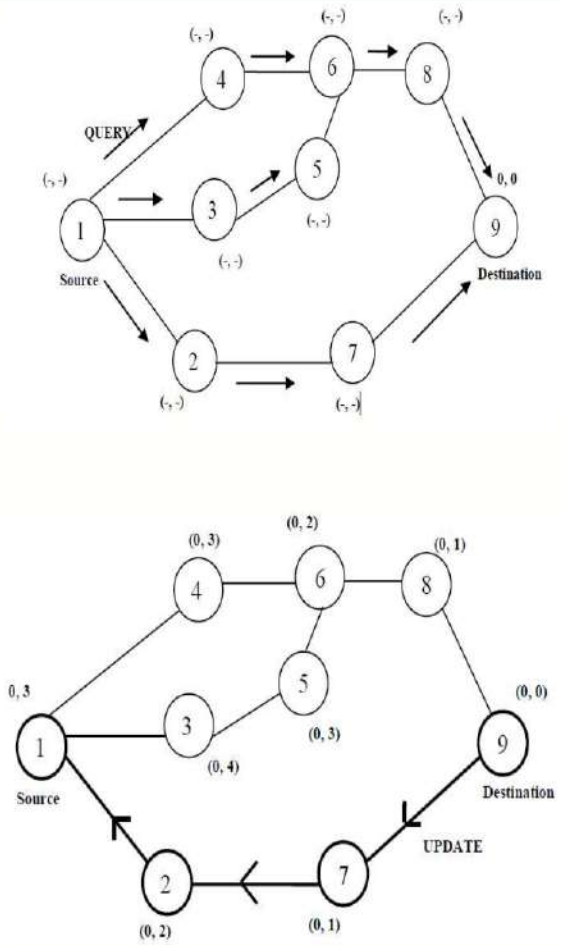

Figure.1 Route creation in TORA[20]

II. ADVANTAGES

- The major Benefit is its excellent support for multiple routers and multicasting.[15] TORA supports multiple routes between source and destination. Hence, failure or removal of any of the nodes quickly resolved without source intervention by switching to an alternate route to improve congestion.[8]
- TORA does not require a periodic update, consequently communication overhead and bandwidth utilization is minimized.[8]
- TORA provides the supports of link status sensing and neighbor delivery, reliable, in-order control packet delivery and security authentication.[8]
- If we have amobile ad hoc network in which probability of occurrence of JFattack is high and if it requires high throughputand consistent service in the network with increasing nodedensity then TORA protocol is recommended.[14]
- It has reduced the far-reaching control messages to a set of neighboring nodes, where the topology change has occurred.
- TORA can be used in conjunction with Lightweight Adaptive Multicast Algorithm (LAM) to provide multicasting. The disadvantage of TORA is that the algorithm may also produce temporary invalid routes as in LMR.

III. DISADVANTAGES

- Poor performances of TORA routing protocol, when mobility or load are increased.[4]
- It depends on synchronized clocks among nodes in the ad hoc network.[8]
- TORA performs well in networks with a small number of traffic connections butpoorly in networks with a large number of traffic connections.
- The dependence of this protocol on intermediate lower layers for certain functionality presumes that the link status sensing, neighbor discovery, in order packet delivery and address resolution are all readily available. This solution is to run the Internet MANET Encapsulation Protocol at the layer immediately below TORA.This will make the overhead for this protocol difficult to separate from that imposed by the lower layer.[8]

IV. CONCLUSION

If it requires high throughput and consistent service in the network with increasing node density then TORA protocol is recommended.[14] Also, it has been detected that increasing the speed yield to minimize the effect of black hole attack. TORA performs better at high mobility but in other cases it shows to have a lower throughput. TORA can be quite sensitive to the loss of routing packets compared to the other protocols.[15] Mobility in the network allows TORA to do better than AODV.[20] Delay for TORA is high because of its route discovery process. It takes a lot of time discovering and deciding a route for data transfer.[2] In general, it's important to realize that DSR and TORA should be avoided for large number of nodes, and AODV and OLSR are recommended. TORA routing protocol is best in terms of end-to-delay in both Static and dynamic network for each set of maximum connections.[13] Poor performances of TORA when mobility or load are increased, are the consequence of forceful use of caching and the lack of any system to expire out of date routes or establish the freshness of routes when several choices are available in the network.[4] TORA is suitable for operation in large mobile networks having dense population of nodes. The major benefit is its excellent support for multiple routes and multicasting.[15]

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Analysis of Routing Protocols in Mobile Adhoc Networks

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***Abstract*—Mobile ad-hoc network (MANET) is a collection of mobile nodes that form dynamic and temporary networks. The wireless links in this network are highly error prone and can go down frequently due to mobility of nodes, interference, and less infrastructure. One of the challenges in the study of MANET routing protocols is the dynamically changing topology. Hence, they establish an efficient communication path between the source and destination nodes with minimum routing overhead and bandwidth consumption. The design problem of such routing protocol is not straightforward since MANET environment introduces new challenges that are not present in fixed networks. The primary goal of such an ad hoc network routing protocol is correct and efficient route establishment between a pair of nodes so that messages may be delivered in a timely manner. In recent years, several routing protocols have been proposed for mobile ad hoc networks and prominent among them are OLSR, DSDV, DSR, AODV and TORA. This paper provides an overview of different protocols by presenting their characteristics and functionality, and then provides a comparison and discussion of their respective applications.**

Keywords **— MANET, OLSR, DSDV, DSR, AODV, TORA.**

I. INTRODUCTION

MANET contains mobile nodes, communicating in a multihop manner without any fixed infrastructure i.e, access points. It contains mobile nodes that can vary dynamically and freely self-organize into temporary and arbitrary ad- hoc network topologies. It allows people and devices to share the resources seamlessly with no pre-existing communication base station [1]. Ad hoc wireless networks have an important role to play in military applications. Soldiers equipped with multimode mobile communicators can now communicate in an ad hoc manner without the need for fixed wireless base stations. Fig. 1 shows an example of MANET.

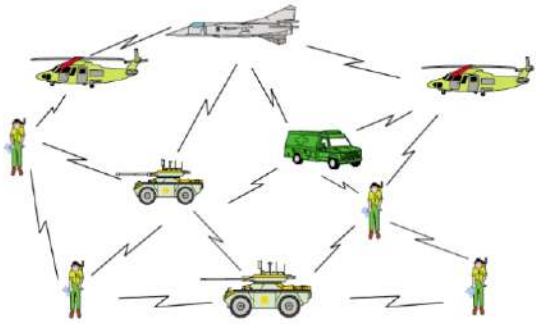

Figure 1. An Example of MANET.

MANETs routing has become the main topic of recent studies due to designing problems relating to finding an appropriate and effective routing protocol. Many Routing protocols have been proposed to solve the MANET problems such as nodes mobility, high power consumption, low bandwidth, and high inaccuracy rates. However, the distinctions of these protocols are based on a mechanism employed for the updating of routing information[1].

II. ROUTING PROTOCOLS FOR MOBILE AD HOC NETWORKS

Routing protocols for Mobile ad hoc networks can be broadly classified into the main categories as:

- Proactive or table-driven routing protocols
- Reactive or on-demand routing protocols and
- Hybrid Routing Protocol

A. Table-Driven Routing Protocols

Table-driven routing protocols try to maintain consistent, up-to-date routing information from each node to every other node. Network nodes maintain one or many tables for routing information. Nodes respond to network topology changes by propagating route updates throughout the network to maintain a consistent network view. The Proactive routing approaches designed for ad hoc networks are derived from the traditional routing protocols. Proactive

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approaches have the advantage that routes are available the moment they are needed. However, the primary disadvantage of these protocols is that the control overhead can be significant in large networks or in networks with rapidly moving nodes. Proactive routing protocol includes Destination-Sequenced Distance-Vector (DSDV) protocol, Wireless Routing Protocol (WRP), Optimized Link State Routing Protocol (OLSR) etc.

B. Reactive or on-demand routing protocols

Reactive routing approaches take a departure from traditional Internet routing approaches by not continuously maintaining a route between all pairs of network nodes. Instead, routes are only discovered when they are actually needed. In this group of protocols all updated routes are not maintained in each node, instead, routes are constructed only when it is necessary. When a source node wants to send something to a destination, it makes a request to the destination node for employing the route detection mechanisms. Hence, this type of protocol is known as are active protocol. This route remains valid until the destination node is accessible. Reactive routing protocol includes Dynamic Source Routing (DSR) protocol, Ad hoc On-demand Distance Vector (AODV) protocol, Ad hoc On-demand Multiple Distance Vector (AOMDV) protocol etc.

C. Hybrid Routing Protocol

Hybrid protocols seek to combine the Proactive and Reactive approaches. Hybrid routing protocols have the potential to provide higher scalability than pure reactive or proactive protocols. This is because they attempt to minimise the number of rebroadcasting nodes by defining a structure (or some sort of a backbone), which allows the nodes to work together in order organise how routing is to be performed. By working together the best or the most suitable nodes can be used to perform route discovery. An example of such a protocol is the Temporally Ordered Routing Algorithm (TORA) and Zone Routing Protocol (ZRP). Figure 2 shows classification of MANET Routing Protocols.

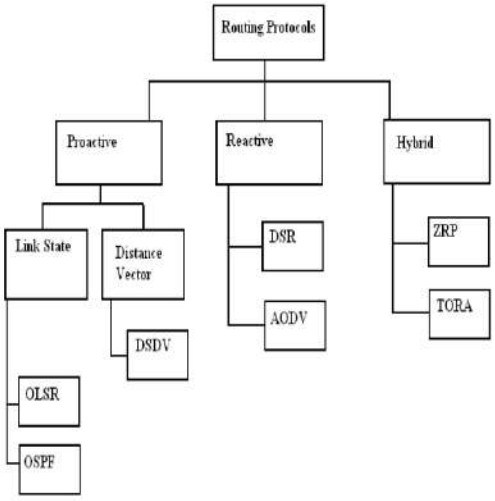

Fig.2. Classification of MANET Routing Protocols [10]

III. TYPES OF AD HOC ROUTING PROTOCOLS

A. Optimized Link State Routing (OLSR)

The OLSR protocol is a proactive protocol, therefore due to it's proactive nature the routes are always available when they are needed. It uses hop -by- hop routing and multi point relays (MPR) flooding mechanism to broadcast and flood topology control (TC) messages in the network. This mechanism takes advantage of controlled flooding by allowing only selected nodes i.e. the MPR nodes to flood the TC message. Each node selects an MPR to reach its two-hop neighbors. The OLSR protocol uses topology discovery/diffusion mechanism by periodic and triggered TC messages. TC messages are generated by MPR nodes and carry information about MPR selector nodes. Neighbor sensing is done by using periodic broadcast of "hello" messages. These messages are one-hop broadcasts (never forwarded) that carry neighbor type and neighbor quality information[14].

B. Ad Hoc On-Demand Distance Vector (AODV)

The Ad Hoc On-Demand Distance Vector routing protocol (AODV) is an improvement of the Destination-Sequenced Distance Vector routing protocol (DSDV). DSDV has its efficiency increasing smaller ad-hoc networks. Since it requires periodic advertisement and global dissemination of connectivity information for correct operation, it leads to frequent system-wide broadcasts[12].AODV [19] is an example of reactive MANET routing protocol, in AODV the network is silent until a connection is needed. At that point the network node that needs a connection broadcasts a request for connection. Other AODV nodes forward this message, and record the node that they heard it from, creating an explosion of temporary routes back to the needy node. When a node receives such a message and already has a route to the desired node, it sends a message backwards through a temporary route to the requesting node which then begins using the route that has the least number of hops through other nodes. Unused entries in the routing tables are recycled after a time. When a link fails, a routing error is passed back to a transmitting node, and the process repeats[2].

C. Dynamic Source Routing (DSR)

DSR [17] is another example of reactive MANET routing protocol The Dynamic Source Routing(DSR) protocol presented in [26] is an on-demand routing protocol that is based on the concept of source routing. Mobile nodes are required to maintain route caches that contain the source routes of which the mobile is aware. Entries in the route cache are continually updated as new routes are learned.

The protocol consists of two major phases: route discovery and route maintenance[23].The fundamental approach of this protocol during the route creation phase is to launch a route by flooding Route Request packets in the network. The destination node, on getting a Route Request packet, responds by transferring a Route Reply packet back to the source, which carries the route traversed by the Route Request packet received. A destination node, after receiving the first Route Request packet, replies to the source node through the reverse path the Route Request packet had traversed. Nodes can also be trained about the neighboring routes traversed by data packets if operated in the promiscuous mode. This route cache is also used during the route construction phase[2].

D. Temporally Ordered Routing Algorithm (TORA)

TORA [21], [15] is an example of hybrid routing protocol, it is an algorithm for routing data across Mobile ad-hoc networks. Temporally Ordered Routing Algorithm TORA comes under a category of algorithms called "Link Reversal Algorithms". TORA is an on demand routing protocol[5].The Temporally Ordered Routing Algorithm (TORA) is an adaptive routing protocol for multi-hop networks. TORA is distributed, in that routers need only to maintain information about adjacent routers (i.e., one-hop knowledge). Like DSDV, TORA maintains state on a per-destination basis. However; TORA does not continuously execute a shortest-path computation and thus the metric used to establish the routing structure does not represent a distance. The destination-oriented nature of the routing structure in TORA supports a mix of reactive and proactive routing on a per-destination basis. During reactive operation, sources initiate routes to a given destination on-demand. This mode of operation is advantageous in dynamic networks with relatively sparse traffic patterns, since it may not be necessary (or desirable) to maintain routes between every source/destination pair at all times. At the same time, selected destinations can initiate proactive operation, resembling traditional table-driven routing approaches. This allows routes to be proactively maintained to destinations for which routing is consistently or frequently required.[1]TORA is designed to minimize the communication overhead associated with adapting to network topological changes. The scope of TORA's control messaging is typically localized to extremely small set of nodes near a topological change[1].

E. DSDV (Destination-Sequenced Distance –Vector Routing Protocol)

Here each mobile node maintains a routing table that includes all accessible destinations, the number of hops necessary for reaching that destination and the sequence of the digits appropriate to that destination. Routing table entries are tagged with sequence of digits which are originated by the destination nodes [13]. This sequence of digits is used to distinguish new routes from old routes and also to determine the creation of a ring. Route updates are transmitted either periodically or immediately after a significant topology change is being detected. DSDV protocol generates a supplementary traffic that adds to the real data traffic[16]. Below table 1 shows the comparison between three protocols.

Parameters	AODV	DSR	TORA
Source rooting	No	Yes	No
Topology	Full	Full	Reduced
Broadcast	Full	Full	Local
Update information	Route error	Route error	Node's height
Update destination	Source	Source	Neighbors
Method	Unicast	Unicast	Broadcast

TABLE1: COMPARISON OF THREE PROTOCOLS [9]

IV. APPLICATIONS

Ad hoc wireless networks have an important role to play in military applications. Soldiers equipped with multimode mobile communicators can now communicate in an ad hoc manner without the need for fixed wireless base stations. In addition, small vehicular devices equipped with audio sensors and cameras can be deployed at targeted regions to collect important location and environmental information which will be communicated back to a processing node via ad hoc mobile communications. Ship-to-ship ad hoc mobile communication is also desirable since it provides alternate communication paths without reliance on ground- or space-based communication infrastructures. Commercial scenarios for ad hoc wireless networks include:

- Conferences/meetings/lectures
- Emergency services
- Law enforcement

People today attend meetings and conferences with their laptops, palmtops, and notebooks. It is therefore attractive to have instant network formation[23].

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CONCLUSION

In this paper, an effort has been made to concentrate on the various routing protocols like OLSR, DSR, AODV and TORA. We have presented a comparison of all routing categories. It has been concluded that OLSR and AODV are more immune to black hole attack than DSR and TORA. Also, it has been detected that increasing the speed yield to minimize the effect of black hole attack. In general, it's important to realize that DSR and TORA should be avoided for large number of nodes, and AODV and OLSR are recommended. It concludes that the average end to end delay of packet delivery was higher in OLSR as compared to AODV. It has been concluded that poor delay and throughput of DSR due to lack of any mechanism to expire stale routes or determine the freshness of routes. The field of ad hoc mobile networks is rapidly growing and changing, and while there are still many challenges that need to be met, it is likely that such networks will see widespread use within the next few years. Ad Hoc is the 4th generation mobile communication technology, the prospect of it is great, but there are still many problems to be solved, but it will play a more and more important role in the future communication field[8].

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Analysis of Teacher Performance Using Fuzzy Logic System

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Abstract—**Performance appraisal is the systematic assessment of performance of employees to understand the abilities for their further development. According to sixth pay commission the approach adopted for evaluation of teaching staff performance focuses on areas like teaching, learning, extension, research, publication etc, which are actually fuzzy concepts and can be captured into fuzzy terms. In the proposed research, we are developing a fuzzy inference system (FIS) for teaching staff performance appraisal using Matlab. The research formulates the mappings from factors affecting performance to the incentives**

Keywords- assessment, fuzzification, membership functions, inference techniques

I. INTRODUCTION

How do you know that a teacher is doing what they are supposed to be doing in a classroom? In a system where people become teachers because they choose to be, where the support systems for teachers are excellent and the parent-teacher community is synergistic, this question is natural. Like all other professionals, teachers want, need and deserve evaluation processes to accurately identify their strengths as well as weakness, so that they can work on the areas in which they lag. Right now, the evaluation systems in too many schools and colleges deny high-quality feedback and fail to provide paths to improvement. This is unfair to both the teachers themselves and the students who need their help. So in order to reduce their burden and analyse teacher performance, a fuzzy logic system can be set up with required parameters which may help to a great extent in bringing out the right results. On the other hand, manual appraisal systems are more complex and need a lot of time in reaching the right results. Also, in most of the systems, we have factors affecting performance that are at higher priority than others. So, Fuzzy logic systems are more reliable and precise than any other set ups to bring out the performance measure. In this research, we are developing a fuzzy logic system to evaluate the teaching performance based on the factors that have been identified by the most popular researchers. The model can be viewed as an alternative to the use of addition in aggregating from all categories, and to produce a final score. The factors used for evaluating the performance are considered as input parameters for fuzzification.

II. FUZZY LOGIC- AN OVERVIEW

Fuzzy logic uses the whole interval of real numbers between False and True to develop logic as a basis for rules of inference. It is a means to transform linguistic experience into mathematical information. It is implemented in three phases as shown in the figure 1.

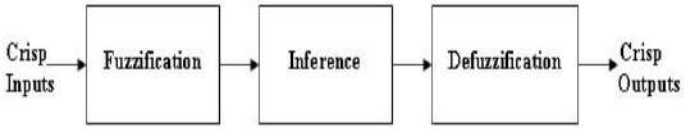

Figure 1: Fuzzy Logic Phases

A. Fuzzification is a means of mapping measured input values into fuzzy membership functions. A membership function is a curve that defines how each point in the input space is mapped to a membership value between 0 and 1. There are different shapes of membership functions; triangular, trapezoidal, piecewise, Gaussian, bell-shaped, etc.

B. Inference can be done by if-then rules which relate multiple input and outputs. Because the rules are based on word descriptions instead of mathematical definitions, any relationship that can be described with linguistic terms can typically be defined by a fuzzy logic. This means that even nonlinear systems can be described and easily controlled with a fuzzy logic.

C. Defuzzification is a conversion of internal fuzzy output variables into crisp values that can actually be used. It is done after the evaluation of inputs and applying them to the rule base. The centroid calculation method is commonly used for defuzzification.

III. ACADEMIC PERFORMANCE INDEX – AN OVERVIEW

The Academic Performance Index (API) is a measurement of academic performance and progress of individual schools and colleges. It is one of the main components of the Public Schools Accountability Act passed by the California legislature in 1999.

As per U.G.C. Notification approved, the Academic Performance Indicators are [4]:

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Category I: Teaching, learning and evaluation related activities.

- Lectures, seminars, tutorials, practical, contact hours undertaken taken as percentage of lectures allocated.
- Lectures or other teaching duties in excess of the UGC norms.

Category II: Co-curricular, Extension, Professional Development Related Activities.

- Preparation and Imparting of knowledge / instruction as per curriculum; syllabus enrichment by providing additional resources to students
- Use of participatory and innovative teaching-learning methodologies; updating of subject content, course improvement etc.

Category III: Research, Publications and Academic Contributions.

- Published Papers in referred, non-referred but recognised, indexed and reputed journals, full papers published in conference proceedings.
- Research guidance to students.

IV. DESIGN OF PROPOSED FUZZY SYSTEM

The main objective of this research is to analyse and organize the appraisal information and propose a new methodology by which performance of teachers can be determined. The various parameters have been selected based on the surveys and researches as well as government norms for building appraisal systems

1. *Teaching*
   The first and foremost parameter to estimate the performance of a teacher is the initiatives he takes to promote actual teaching. This parameter includes preparation and imparting of knowledge / instruction as per curriculum; syllabus enrichment and providing of additional resources to the students to make their task easier.
2. *Punctuality*
   This is an important factor that has an everlasting effect on student's mind. More punctual teachers tend to have better reputation than non –punctual ones and are better looked upon by sincere students. Punctuality sends a positive signal to the students & gives them a clear idea of what is expected of them from the beginning. Apart from this , a teacher who is punctual exercises a better control over the class as a whole as well.
3. *Hi-Tech Resources*
   Technology ushers in fundamental structural changes that can be integral to achieve significant improvements in knowledge grasping. It supports both teaching and learning and infuses students with unforgettable on course study experiences. So a teacher who inculcates a habit of using hi-tech resources along with the text book materials is definitely at edge as compared to the ones who follow syllabus through written materials only. Use of projectors and hi tech software as an aid to learning improves the view of students towards a particular subject.
4. *Teacher-Student Relation*
   This is an important factor that determines the will of a student to grasp the knowledge being imparted by a teacher. A study has shown that, the teachers who tend to be polite and maintain cordial relations with their students are at a higher chance of being understood and are kept in high esteem by the students. Friendly relations ensure less worry on the part of students and exhibit control of a teacher as well as his manipulative behaviour.
5. *Extra Activities*
   Activities meant to provide practical knowledge to a student about particular subjects are referred to as extra activities. These activities are necessary for mental growth of the students as well as developing logical reasoning. Industrial visits, lab experimentation, simulations and providing students with general problems that relate to the topics being taught can work wonders apart from attaining the textual knowledge. The most important benefit of these activities is that they lead to overall development of a student's mind and enhance their interest to a large extent. A teacher that tends to involve students in such activities certainly performs better. So this factor forms an important part of appraisal systems.

Figure 2 illustrates the components of the proposed logic. It represents a construction of a multi-input, linear model.

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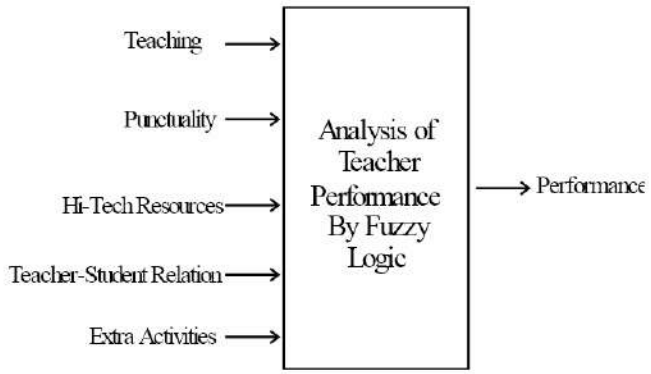

Figure 2: Architecture of proposed fuzzy system

V. DEVELPOMENT IN MATLAB

Fuzzification refers to the process of transforming crisp values into grade of membership for linguistic terms of fuzzy sets. The membership function is used to associate a grade to each linguistic term. The first step in using fuzzy logic within the model is to identify the parameters that will be fuzzified and to determine their respective range of values. The final result is the result as a whole for each performance parameter that involves complex background calculations.

A. Input and Output parameters

The input and output parameters are created in FIS editor as shown in the figure 3.We have considered five input parameters. To measure the teacher's performance it is necessary to assign a number in the identified dimensions. Though numbers are not binding ,labels such as poor, good and excellent have been used. The input parameters represent linguistics poor, good and excellent for 4 parameters and Yes, No for one parameter. The FIS editor with input and output parameters is as shown in figure 3.

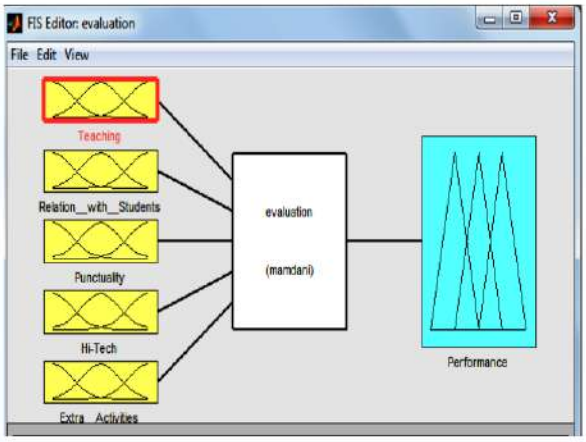

Figure 3: FIS Editor showing input/output parameters

The rating scales of input and output parameters have been set up as the pattern shown in the following tables.

Input Name	Linguistic
Teaching	Poor
	Good
	Excellent
Punctuality	Poor
	Good
	Excellent
Hi-Tech Resources	Poor
	Good
	Excellent
Teacher-Student Relations	Poor
	Good
	Excellent
Extra-Activities	Yes
	No

Table 1: Rating scales of input parameters

Output Name	Linguistic
Performance	Poor
	Good
	Excellent

Table 2: Rating scale of output parameter

B. Membership Functions

A membership function is used to associate a grade to each linguistic term. The membership function editor is used to define the properties of the membership function for the systems variables. Figure 4 shows fuzzification of input parameters of first fuzzy module with membership function as explained in table1, the membership function are overlapping with each other for achieving better results.

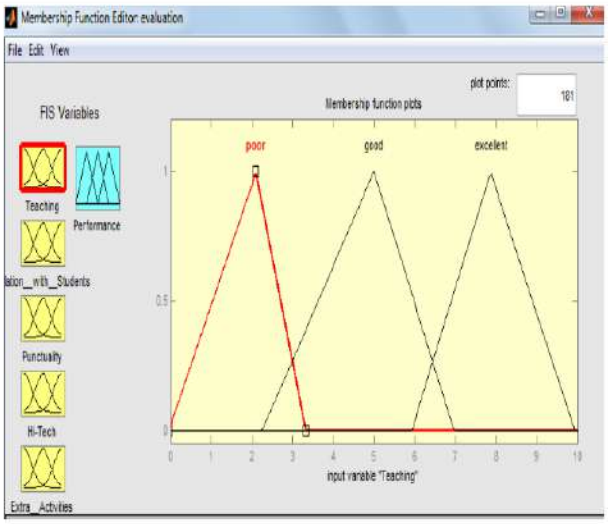

Figure 4: Membership function for "Teaching"

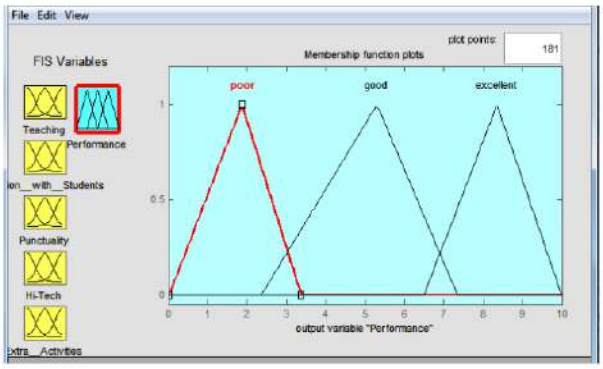

Figure 5: Membership function for output "Performance"

Figure 5 shows fuzzification of output parameter performance with membership function as explained in table 2, the membership function are touching with each other for achieving better results.

C. Rule Base

Fuzzy control system design is based on empirical methods; basically a methodical approach to trial-and-error and rule base is a collection of knowledge in the If-Then format from studied sources. It tells the true relationship between fuzzy input parameters and output that is really hard to be reached keeping the rule base in mind. In simple words, the rule base tells how multiple outputs have a combined effect while producing a single output. The rule editor enables the user to define and edit the rules that describe the behaviour of the system. As per the input and output parameters fuzzified, rule base is generated by applying reasoning to evaluate the performance of a teacher. During the course of the experiment, **104** rules have been considered based on the surveys and researches that have been carried out by education departments of various colleges and universities. Following are the sample rules collected from rule base which are responsible for the assessment

1. If (Teaching is poor) and (Relation with Students is poor) and (Punctuality is poor) and (Hi-Tech is poor) and (Extra Activities is Yes) then (Performance is poor).
2. If (Teaching is poor) and (Relation with Students is poor) and (Punctuality is excellent) and (Hi-Tech is good) and (Extra Activities is yes) then (Performance is poor).
3. If (Teaching is good) and (Relation with Students is poor) and (Punctuality is poor) and (Hi-Tech is excellent) and (Extra Activities is yes) then (Performance is good).
4. If (Teaching is good) and Relation with Students is good) and (Punctuality is good) and (Hi-Tech is good) and (Extra Activities is no) then (Performance is excellent).
5. If (Teaching is poor) and (Relation with Students is poor) and (Punctuality is poor) and (Hi-Tech is excellent) and (Extra Activities is no) then (Performance is poor).

D. *Simulation and Results*

The proposed method is applied to evaluate the performance appraisal of teaching staff. Sample data were examined and randomly selected for the present study. This is an example of the activation of rules relative to an aspect of staff performance appraisal for the initial FIS. Figure 6 and 7 shows snapshots of results of work done in MATLAB. The rule viewer is a read only tool that displays the whole fuzzy inference diagram. The surface viewer is also a read only tool.

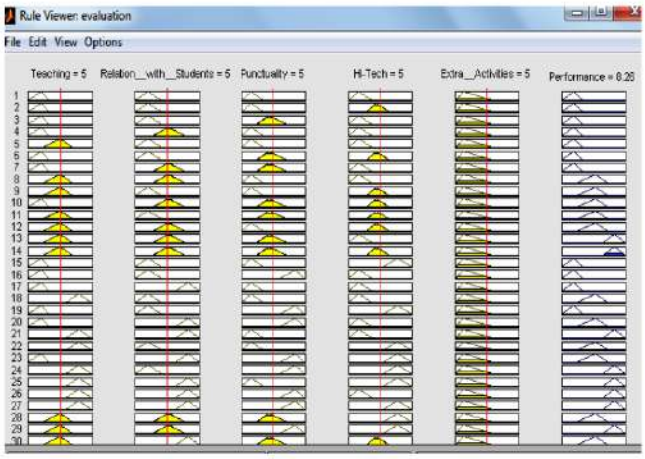

Figure 6: Rule view of input, output parameters

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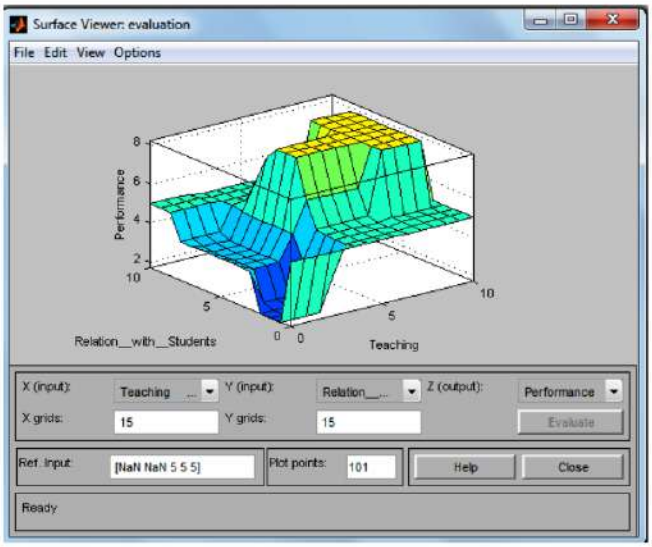

Figure 7: Surface view of input, output parameters

Staff	Input variables					Outputs
Sl. No.	Teaching (0-10)	Punctuality (0-10)	Hi-tech resources (0-10)	Teacher-student relation (0-10)	Extra Activities (Yes/No	Performance (0-10)
1	25	5	10	10	12.5	60.5
2	20.6	3.29	7.2	6.07	8.76	50.5
3	16.4	2.64	5.51	4.21	6.43	44
4	5.79	1.44	3.27	2.71	3.15	18.7
5	36.2	1.06	19.9	19.5	0	92.7
6	47.5	1.16	11.3	12.6	7.13	69.9
7	43.8	1.53	6.45	9.07	15.8	60.2
8	45.1	4.03	14.1	14.9	21.6	74.8
9	48.8	1.9	18.8	17.7	23	91
10	38.2	9.31	5.7	3.46	22.8	49.9

Table 3: Inputs and outputs for the selected cases

VI. SIGNIFICANCE AND CONCLUSIONS

Assessing teachers by a more meaningful evaluation process allows administrators to recognize those teachers doing a good job while identifying, providing resources and supporting those who need to improve. This, in turn, also benefits students as they receive the kind of education that better prepares them for life after education. The most important benefit is that it builds a sense of good will between teachers and the students in the class. More obviously is the fact that it provides us with feedback that teachers can use to actually make adjustments in the course whenever they teach the next time. Proper system to motivate the teachers to improve their work performance is the primary aim of this research. This paper presents how fuzzy inference system can be used to build performance evaluation models based on realistic data. Number of factors affecting the staff's performance were identified and incorporated in the system. This research can be extended by considering remaining categories for the evaluation of teacher's performance after researching into more surveys for further improvements.

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Analysis of TG Based Different Bit Adders using 180nm Technology

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***Abstract*— Continuous scaling of the transistor size and reduction of the operating voltage has led to a significant performance improvement of integrated circuits. Low power consumption and smaller area are some of the most important criteria for the fabrication of DSP systems and high performance systems. In this paper there is try to determine the best solution to this problem by comparing a few adders.**
In this paper we study the different adders like 6 bit, 8bit, 16 bit and power consumption of all the adders. But the conventional full adder is built by 28 transistors. So the transistor count is very high. The average power consumption and delay is very high. In this paper we compare the power consumption of all the adders we find that carry look ahead and Carry bypass adder consume more power in different bits adders. In this paper we analysis different bit adders which is made by mainly the TG technology. For the purpose of analysis of TG based different adder Design using 180nm technology, we use TANNER tool.

***Index Terms*— Ripple Carry 6 bit Adder, Ripple Carry 8 bit Adder Ripple Carry 16 bit Adder, Carry look-ahead adder, and Carry Bypass Adder TG based CMOS Logic Design Style.**

I. INTRODUCTION

The adder is the most commonly used arithmetic block of the Central Processing Unit (CPU) and Digital Signal Processing (DSP), therefore its performance and power Optimization is of utmost importance. With the technology scaling to deep sub-micron, the speed of the Circuit increases rapidly. At the same time, the power consumption per chip also increases significantly due to the increasing density of the chip. Therefore, in realizing Modern Very Large Scale Integration (VLSI) circuits, low-power and high-speed are the two predominant factors which need to be considered. Like any other circuits' design, the design of high-performance and low-power adders can be addressed at different levels, such as architecture, logic style, layout, and the process. There are two major sources of power dissipation in digital CMOS circuits[1-2]. These sources are the static power consumption, which mainly affects a system in a standby mode and the dynamic power consumption, which mainly affects when the system is in an active mode. CMOS devices have very low static power consumption, which is the result of leakage current. This power consumption occurs when all inputs are held at some valid logic level and the circuit is not in charging states. But, when switching at a high frequency, dynamic power consumption can contribute significantly to overall power consumption. From above power consumptions in CMOS circuits have three main components:

- Static power consumption
- Dynamic power consumption
- Short circuit power consumption

Transmission Gate (TG) Technology:
TG is typically used as building blocks for logic circuitry, such as a D Latch or D Flip-Flop. When the voltage on node A is a Logic 1, the complementary Logic 0 is applied to node active-low $\bar{A}$, allowing both transistors to conduct and pass the signal at IN to OUT. When the voltage on node active-low A is logic 0, the complementary Logic 1 is applied to node 0, turning both transistors off and forcing a high-impedance condition on both the IN and OUT nodes. The schematic representation of TG is shown in Figure 1.

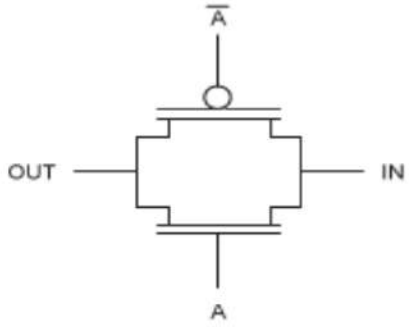

Fig 1: Transmission gate Technology[1]

This paper is organized as follows. In Section iii, we will review the different adder architectures. Section iv describes the performance parameters of 8 bit different adders. in Section v, Final result is discussed and the conclusions are summarized .

II. LOGIC DESIGN STYLE

Adder is the most commonly used arithmetic block of the Central Processing Unit (CPU) and Digital Signal Processing (DSP), therefore its performance and power optimization is of utmost importance. For arithmetic applications, following three different logic styles are used for a full adder design to achieve best performance results for adder design. Wide application of adders is explained by a number of treasons:

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summation is a key operation for foundation of basic logic functions of computing systems - summation, subtraction, multiplication, division, exponentiation, etc[2]-[4]. core of the N-bit adder is one of the most critical building block in Digital Signal Processors and units of the microprocessors for achievement of growing requirements for speed; the adder is the basic block of Arithmetic Logic Units[5] ; adders are the important blocks of final signal processing for some modem architectures of high-speed Analog Digital Converters.

A. Ripple Carry Adder

In the figure 2, the full adder is built by 18 transistors by using TG technology. In this circuit the design process all simulations are run using Micron Technology's 0.18 µm process models with typical n-channel and p-channel drive, a 1.8 V power supply[5-6]. In the schematics all logic is designed using a different gate width for NMOS and PMOS and a minimum length of .18 µm for NMOS and PMOS. With the help of below full adder 6-bit, 8-bit, 16-bit ripple carry adder is developed. In the circuit there are three inputs A, B, C and two outputs sum and carry.

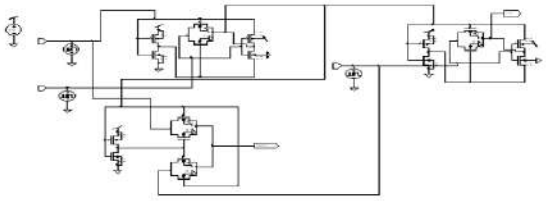

Fig 2: TG Based Full Adder [5]

B. Carry Look-ahead Adder

In the figure 3 the carry look-ahead adder is built by 30 transistors by using TG technology. In this circuit the design process all simulations are run using Micron Technology's 0.18 µm process models with typical n-channel and p-channel drive, a 1.8 V power supply[5-6]. In the schematics all logic is designed using a different gate width for NMOS and PMOS and a minimum length of .18 µm for NMOS and PMOS. With the help of below full adder 6-bit, 8-bit, 16-bit carry look-ahead adder is developed. In the circuit there are three inputs and two outputs.

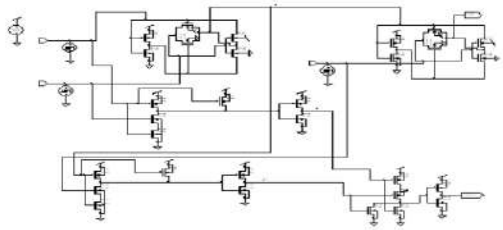

Fig 3: TG Based Carry Look-ahead Adder [5]

C. Carry Bypass Adder

In the figure 4, the 2 bit carry bypass adder is built by 60 transistors by using TG technology. In this circuit the design process all simulations are run using Micron Technology's 0.18 µm process models with typical n-channel and p-channel drive, a 1.8 V power supply. In the schematics all logic is designed using a different gate width for NMOS and PMOS and a minimum length of .18 µm for NMOS and PMOS. With the help of below full adder 6-bit, 8-bit, 16-bit carry bypass adder is developed. In the circuit there are three inputs A, B, C and two outputs sum and carry.

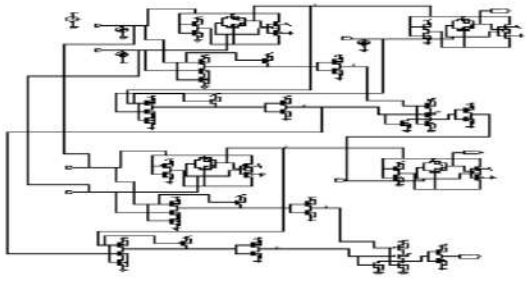

Fig 4: TG Based Carry Bypass Adder [5]

II. ADDER ARCHITECTURES

Multiple-bit addition can be as simple as connecting several full adders in series or it can be more complex. How the full adders are connected or the technique that is used for adding multiple bits defines the adder architecture. Architecture is the most influential property on the computation time of an adder. This property can limit the overall performance. In general the computation time is proportional to the number of bits implemented in the adder. Many different adder architectures have been proposed to reduce or eliminate this proportional dependence on the number of bits[7]. Several adder architectures are reviewed in the following sections.

A .Ripple Carry Adder (RCA)

An n-bit ripple carry adder consists of 'n' full adders with the carry signal that ripples from one full-adder stage to the next, from LSB to MSB. It is possible to create a logical circuit using several full adders to add multiple-bit numbers. Each full adder inputs a C_{in} which is the C_{out} of the previous adder. Addition of k-bit numbers can be completed in k clock cycles. A 4-bit ripple carry adder structures is shown in figure 5.

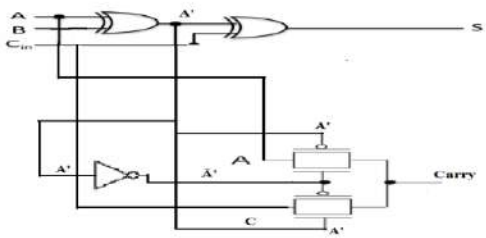

Fig 5: Structure of 1-Bit Ripple Carry Adder [8]

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The ripple-carry adder has many advantages like low power consumption, low area and simple layout. The drawback of the ripple carry adder is its slow speed because each full adder must wait for the carry bit to be calculated from the previous full adder.

B. Carry Look-ahead Adder (CLA)

To reduce the computation time, faster ways to add two binary numbers by using carry look ahead adders. It is done by creating two signals (P and G) for each bit position, based on if a carry is propagated through from a less significant bit position (at least one input is a '1'), a carry is generated in that bit position (both inputs are '1'), or if a carry is killed in that bit position (both inputs are '0'). In most cases, P is simply the sum output of a half-adder and G is the carry output of the same adder. After P and G are generated the carries for every bit position are create.

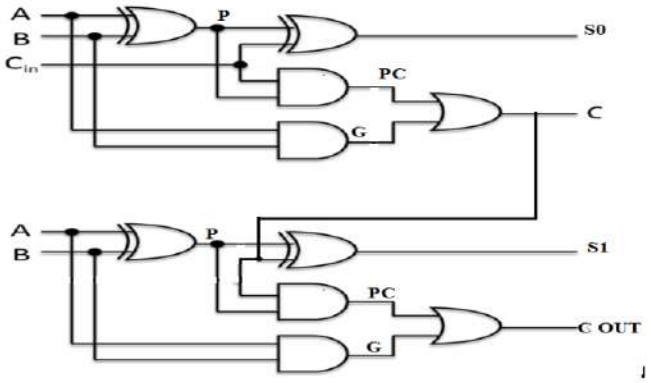

Fig 6: Structure of 2-Bit Carry Look-ahead Adder [8]

These block based adders include the carry bypass adder which will determine P and G values for each block rather than each bit, and the carry select adder which pre-generates sum and carry values for either possible carry input to the block. On the other hand adder designs include the conditional sum adder, carry skip adder, and carry complete adder. In carry look-ahead architecture instead of rippling the carry through all stages (bits) of the adder, it calculates all carry's in parallel based on "Equation 1"[8].

$$Ci = gi + piCi\text{-}1 \qquad (1)$$

In "Equation 1" the gi and pi terms are defined as carry generate and carry propagate for the ith bit. If carry generate is true then a carry is generated at the I_{th} bit. If carry propagate is true then the carry-in to the I_{th} bit is propagated to the carry-in of i+1 bit. They are defined by "Equations 2" and 3[8] where Ai and Bi are the binary inputs being added.

$$gi = AiBi \qquad (2)$$

$$pi = Ai \oplus Bi \qquad (3)$$

C .Carry Bypass Adder (CBA)

The carry-bypass or carry-skip adder is much like the RCA only it has a carry bypass path. In this adder pc signal is directly connected to the next stage as show in the figure 7.

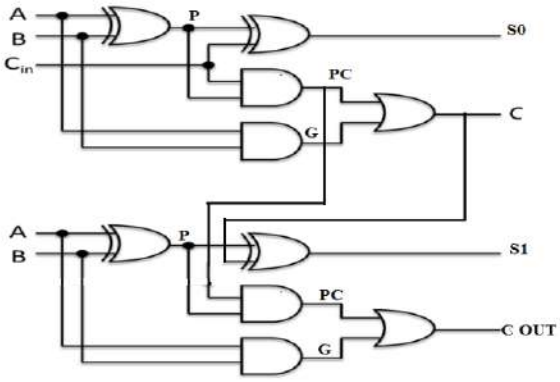

Fig 7: Structure of 2-Bit Carry Bypass Adder [8]

In the figure the inputs to each full adder block are carry generate (gi) and carry propagate (pi). These signals will be discussed in more detail in the carry look-ahead adder discussion. When a bypass occurs it allows the Mi+1 stage to start evaluating sums instead of waiting for the ith stage to ripple the carry through each bit of the stage.

IV. FINAL RESULT

The Table 1 is carried out by using a gate width of .64 µm for NMOS and 1.8 µm PMOS and a minimum length of .18 µm for NMOS and PMOS. The result is carried out at 1.8v supply voltages and average powers consumed.

Design style	Adder	No. of Transistor	Supply voltage (v)	Minimum Length	Width of NMOS(µm)	Length of PMOS(µm)	Avg. Power Consum. (watts)
RCA	6-Bit	108	1.8	.18	.64	1.6	$3.27*10^{-5}$
CLA	6-Bit	180	1.8	.18	.64	1.6	$1.31*10^{-4}$
CBA	6-Bit	180	1.8	.18	.64	1.6	$1.09*10^{-4}$
RCA	8-Bit	146	1.8	.18	.64	1.6	$4.27*10^{-5}$
CLA	8-Bit	240	1.8	.18	.64	1.6	$1.69*10^{-4}$
CBA	8-Bit	240	1.8	.18	.64	1.6	$1.64*10^{-4}$
RCA	16-Bit	294	1.8	.18	.64	1.6	$1.39*10^{-4}$
CLA	16-Bit	484	1.8	.18	.64	1.6	$3.46*10^{-4}$
CBA	16-Bit	484	1.8	.18	.64	1.6	$2.46*10^{-3}$

Table 1. Performance parameters of 6 bit adders, 8 bit and 16 bit[5],[8],[9].

From the above table it is concluded that TG based ripple carry adder has lesser no. of transistor count in all bit adders,

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so lesser be the area, less average power consumed and output as compare to TG based carry look-ahead adder and TG based carry bypass adder.

V. DISCUSSION AND CONCLUSION

It has been observed that TG Based adder is better than conventional adder. Ripple Carry Adder (RCA) logic design style exhibit better characteristics (power dissipation and area) as compared to other design styles[9-10]]..
So, RCA logic style can be used where Low power and high speed low and lesser area is the prime aim. Whereas, TG Based Carry Look-ahead Adder (CLA) and TG Based Carry Bypass Adder (CBA) consumes more power than RCA.

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Analysis of Wireless Optical Channel (WOC) Using Various Meteorological Conditions

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***Abstract*—It has been more than 30 years since optical wireless (OW) was an alternative broadband technology for wireless data transmission. The concept of OW is very simple that utilize optical beams to carry data through the atmosphere or vacuum. The Optical Wireless Communications (OWC) is the type of communications systems that uses the atmosphere as a communications channel. The OWC systems are attractive to provide broadband services due to their inherent wide bandwidth, easy deployment and no license requirement. The idea to employ the atmosphere as transmission media arises from the invention of laser. OW is very similar to RF wireless, but radio waves are replaced with light and antennas with free-space optical transceiver. Despite this superficial resemblance between OW and RF links, OW exhibits several appealing attributes when compared to RF. OW links are inherently broadband and optical frequencies in the infrared and visible spectrum are neither regulated nor licensed. Optical components are less cheap and consume less electrical power than high-speed RF components.**

Keywords: OWC, RF links, FSO, optical trans-receiver.

I. INTRODUCTION:

The Optical Wireless Communications (OWC) is the type of communications systems that uses the atmosphere as a communications channel. The OWC systems are attractive to provide broadband services due to their inherent wide bandwidth, easy deployment and no license requirement. The idea to employ the atmosphere as transmission media arises from the invention of laser. However, the early experiments on this field did not have any baggage of technological development (like the present systems) derived from the fiber optical communications systems, because like this, the interest on them decreased [6]. At the beginning of the last century, the OWC systems have attracted some interest due to the advantages mentioned above. However, the interaction of the electromagnetic waves with the atmosphere at optical frequencies is stronger than that corresponding at microwave [9]. The model of a typical atmospheric optical communication link is shown in the figure 1.

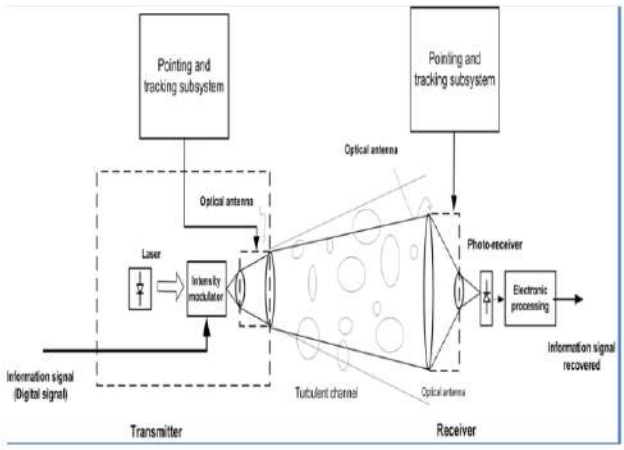

Fig.1 Model of a typical atmospheric optical communications link [6]

The intensity of a laser beam propagating through the atmosphere is reduced due to phenomena such as scattering and molecular absorption, among other [6]. The changes in the refractive index of the atmosphere due to optical turbulence affect the quality of laser beam through distortion of its phase front and random modulation of its optical power [10]. Also the presence of fog may completely prevent the passage of the optical beam that leads to a no operational communications link [12].

The figure 1 shows the block diagram of an OWC communications system (also called Free Space optic communications system or FSO) [10]. The information signal (analog or digital) is applied to the optical transmitter to be sent through the atmosphere using an optical antenna. At the receiver end the optical beam is concentrated, using an optical antenna, to the photo-detector sensitive area, which output is electrically processed in order to receive the information signal.

BASIC SCHEME OF OWC SYSTEMS COMMUNICATIONS:

Optical communications receivers can be classified into two basic types: non-coherent receivers and coherent receivers. Non-coherent detect the intensity of the signal (and therefore its power). These kinds of receivers are the most

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basic and are used when the information transmitted is sent by the variations in received field strength. On the other hand are coherent receivers, in which the received optical field is mixed with the field generated by a local optical oscillator (laser) through a beam combiner or coupler, and the resulting signal is photo-detected.

- *Non-coherent optical communications systems:*

The commercially deployed OWC systems use the intensity modulation (IM) that is converted into an electrical current in the receiver by a photo-detector (usually are a PIN diode or an avalanche photo diode (APD)) which is known as direct detection (DD). This modulation scheme is widely used in optical fiber communications systems due to its simplicity. In IM-DD systems, the electric field of light received, *Es* is directly converted into electricity through a photo-receiver, as explained above. The photocurrent is proportional to the square of *Es* and therefore the received optical power Pr, i.e.:

$$i(t) = e\eta E^2_t(t)/h\,\upsilon$$

Where e is the electronic charge, η is the quantum efficiency, h is Planck's constant, υ is the Optical frequency. The block diagram of the system is shown in Figure 2.

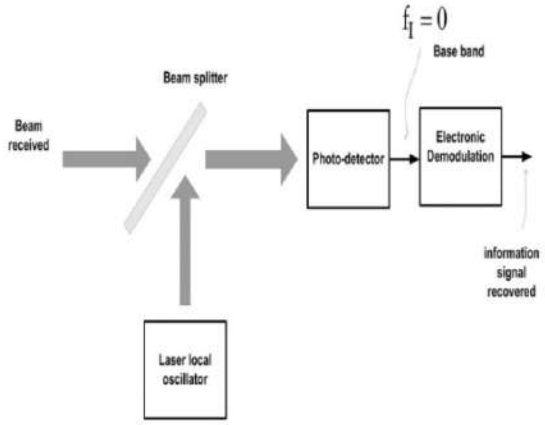

Fig 2: Block diagram using an optical communication system of intensity modulation and Direct-detection (non-coherent) [7].

The optical direct detection can be considered as a simple process of gathering energy that only requires a photo-detector placed in the focal plane of a lens followed by electronic circuits for conditioning the electrical signal derived from the received optical field.

- *Coherent optical communications systems:*

In analog communications, the coherent term is used for systems that recover the carrier phase. In coherent optical communications systems, the term "coherent" is defined in a different way: an optical communication system is called coherent when doing the mixing of optical signals (received signal and the signal generated locally) without necessarily phase optical carrier recovered. Even if it does not use the demodulator carrier recovery but envelope detection, the system is called coherent optical communication system due to the mixing operation of the optical signals. In turn, the coherent receivers can be classified into two types: asynchronous and synchronous. They are called synchronous when the tracking and recovering of the carrier phase is performed and asynchronous when is not performed the above mentioned process. The asynchronous receivers typically use envelope detection. Figure 3 shows the basic structure of a communications system with digital phase Modulation and coherent detection. The output current of the photo detectors array is:

$$i(t) = R\,E^2_t(t)/2 + R\,E^2_{LO}(t)/2 + R$$

where R=en/hv is the responsivity, E_{LO} the electric field generated by the laser that operates as a local oscillator, ω_{LO} is the frequency of the local oscillator and ω_s is the carrier frequency of the optical received signal φ_{LO} is the phase of the carrier signal received, and φ_s is the carrier phase of the received optical signal. The coherent mixing process requires that the local beam to be aligned with the beam received in order to get efficient mixing. This can be implemented in two different ways; if the frequency of signal and local oscillator are different and uncorrelated the process is referred to as heterodyne detection (Fig. 4) [11], if the frequencies of the signal and local oscillator are the same and is correlated, is

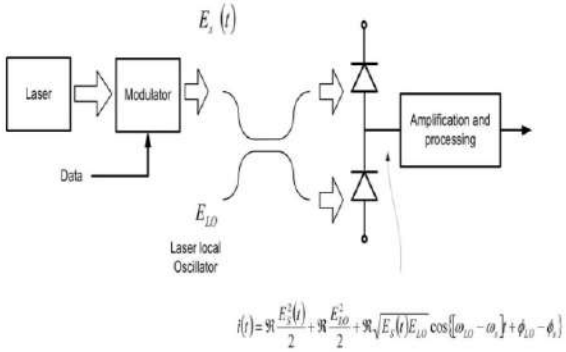

Fig 3: Optical Communication System with coherent detection [7].

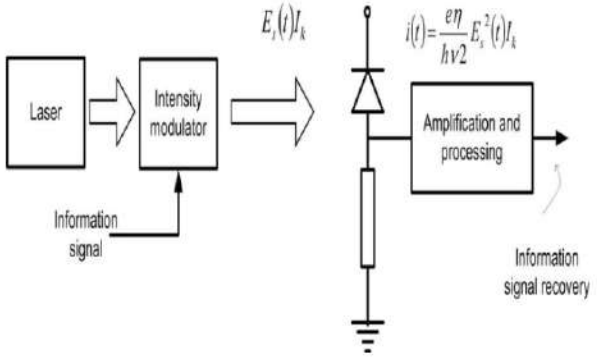

Fig 4: Optical heterodyne receiver [11].

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Called homodyne detection (Fig. 5) [11]. Due to the process of mixing, coherent receivers are theoretically more sensitive than direct detection receivers. In terms of sensitivity, the coherent communications systems with phase modulation theoretically have the best performance of all (e.g. BPSK is about 20 dB better than OOK). Sensitivity is the number of photons per bit required to get a given probability of error.

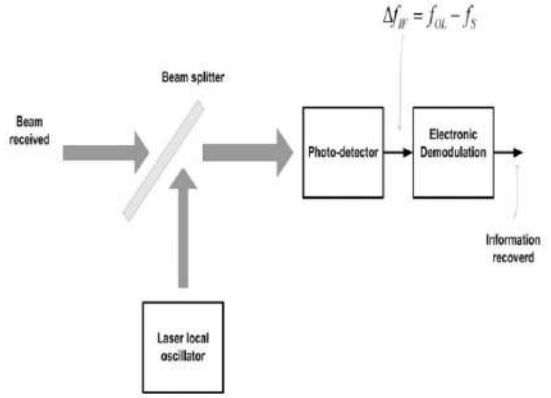

Fig 5: Optical homodyne receiver [11]

II. OPTICAL AND OPTOELECTRONIC COMPONENTS

Devices such as the laser diodes, high-speed photo-receivers, optical amplifiers, and optical modulators among others are derived of about thirty years of investigation and development of the fiber optics telecommunications systems. This technological advance has made possible the present OWC systems. Additionally, OWC systems have been benefited by the advances in the telescopes generated by the astronomy.

OPTICAL SOURCES FOR TRANSMITTERS:

In modern optical wireless communications, there are a variety of light sources for use in the transmitter. One of the most used is the semiconductor laser which is also widely used in fiber optic systems. For indoor environment applications, where the safety is imperative, the Light Emitter Diode (LED) is preferred due to its limited optical power. Light emitting diodes are semiconductor structures that emit light. Because of its relatively low power emission, the LED's are typically used in applications over short distances and for low bit rate (up to 155Mbps). Depending on the material that they are constructed, the LED's can operate in different wavelength intervals. When compared to the narrow spectral width of a laser source, LEDs have a much larger spectral width (Full Width at Half Maximum or FWHM). In Table 1 are shown the semiconductor materials and its emission wavelength used in the LED's [7].

Table 1: Material, wavelength and energy band gap for typical LED

Material	Wavelength Range (nm)
AlGaAs	800 - 900
InGaAs	1000 - 1300
InGaAsP	900 - 1700

A. *LASER*

The laser is an oscillator to optical frequencies which is composed by an optical resonant cavity and a gain mechanism to compensate the optical losses. Semiconductor lasers are of interest for the OWC industry, because of their relatively small size, high power and cost efficiency. Many of these lasers are used in optical fiber systems; there is no problem of availability. Table 2 summarizes the materials commonly used in semiconductor lasers [13].

Table 2: Materials used in semiconductor laser with wavelengths that are relevant for FSO

Material	Wavelength Range (nm)
GaAlAs	620 - 895
GaAs	904
InGaAsP	1100 – 1650 1550

B. *PHOTO DETECTORS*

At the receiver, the optical signals must be converted to the electrical domain for further processing; this conversion is made by the photo detectors. There are two main types of photo detectors, PIN diode (Positive-Intrinsic-Negative) and avalanche photodiode" avalanche photodiode (APD) [13]. The main parameters that characterize the photo detectors in communications are: spectral response, photosensitivity, quantum efficiency, dark current, noise equivalent power, response time and bandwidth [13].The photo detection is achieved by the response of a photosensitive material to the incident light to produce free electrons. These electrons can be directed to form an electric current when applied an external potential.

C. *PIN PHOTODIODE*

These types of photo-diodes have an advantage in response time and operate with reverse bias. This type of diode has an intrinsic region between the PN materials; this union is known as homojunction. PIN diodes are widely used in telecommunications because of their fast response. Its responsivity, i.e. the ability to convert optical power to electrical current is function of the material and is different for each wavelength. This is defined as:

$$R = \eta e/hv \quad [A/W]$$

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Where η is the quantum efficiency, e is the electron charge (1.6×10^{-19} C), h is Planck's constant (6.62×10^{-34} J) and ν is the frequency corresponding to the photon wavelength. InGaAs PIN diodes show good response to wavelengths corresponding to the low attenuation window of optical fiber close to 1500nm. The atmosphere also has low attenuation into regions close to this wavelength.

D. AVALANCHE PHOTODIODE

This type of device is ideal for detecting extremely low light level. This effect is reflected in
The gain M:

$$M= I_G/I_P$$

I_G is the value of the amplified output current due to avalanche effect and Ip is the current without amplification. The avalanche photo diode has a higher output current than PIN diode for a given value of optical input power, but the noise also increases by the same factor and additionally has a slower response than the PIN diode (see table 3).

Table 3: Characteristics of photo detectors used in OWC systems

Material and Structure	Wavelength (nm)	Responsivity (A/W)	Gain	Rise time
PIN. Silicon	300 - 1100	0.5	1	0.1-5 ns
PIN InGaAs	1000 - 1700	0.9	1	0.01-5 ns
APD Germanium	800 - 1300	0.6	10	0.3-1 ns
APD InGaAs	1000 - 1700	0.75	10	0.3 ns

E. OPTICAL AMPLIFIERS:

Basically there are two types of optical amplifiers that can be used in wireless optical communication systems: semiconductor optical amplifier (SOA) and amplifier Erbium doped fiber (EDFA). Semiconductor optical amplifiers (SOA) have a structure similar to a semiconductor laser, but without the resonant cavity. The SOA can be designed for specific frequencies. Erbium-doped fiber amplifiers are widely used in fiber optics communications systems operating at wavelength close to 1550 nm. Because they are built with optical fiber, provides easy connection to other sections of optical fiber, they are not sensitive to the polarization of the optical signal, and they are relatively stable under environment changes with a requirement of higher saturation power that the SOA.

F. OPTICAL ANTENNAS:

The optical antenna or telescope is one of the main components of optical wireless communication systems. In some systems may have a telescope to the transmitter and one for the receiver, but can be used one to perform both functions. The transmitted laser beam characteristics depend on the parameters and quality of the optics of the telescope. The various types of existing telescopes can be used for optical communications applications in free space. The optical gain of the antennas depends on the wavelength used and its diameter .The Incoherent optical wireless communication systems typically expands the beam so that any change in alignment between the transmitter and receiver do not cause the beam passes out of the receiver aperture. The beam footprint on the receiver can be determined approximately by:

$$D_f= \theta L$$

D_f is the footprint diameter on the receiver plane in meters, θ is the divergence angle in radians and L is the separation distance between transmitter and receiver (meters). The above approximation is valid considering that the angle of divergence is the order of mille-radians and the distances of the links are typically over 500 meters.

III. FACTORS AFFECTING THE TERRESTRIAL OPTICAL WIRELESS COMMUNICATIONS SYSTEMS:

Several problems arise in optical wireless communications because of the wavelengths used in this type of system [11]. The main processes affecting the propagation in the atmosphere of the optical signals are absorption, dispersion and refractive index variations
[2],[3],[14],[6]. The latter is known as atmospheric turbulence. The absorption due to water vapor in addition with scattering caused by small particles or droplets or water (fog) reduces the optical power of the information signal impinging on the receiver [6]. Because of the above mentioned previously, this type of communications system is susceptible to the weather conditions prevailing in its operating environment. Figure 6 shows the disturbances affecting the optical signal propagation through the atmosphere.

A. FOG:

Fog is the weather phenomenon that has the more destructive effect over OWC systems due
to the size of the drops similar to the optical wavelengths used for communications links [15]. Dispersion is the dominant loss mechanism for the fog [15]. Taking into account to the effect over the visibility parameter the fog is classified as low (1-5 km), moderate (0.2-1 km) and Dense (0.034 – 0.2 km). The attenuation due to visibility can be calculated using the following equation [12].

$$P_v= \exp[-3.9/V\ (\lambda/0.5)^m\ L]$$

Where V is the visibility [km], L is the propagation range and m is the size distribution for the water drops that form the fog.

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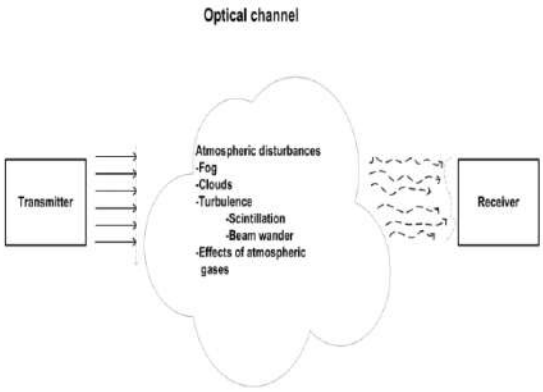

Fig 6. Optical link over a terrestrial atmospheric channel [15]

B. *RAIN*

Other weather phenomena affecting the propagation of an optical signal is the rain, however Its impact is in general negligible compared with the fog due to the radius of the drops (200μm - 2000μm) which is significantly larger than the wavelength of the light source OWC Systems [6].

IV. EFFECTS DUE TO ATMOSPHERIC GASES. DISPERSION AND ABSORPTION:

The dispersion is the re-routing or redistribution of light which significantly reduces the intensity arriving into the receiver [6]. The absorption coefficient is a function of the absorption of each of the particles, and the particle density. There absorbent which can be divided into two general classes: molecular absorbent (gas), absorbing aerosol (dust, smoke, water droplets).

A. *ATMOSPHERIC WINDOWS:*

The FSO atmospheric windows commonly used are found in the infrared range. The windows are in 0.72μm and 1.5μm, and other regions of the absorption spectrum. The region of 0.7μm to 2.0μm is dominated by the absorption of water vapor and the region of 2.0μm to 4.0μm is dominated by the combination of water and carbon dioxide.

ABERRATIONS LOSSES:

These losses are due to the aberrations of the optical elements and can be expressed as:

$$L_{ab} = e^{-(k\sigma_a)2}$$

$K=2\pi/\lambda$

σ_a = rms aberrations error

B. *ATMOSPHERIC ATTENUATION:*

Describes the attenuation of the light traveling through the atmosphere due to absorption and dispersion. In general the transmission in the atmosphere is a function of link distance L, and is expressed in Beer's law as.

$$L_{atm} = 10 \log \tau [db/km]$$

With

$$I_d/I_{TX} = \tau = \exp(-\gamma L)$$

I_d/I_{TX} is the relationship between the intensity detected and the transmitted output intensity and γ is the attenuation coefficient. The attenuation coefficient is the addition of four parameters; the dispersion coefficients of molecules and aerosols, α and absorption coefficient, β of molecules and aerosols, each depending on the wavelength and is given by.

$$\gamma = \alpha_{molecule} + \alpha_{aerosol} + \beta_{molecule} + \beta_{aerosol}$$

C. *Atmospheric turbulence*:

In homogeneities in temperature and pressure variations of the atmosphere cause variations in the refractive index, which distort the optical signals that travel through the atmosphere. This effect is known as atmospheric turbulence. The performance of atmospheric optical communications systems will be affected because the atmosphere is a dynamic and imperfect media. Atmospheric turbulence effects include fluctuations in the amplitude and phase of the optical signal [1], [9]. The turbulence-induced fading in optical wireless communication links is similar to fading due to multi-paths experienced by radiofrequency communication links [10]. The refractive index variations can cause fluctuations in the intensity and phase of the received signal increasing the link error probability. As mentioned briefly above, the heating of air masses near the earth's surface, which are mixed due to convection and wind generates atmospheric turbulence. These air masses have different temperatures and pressure values which in turn leads to different refractive index values, affecting the light traveling through them. The atmospheric turbulence has important effects on a light beam especially when the link distance is greater than 1 km [10]. Variations in temperature and pressure in turn cause variations in the refractive index along the link path [1] and such variations can cause fluctuations in the amplitude and phase of the received signal (known as flicker or scintillation) [5]. Figure 7 shows the turbulence by eddies, where the larger eddies are split into smaller eddies without loss of energy, dissipated due to viscosity [9],[14]. The size of the eddies ranges from a few meters to a few millimeters, denoted as outer scale L0, and inner scale, l0, respectively as shown in Figure 7 and eddies or in homogeneities with dimensions that are

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between these two limits are the range or inertial sub range [1].

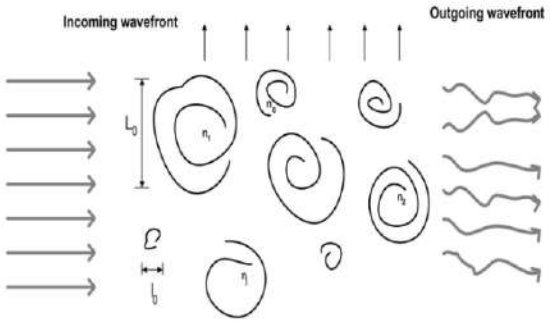

Fig 7. Turbulence model based on eddies [9] [14]

A measure of the strength of turbulence is the constant of the structure function of the refractive index of air, C_n^2, which is related to temperature and atmospheric pressure by [14].

$$C^2_n = (79 * 10^{-6} P/T)^2 C_T^2$$

Where P is the atmospheric pressure in milliards, T is the temperature in Kelvin degrees and C_T^2 is the constant of the structure function. In short intervals, at a fixed propagation distance and a constant height above the ground can be assumed that Cn2 is almost constant, [3]. Values of C_n^2 of 10-17 $m^{-2/3}$ or less are considered weak turbulence and values up to 10-13 $m^{2/3}$ or more as strong turbulence [3]. We can also consider that in short time intervals, for paths at a fixed height, C_n^2 is constant (the above for horizontal paths). C_n^2 varies with height [3].

D. Scintillation:

Atmospheric optical turbulence is due to the fluctuation in the index of refraction of the air. It affects the optical signals temporal intensity and is referred to as scintillation. The twinkling of stars is a classic example of such an effect. In addition to scintillation, beam wander and broadening also occur when optical signals pass through turbulent air. FSO beams are subject to spatial and temporal fluctuations when passing through turbulence cells, which have been extensively statistically modeled using weather parameters, altitudes and refraction index. Small temperature variations cause virtual atmospheric lenses that can redirect the incident beam by refraction effects. The result could blur the received beam spot (scintillation) reducing the received power, image spot dancing at the receiver focal point, or completely divert the beam direction (beam wander).

Turbulence is greater closer to the ground or large horizontal planes such as roofs. It is for this reason that most, if not all, FSO rooftop installations are deployed at the edge of the roof or use tall tripods to avoid heated air induced by the roof itself. In order to study optical signal propagation through turbulence, some approximations are made to solve the electromagnetic wave propagation equation. The main approximation is that the index of refraction does not change rapidly in either space or time. One of the most widely used models is Rytov Models. It provides signal power and phase fluctuations due to scintillations. For optical paths parallel to the ground, the equation is simplified and shows a $(2\pi/\lambda)^{7/6}$ dependency, where λ is the transmitted wavelength. From the inverse wavelength dependence, it is clear that longer wavelengths are less susceptible to scintillation effects.

Aperture averaging over the receiver collecting area has been known to decrease scintillation effects. That means the larger the receiving aperture is, the more scintillation it can combat. However, increasing the size of the receiving lens is not practical, and therefore some vendors leverage spatial diversity by using several smaller apertures that are sufficiently far apart that each received signal experiences independent air paths and therefore uncorrelated phase and intensity variations. The summed output from such an array of detectors provides aperture averaging. A patent has been issued describing the use of multiple apertures in FSO systems to combat scintillation and reference analyzes the effectiveness of multiple apertures versus one aperture of identical area coverage. It was found that multiple apertures tend to exhibit better averaging results for long ranges. Furthermore, the longer the wavelength the less aperture averaging effects occur. This may be correlated to the fact that longer wavelengths are less susceptible to scintillation in the first place.

Beam spot image dancing at the receiver plane is described by the angle of arrival. The variance of the angle-of arrival is found to be independent of the optical wavelength. Under large-scale atmospheric turbulence in homogeneities, the optical beam will experience random deflections as it propagates. This is referred to as beam wander and is found to be independent of the wavelength. Experimentally, it has been shown that fast tracking can correct the beam wander effect.

CONCLUSION

In this paper, the concept of OW is very simple that utilize optical beams to carry data through the atmosphere or vacuum. The Optical Wireless Communications (OWC) is the type of communications systems that uses the atmosphere as a communications channel. The OWC systems are attractive to provide broadband services due to their inherent wide bandwidth, easy deployment and no license requirement. Different atmospheric channel characteristics have been emphasized and in general have shown the most relevant such as scintillation, the variations of the angle of arrival, the attenuation due to atmospheric gases and the effects of weather conditions.

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Autonomous Solar - Powered Robot Vehicle

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***Abstract*— The objective of this paper is to present the various aspects of an autonomous robot vehicle that senses its environment using such techniques as Ultrasonic sensing, IR sensing and Edge Detection and navigate in it through the application of solar energy. The proposed robot is capable of navigating without hitting the walls or falling off the surface it is running on, staying in its lane including U-turns and avoiding obstacles in its path. The applications of such a robot are diverse; such as driverless vehicles, relief operations, exploration on other planets etc.**

***Index Terms*—Autonomous, Solar, Solar-Powered, Solar-Tracking, Image Processing, Edge Detection, Obstacle Avoidance**

I. Introduction

Human mind and artificial intelligence has brought a cutting end technology in various aspects which in turn have brought a large scope and application in day to day life. Autonomous robots are robots [1] that can act on their own. These are capable of sensing their environment and navigating without human input. A fully autonomous robot has the ability to gain information about the environment, work for an extended period without human intervention, move either all or part of itself without human assistance and avoid situations that are harmful to people, property, or itself. Ever since 'Electric Dog' [2], the first documented implementation of a self-directed, phototropic robot, there have been various advancements in the field of artificial intelligence and autonomy. This project aims to make such an autonomous robot that runs on solar energy.

Solar energy is used to give power to the robot because shortage of non-renewable energy sources in the future is a major global concern; therefore renewable energy sources such as solar energy should gradually replace non-renewable energy sources.

Moreover, the robot is equipped with a solar tracking system that uses photosensitive devices to detect the direction of sunlight. This helps to increase the efficiency and get maximal advantage of the solar energy.

II. Features

This robot is capable of navigating in its environment without hitting the walls or falling off the surface it is running on. Moreover, it is equipped with a lane keeping system that automatically take steps to ensure that the robot stays in its lane and/or follows the track, including U-turns. This intelligent robot also detects any obstacles in its path and avoids these obstacles in any case. The use of solar energy as power source makes it an environment-friendly robot since solar power is a renewable source of energy and the solar-tracking system effectively increases its efficiency.

III. Experimental Set Up

In order to accomplish the autonomous solar vehicle robot project, the main hardware parts required are microcontrollers, servos & actuators, tyres , IR sensors, ultrasonic sensors, camera, batteries, aluminum base, motor drivers, power supplies, connecting wires etc. whereas the software required for simulation and programming are Code Vision AVR, PROTEUS and Sinaprog_2.0

The robot requires two microcontrollers, one for the autonomous operation i.e. sensing the environment and navigating in it and the other microcontroller is used for solar tracking operation.

The method used for sensing is the Multi-Sensor Data Fusion that uses Ultrasonic, IR and Optical Sensors followed by data integration for the detection, identification, and interpretation of the surrounding environment. The currently available ultrasonic sensors can effectively measure the distances of range 2 cm to 4 m [3] which can be used to detect walls and obstacles in the path of the robot while the IR sensors can continuously sense the surface below the robot and avoid its fall in case of a change in surface height such as on stairs etc. The lane-keeping system requires a more subtle approach such as using an image-sensor array or camera to take images and processing these for edge detection of the lanes. The suggested method [4] for edge detection is performing differentiation of the image signal for every row of pixel array and set a threshold to determine the position lane marks according to the resulting value being above or below the threshold value.

For speed control [5] of the robot, Pulse Width Modulation (PWM) technique is used. The average value of voltage fed to the motor is controlled by the turning a switch on and off at a decided rate. Higher the width of the pulse more is the speed of the robot since higher power is supplied to the motors and vice versa. Thus, to slow down or decelerate the robot, we just need to decrease the pulse width

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of the voltage applied to the motors that control the movement of the robot.

The solar tracking system requires the use of photodiodes [6] placed at the edges of the solar panel. Photodiodes produce current proportional to the incident light and the values of the currents in the photodiodes can be used to detect the direction/ angle of the sunlight. The solar panel is thus adjusted to the required position.

IV. BLOCK DIAGRAM

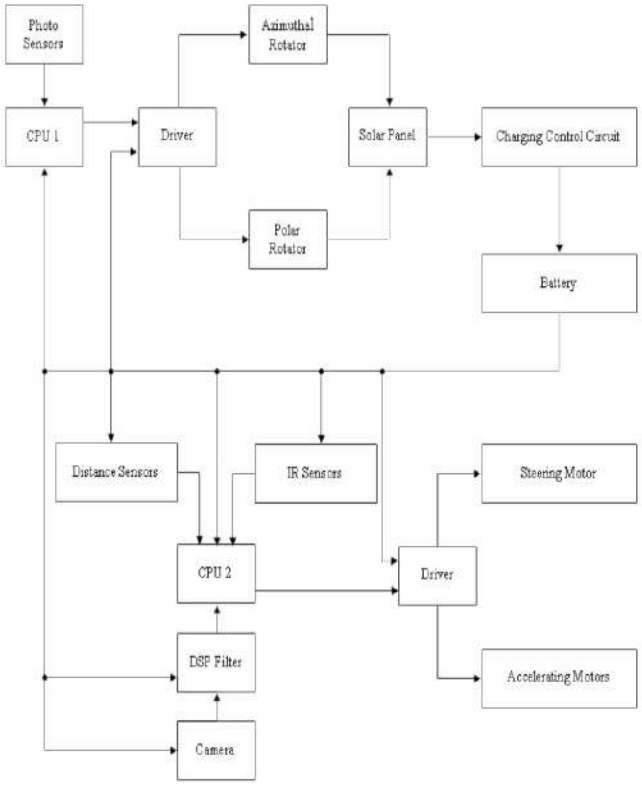

FIGURE 1. BLOCK DIAGRAM OF AUTONOMOUS SOLAR POWERED ROBOT VEHICLE

V. MEAUREMENTS ANALYSIS

A. Distance Measurement using Ultrasonic Sensors

The ultrasonic distance measuring sensors senses the distance of the obstacles [7] and interference from the robot vehicle in its line of sight For an ultrasonic sensor, the range, D to be measured is given by equation 1.

$$D = (T\ V_s / 2) \qquad (1)$$

Where,

T = Echo pulse width high time in seconds

V_s = Velocity of Sound (343 m/sec)

or $D = (T\ 0.01715)$ (2)

B. Lane Edge Detection using Camera

The line detection and tracing is to be done with the camera the gradient of an image [8] captured is given by the formula:-

$$\nabla f = \frac{\partial f}{\partial x}\hat{x} + \frac{\partial f}{\partial y}\hat{y} \qquad (3)$$

Where,

$\frac{\partial f}{\partial x}$ = Gradient in x direction

$\frac{\partial f}{\partial y}$ = Gradient in y direction.

VI. PROJECT SIMULATIONS

Fig 2 shows the simulation model of the project where four DC motors have been connected to microcontroller, AT MEGA 128. Here, Port A is used for two DC motors, Port C for one servo motor and Port D for another two dc motors. It is essential to check the parameters like specifications and performance before implementing it in real time project. PROTEUS software has been used for the simulation designing and AVR software has been used for program coding. It is to be noted that the real time project implementation may be done using Sinaprog_2.0 software.

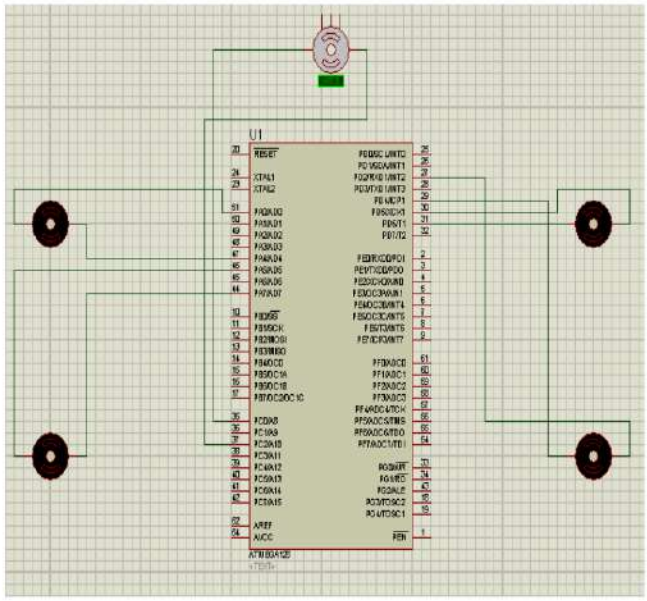

FIGURE 2. SIMULATED MODEL USING PROTEUS SOFTWARE

VII. .APPLICATIONS

The applications of such a Robot are diverse. These robots can have increased reliability and faster reaction time compared to human drivers in case of driverless vehicles. Exploration on other planets [9] is possible with infinite fuel

in the form of Solar Energy. These machines are useful in military and defense services as these make autonomous decisions and can attack enemy by planting weapons in their base. The autonomous robot can be used for Patrolling and Surveillance, hence can be used for maintaining law and order. These autonomous unmanned machines can go where a human can't go in case of disaster and/or natural calamity and carry out search and rescue operations

VII. CONCLUSION AND FUTURE SCOPE

This is a generalized/generic autonomous robot that has the ability to sense its environment and navigate on its own. It can be put to certain specialized applications by enhancements necessary as per the requirements of that particular application.

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Basic Concepts of Mathematical Morphology

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***Abstract*— In this paper, the basic concepts of Mathematical Morphology and its operations are discussed. It is also elaborated that how a structure element is an integral part for operations of mathematical morphology. It is demonstrated with the help of examples, that how Morphology theory is useful for image processing applications.**

***Index Terms*— Closing, Dilation, Erosion, Morphology, Opening, Structure Element.**

I. Introduction

The word morphology commonly denotes a branch of biology that deals with the form and structure of animals and plants. It can also be interpreted as study of shape using mathematical set theory. In image processing, mathematical morphology refers to a branch of nonlinear image processing and analysis developed initially by George Matheron and Jean Serra [1] that concentrate on the geometric structure within an image. The original theory developed by Matheron and Serra was limited to binary images, and later it was extended to gray scale morphology by Sternberg [2], Nakagawa and Rosenfeld [3] etc.

The language of mathematical morphology is the set theory. As such, morphology offers a unified and powerful approach to numerous image processing problems. These include enhancement, segmentation, restoration, edge detection [4], texture analysis, particle analysis and compression.

In general, morphological operations transform the original image into another image through interaction with other image of a certain shape and size, which is known as structuring element. Geometric features of the images that are similar in shape and size to the structuring elements are preserved, while other features are suppressed. Therefore, morphological operations can simplify the image data, preserve its shape, characteristics and eliminate irrelevancies. In view of applications, morphological operations can be employed for many purposes, including edge detection, segmentation and enhancement of images. In this paper, the detailed review of mathematical morphology and its operations are presented.

II. Binary Morphology

The theoretical foundation of binary mathematical morphology is a set theory [6]. In binary images, those points in the set are called the 'foreground' and those in the complement set are called the 'background'.

Besides dealing with the usual set-theoretical operations of union and intersection, morphology operations are mainly dependent on the translation operation. For convenience, '$\cup$' denotes the set union, '$\cap$' denotes set interaction and '+' inside the set notation refers to vector addition in the following equations. To introduce the basic concepts of morphological operators, several basic definitions are discussed first. Let A and B be sets in R^2 where $a=(a_x,a_y)$ and $b=(b_x,b_y)$. The reflection, translation and complement are defined as follows:

A).Reflection

Given an image B, the reflection of set B denoted by $\hat{B}$ is defined as

$$\hat{B} = \{w|w = -b, \text{for } b \in B\} \quad (1)$$

Actually, this operation has same effects as rotating image 180^0 about its origin.

B). Translation

The translation of a set A by point $z = (z_1,z_2)$,denoted by $(A)_z$ is defined as

$$(A)_z = \{c|c=a+z, \text{for } a \in A\} \quad (2)$$

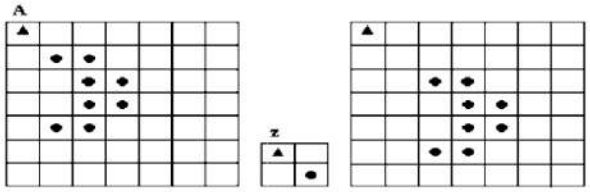

Fig.1: Illustration of the translation operation on digital setting

Fig.1 shows an example of the translation operation in digital space. The symbol ▲ denotes the origin of each image set. The set A is an image in Z^2. The result is described in the right part of fig.1.

C). Complement

The complement of a set A is the set of elements not contained in A and it is defined as:

$$A^c = \{w|w \notin A\} \quad (3)$$

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III. Structuring Element

A structuring element is a small image that is overlapped on input image to compute a certain definition. The basic operations of binary images and also of gray scale images depend on what structuring elements are used. In this section, only structure elements for binary morphology are considered. Fig.2 contains some examples of SE(structure elements) that are used commonly for binary images.

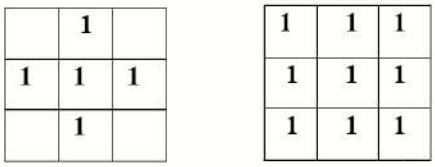

Fig.2: Examples of 3×3 Structuring Element

In these cases, all origins of structuring elements are located on the center. Depending on the shape of structuring element, the origin could be on a different location. The pixels marked with '1' are the points that should be considered during any binary morphological operations.

IV. Basic Operations of Mathematical Morphology

There are two basic operations in mathematical morphology namely dilation and erosion [7]. The other morphologic operators are derived from these basic operations.

A). Binary Dilation

Dilation is an operation that 'grows' or 'thickens' objects in a binary image. The specific manner and extent of this thickening is controlled by the structuring element.

Let A and B are sets in Z^2, the dilation of A by B (usually A is an image and B is the structuring element), denoted by $A \oplus B$, is defined as

$$A \oplus B = \{z \in Z^2 \mid z = a + b \text{ for some } a \in A \text{ and } b \in B\} \quad (4)$$

It can be shown that dilation is equivalent to the union of translation of the original image with respect to the structuring element:

$$A \oplus B = \cup_{b \in B} (A)_b \quad (5)$$

In other words, the dilation of A by *B* is the set consisting of all the structuring element origin locations where the reflected and translated *B* overlaps at least some portion of A.

Fig.3 shows a simple binary image containing a rectangular object and a structuring element. The bold rectangle on the centre of the structuring element denotes the center of it.

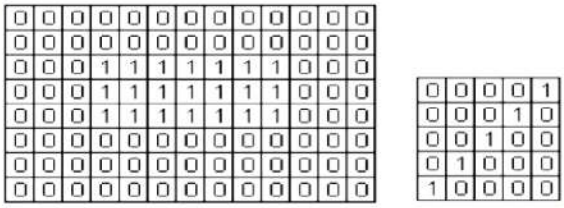

Fig.3: Example binary image and a structuring element

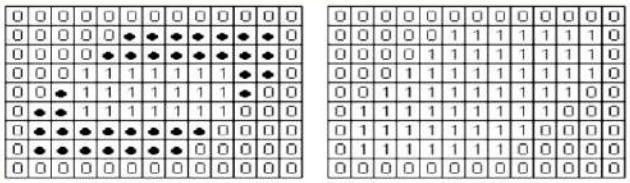

Fig.4: Illustration of Binary Dilation on Digital Setting

Dilation is found by placing the center of the template over each of the foreground pixels of the original image and then taking the union of all the resulting copies of the structuring element, produced by using the translation. From fig.4, it is clear that how dilation modifies the original image with respect to the shape of the structuring element. Dilation generally has an effect of expanding an image; so consequently, small holes inside foreground can be filled. In another sense, dilation can be a morphological operation on a binary image defined as:

$$A \oplus B = \{z | (\hat{B})_Z \cap A \neq \emptyset\} \quad (6)$$

This equation is based on obtaining the reflection of B about its origin and shifting this reflection by z. The dilation of A by B is the set of all displacements, z, such that B and A overlap by at least one element. Based on this interpretation, the equation above may be written as:

$$A \oplus B = \{z | [(\hat{B})_Z \cap A] \subseteq A\} \quad (7)$$

Although dilation is based on set operations, whereas convolution is based on arithmetic operations, the basic process 'flipping' B about its origin and successively 'displacing' it so that it slides over set (image) A and it is analogous to the convolution process. Even though dilation of an image A by structuring element B can be defined in several ways, all definitions have the same meaning and results in the same output. Fig.5 illustrates the dilation operation using a binary image. The original image is dilated with an 11×11 'disk' type structuring element.

Fig.5: Binary Dilation Example

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B). Binary Erosion

Erosion is an operation that 'shrinks' or 'thins' objects in a binary image. As in dilation, the manner and extent of shrinking is controlled by a structuring element.

Let A and B are sets in Z^2, erosion of a binary image A by structuring element B, denoted by

AΘB, is defined as

$$A\Theta B = \{z \mid z + b \in A, \forall b \in B\} \quad (8)$$

whereas dilation can be represented as a union of translates, erosion can be represented as an intersection of the negative translates. So, the given definition of erosion above can be redefined as

$$A\Theta B = \cap_{b \in B} (A)_{-b} \quad (9)$$

where '–b' is the scalar multiple of the vector b by -1.

Fig.6 shows the erosion operation on the binary image and structuring element given in Fig.3. Black dots are the shrinked points on the original binary image

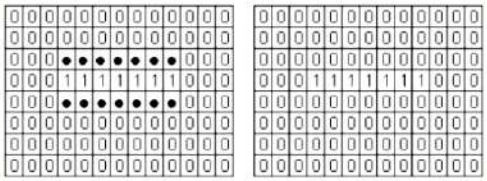

Fig.6: Eroded image

The erosion of the original image by the structuring element can be described intuitively by template translation as seen in the dilation process. Erosion shrinks the original image and eliminates small enough peaks (Note: the terms 'expand' for dilation and 'shrink' for erosion refer to the effects on the foreground). Fig.7 clearly illustrates these effects. The original image is eroded with 7×7 disk-shape structuring element.

Fig.7: Binary Erosion Example

C). Binary opening

The opening of a binary image A by the structuring element B, denoted by A∘B, is defined as

$$A \circ B = (A\Theta B) \oplus B \quad (10)$$

From the definition, the original image A is first eroded and then dilated by the same structuring element B. In terms of set theory, this opening process can also be defined as

$$A \circ B = \cup\{(B)_z \mid (B)_z \subseteq A\} \quad (11)$$

The whole procedure of opening can be interpreted as 'rolling the structuring element about the inside boundary of the image'.

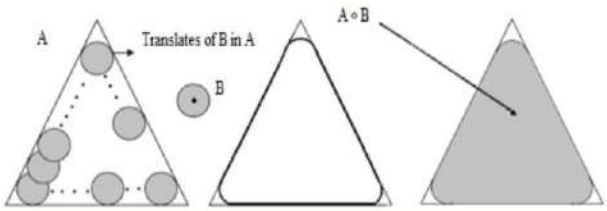

Fig.8: Illustration of Binary Opening Process

The effects of the opening process on the original image are smoothing, reducing noise from quantization or the sensor and pruning extraneous structures. These effects result from the fact that the structuring element cannot fit into the regions. Therefore, it can be said that the result of the opening process heavily depends on the shape of structuring elements. Fig.9 presents an example of the opening process.

Fig.9: Binary Opening Example

The effects of the opening mentioned before are clearly shown in the fig.9. The original image on the left of fig.9 is opened by a 7×7 square structuring element. The vertices of the triangle foreground have been cut out because the image is 'opened' with 'square' type structuring element, whereas the sides are square due to square structuring elements.

D). Binary closing

Closing of a binary image A by a structuring element B, denoted by A•B, is defined as

$$A \bullet B = (A \oplus B)\Theta B \quad (12)$$

In the closing operation, dilation and erosion are applied successively in this order. Note that this order is reversed for the opening process. In another aspect, the closing process on a binary image can be defined as:

z is an element of A• B if and only if $(B + y) \cap A \neq \varphi$, for any translate (B+y) containing z. The closing operation can be described as in fig.10 as 'rolling the structuring element on the outer boundary of the image'.

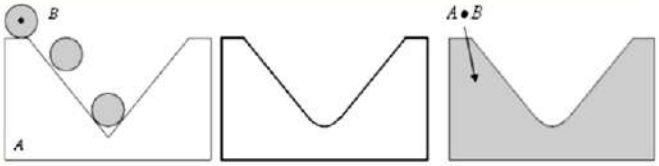

Fig.10: Illustration of Binary Closing Process

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The closing process has the effect of filling small holes in the original image, smoothing as the opening process does, and filling up the bay in the foreground. Sometimes, it is said that the closing has an effect of clustering each spatial point to be connected. Fig.11 is an example showing how the closing operation works.

Fig.11: Binary Closing Example

I. Discussion/Conclusion

This paper presented the detailed theory of mathematical morphology. It is also explained that how the other operations like opening and closing can be derived from the two basic operations of Morphology i.e. Dilation and Erosion. Effects of various morphological operations and structure elements on image chararcterstics are also discussed along with some examples. It is observed from mathematical morphology operations that it is a good tool to extract the features and other details from noisy as well as non-noisy images.

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Basic Theory of Grey Scale Morphology

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***Abstract*— In this paper, basic concepts of Grey scale morphology are explained. It is also discussed that how grey scale morphology is different from binary morphology and with the help of examples, it is elaborated that how grey scale morphology operations work on images.**

***Index Terms*— Closing, Dilation, Erosion, Morphology, Opening, Structure Element.**

I. INTRODUCTION

A gray-scale image can be considered as a three dimensional set where the first two images are the x and y coordinates of a pixel and the third element is the gray-scale value. The binary morphology is extended to gray-scale morphology. The key issue in gray-scale morphology is to use 'Maximum' and 'Minimum' functions to define gray-scale morphological operators. Using these concepts, gray-scale morphology can be easily extended from binary morphology. The differences between binary and gray-scale morphology result from the definitions of dilations and erosion because other operators basically depend on these. Except for these definitions, gray-scale morphology is fairly similar to the binary case. In this paper, definitions for gray-scale dilation and erosion as well as some of examples from gray-scale dilations and erosion are presented.

II. GRAY-SCALE DILATION AND EROSION

Before discussing basic gray-scale morphological operations, it should be noted that the structuring elements of the gray-scale morphological operations could have the same domains as those in binary morphology. However, as will be seen in the definitions below, a gray-scale structuring element has certain values (b's) instead of having only position value '1' or '0' showing its domain. A grayscale image can be considered as a three-dimensional set where the first two elements are the x and y coordinates of a pixel and the third element is gray-scale value. It can also be applied to the gray-scale structuring element. With this concept, gray-scale dilation can be defined as follows

Definition: Gray-scale Dilation

Gray-scale dilation of f by b, denoted by $f \oplus b$, is defined as:

$$(f \oplus b)(s,t) = \max\{ f(s - x, t - y) + b (x, y) | (s - x),(t - y) \in D_f ;(s, y) \in D_b\} \quad (1)$$

Where D_f and D_b are the domains of f and b respectively.

An example of gray-scale dilation is given below. F represents a 5×5 image; B represents a 3×3 non – flat structuring element as given in fig.1.

$$B = \begin{matrix} 0 & 3 & 0 \\ 2 & 2 & 1 \\ 0 & 1 & 0 \end{matrix} \qquad F = \begin{matrix} 0 & 0 & 0 & 0 & 0 \\ 0 & \mathbf{1} & 3 & 2 & 0 \\ 0 & 5 & 2 & 4 & 0 \\ 0 & 0 & 4 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{matrix}$$

Fig.1: Calculation of gray scale dilation

The x-y plane is shown with the numbers representing the intensity at (x,y). The origin of B is shown by the bold number at the center. The origin of F is the upper left corner. To start the algorithm, the origin of B is superimposed on the centre element of F. Since B is 3 × 3, the boundary elements of F are ignored. Those values are set to zero.

For F_a (1,1) calculations are as follows using equation 1.

$$\begin{aligned} F_a(1,1) &= \max\{ f(1-i,1-j) + b(i,j) \mid i=-1,0,1 ; j= -1,0,1 \} \\ &= \max\{ f(0,0) + b(1,1), f(0,1) + b(1,0), f(0,2) + b(1,-1), f(1,0) + b(0,1), f(1,1) + b(0,0), f(1,2) + b(0,-1), f(2,0) + b(-1,1), f(2,1) + b(-1,0), f(2,2) + b(-1,-1) \} \\ &= \max\{0+0, 0+1,0+0,0+1,1+2, 5+3, 0+0, 3+2, 2+0\} \\ &= \max\{0,1,0,1,3,8,0,5,2\} \\ &= 8 \end{aligned}$$

If we continue this process we obtain the result shown in fig.2 below. The grayscale value of f(1,1) is 8.

$$\begin{matrix} 3 & 4 & 6 & 5 & 3 \\ 3 & \mathbf{8} & 5 & 7 & 3 \\ 7 & 7 & 7 & 6 & 5 \\ 3 & 6 & 6 & 5 & 3 \\ 2 & 2 & 5 & 2 & 2 \end{matrix}$$

Fig.2: Gray – scale dilation example

Definition: Gray-scale Erosion

Gray-scale erosion, denoted by $f \Theta b$, is defined as

$$(f \Theta b)(s,t) = \min\{f(s+x, t+y)- b(x, y) | (s + x),(t+y) \in D_f ;(s,y) \in D_b\} \quad (2)$$

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where D_f and D_b are the domains of each image or function.

An example of gray-scale erosion is given below. If the same image F and the structuring element B is used in fig.1, then the calculation of gray-scale erosion using equation-2 is as follows:

$F_a(2,2) = \min\{ f(2+i,2+j) - b(i,j) \mid i=-1,0,1 : j=-1,0,1 \}$

$=\min\{(f(1,1)-b(-1,-1)),(f(1,2)-b(-1,0)),(f(2,1)-b(-1,1)),(f(2,1)-b(0,-1)),(f(2,2)-b(0,0)),(f(2,3)-b(0,1)),(f(3,1)-b(1,-1)),(f(3,1)-b(1,0)),(f(3,2)-b(1,1))\}$

$= \min\{1-0, 5-3, 0-0, 1-2, 2-0, 4-1, 0-0, 0-1, 4-0\}$

$= \min\{1,2,0,-1,2,3,0,-1,4\}$

$=-1$

$$\begin{matrix} -3 & -3 & -3 & -3 & -3 \\ -3 & -2 & -1 & -1 & -3 \\ -3 & -2 & \mathbf{-1} & -1 & -3 \\ -3 & -2 & -2 & -2 & -3 \\ -3 & -3 & -3 & -3 & -3 \end{matrix}$$

Fig.3: Gray–scale erosion example

Specific concepts and operation procedures are already similar to binary morphology. Gray-scale dilation and erosion are dual with respect to function completion and reflection. That is, the relation between these can be expressed as

$$(f \Theta b)^c(s,t) = (f^c \oplus \hat{b})(s,t) \qquad (3)$$

where $f^c = -f(x,y)$ and $\hat{b} = b(-x,-y)$.

The minimum operator will interrogate a neighborhood with a certain domain and select the smallest pixel value to become the output value. This has the effect of causing the bright areas of an image to shrink or erode. Similarly, grayscale dilation is performed by using the maximum operator to select the greatest value in a neighborhood. Fig.4 shows a simple image and its dilation and erosion with a 'flat-top' structuring element. The term 'flat-top' refers to the fact that the values (b's) of the structuring element are all zero in a certain domain. In this example, a disk-type structuring element of size 5 is applied.

a) Original b) Dilation c) Erosion

Fig.4: An Example of Gray-scale Dilation and Erosion

III. GRAY-SCALE OPENING AND CLOSING

Gray-scale opening and closing are defined below in a similar manner as the binary case. The only difference is, when the operations are carried out, these opening and closing operations use gray-scale dilation and erosion described in the previous section. The effect of gray-scale closing and opening is shown in fig.5. As binary morphological operations do, gray-scale opening is anti-extensive and gray-scale closing is extensive. Both operations make an original image smooth along to the nature of minimum and maximum functions. Also both operations have 'increasing' and 'idempotent' properties.

a) Original b) Opening c) Closing

Fig. 5: An Example of Gray-scale Opening and Closing

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IV. CONCLUSION AND DISCUSSION

The theory of basic operations of grey scale morphology like dilation, erosion, opening and closing are explained in this paper. It has shown with examples that how grey scale morphology work on the images and how it is useful to denoise and extract the features and other details from grey scale images.

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Classification of Image Denoising Filters

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***Abstract*—Restoration of image is one of prominent field in machine vision and computer vision applications. In this paper, source of noise along with the detailed theory of two dominating noises i.e. Gaussian noise and impulse noise are presented. Image denoising filters are classified on the basis of their mode of operations, nature and domain.**

***Index Terms*— Noise, Gaussian noise, Impulse noise, Linear filter, Non-linear filter.**

I. Introduction

Image processing has a wide variety of applications in Machine Vision, Multimedia Communication, and Television Broadcasting etc. that demands very good quality of images. The quality of an image degrades due to introduction of noise during acquisition, transmission/ reception and storage / retrieval processes. It is very essential to suppress the noise in an image and to preserve the edges and fine details as far as possible.

During image acquisition (digitization), performance of imaging sensors is affected by a variety of factors, such as environment conditions and the quality of the sensing elements themselves. For instance, in acquiring images with the CCD camera, light levels and sensor temperature are major factors affecting the amount of noise in the resulting image. Images are corrupted during transmission, principally due to interference in the channel used for transmission e.g. an image transmitted using a wireless network might be corrupted as a result of lightning or other atmospheric disturbance. The most common noise that affect the quality of image are gaussian noise, salt and pepper noise, speckle noise and periodic noise.

II. Model of Image Degradation

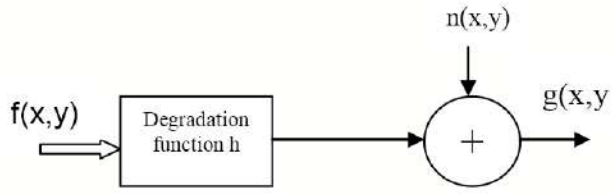

Fig.1: Model of image degradation

$$g(x,y)= h(x,y)* f(x,y) + n(x,y) \quad (1)$$

Where g(x,y) is the degraded image, h(x,y) is the spatial representation of the degradation function, f(x,y) is an original image and n(x,y) is noise. Symbol '*' indicates the convolution.

Noise is of various kinds that effect the image but the most widely studied two kinds are Gaussian noise and impulse "Salt and pepper" noise. Gaussian noise is usually characterized by adding to each pixel a random value from a zero-mean Gaussian distribution, thus intensity of image varies according to the variance of distribution. Impulse noise is characterized by replacing a portion of an image's pixel with noise values, this noise affects image pixel by pixel not the whole area of image.

III. Gaussian Noise

Distortion due to additive white Gaussian noise (AWGN) can be caused by poor quality image acquisition, images observed in a noisy environment or noise inherent in communication channels. However, because of its mathematical tractability in both the spatial and the frequency domains, Gaussian noise models are used frequently in practice. More specifically the noise, w, is assumed to be an additive wide-sense stationary (WSS) white Gaussian noise (AWGN) process with zero mean and constant variance σ^2, which is formed independently of the original noise-free image. Thus, if an image I of size M*N pixels is defined by its gray-level function, u = u(m,n), m, n = 1, 2….M,N, then the noisy image I^ is defined by the noisy gray-level function u^ = u^(m,n), m,n = 1; 2……M,N, as follows:

$$u^ = u + w; \quad (2)$$

Where, u and w are statistically independent. In the pixel domain, one has

$$u^(m,n) = u(m,n) + w(m,n), m; n = 1; 2……..M,N;$$

where wm;n; m; n = 1; 2; : : : ;M;N are independent and identically distributed (iid) Gaussian random samples with zero mean and variance σ^w , that is

$$w(m,n) \sim N(0; σ^2 w); \text{ for } m, n = 1, 2……M,N,$$

Gaussian noise is used as an approximation in cases such as imaging sensors operating at low light levels. Its PDF is given as:

$$f(z) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(z-\mu)^2/2\sigma^2} \quad (3)$$

Where, z is the pixel intensity, μ is mean and σ is standard deviation which decides shape of Gaussian function.

IV. Impulse Noise

Impulse noise is characterized by replacing a portion of an image's pixel with noise values, this noise affects image pixel by pixel not the whole area of image. Such noise is introduced due to transmission errors. Impulse noise can be of two types:

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- Random Values impulse noise(RVIN)
- Salt & pepper noise

The Salt and Pepper (SP) noise is also called as fixed valued impulse noise will take a gray level value either minimal (0) or maximal (255) (for 8-bit monochrome image) in the dynamic range (0-255). It is generated with the equal probability. In the case of salt and pepper noise, the image pixels are randomly corrupted by either 0 or 255. That is a pixel is replaced by either white value (255) or black value (0) that's why it is called as salt & pepper noise.

For each image pixel at location (i,j) with intensity value Oi,j , the corresponding pixel of the noisy image will be Xi,j , in which the probability density function of Xi,j is

$$p(x) = \begin{cases} \frac{p}{2} & for\ x = 0 \\ 1 - p & for\ x = o_{i,j} \\ \frac{p}{2} & for\ x = 255 \end{cases}$$

Random Valued Impulse noise (RVIN) is also called as variable type impulse noise which also replaces some pixels with random values like salt & pepper noise but in the range [0 255](in case of 8 bit gray scale image).

Distribution of Impulse noise: Impulse noise follows the impulse distribution like a unit impulse signal which can take either 0 or 1(random value in case of impulse signal). There is an abrupt transition in the pixel value in the neighborhood of any pixel of an image corrupted by impulse noise.

Effect on image: Image corrupted by salt & pepper noise will have black & white dots on image (for gray valued image) which causes image distorted.

V. Classification of Denoising Methods

There are two basic methods to denoise an image i.e. spatial domain filtering methods and transform domain filtering methods [136].

A. Spatial Domain Denoising Methods

A traditional way to remove noise from image data is to employ spatial filters. Two typical methods in the spatial domain are:

(1) Linear Filtering

Mathematically, a linear filter may be defined as an operator L( ), which maps a signal x into a signal y:

$$y = L(x) \quad (4)$$

When the operator L( ) satisfies both the superposition and proportionality principles, the filter is said to be linear.

Most classical linear image processing techniques are based on the assumption that images are stationary. Even though linear filters are useful in a wide variety of applications, there are some situations in which they are not adequate. For instance, linear filters may involve image processing applications where both edge enhancement and noise reduction are desired. Usually edge enhancement can be considered as a high-pass filtering operation, while noise reduction is most often achieved using low-pass filtering operations. However, Linear Shift-Invariant (LSI) filters do not take into account any structure in images. Therefore, the degree of smoothing is the same over all parts of an image and will cause the loss of some detailed information of the image. However, it is known that people are less sensitive to noise in more detailed regions of an image [2]. If the filter can smooth less in these regions than in the less detailed regions, it will preserve the detailed information of the images while smoothing out noise. Conventionally, linear shift invariant filters do not adapt to image content.

(2) Non-linear Filtering

These filters do not follow the superposition or proportionality principles like linear filters. Non-linear filters modify the value of each pixel in an image based on the value returned by a non-linear function that depends on the neighboring pixels. Non-linear filters are mostly used for noise removal and edge detection. For example, the traditional non-linear filter is the median filter. It can efficiently decrease additive noise, especially impulsive noise. There are also many improved median filters, such as the weighted median filter [1], center weighted median filters [2], detail preserving median based filters [3], multilevel hybrid median filter [4] etc. However, they do not get rid of all additive noise and blur edges to some degree.

B. Transform Domain Filtering

According to the choice of the analysis function [5], the transform domain filtering methods can be classified into the following two categories.

(1) Spatial-Frequency Filtering

Spatial-Frequency Filtering refers to low pass filters using Fast Fourier Transform (FFT). In frequency smoothing methods [2], the removal of the noise is achieved by designing a frequency domain filter and adapting a cut-off frequency to distinguish the noise components from the useful signal in the frequency domain. These methods are time consuming and depend on the cut-off frequency and the filter function behavior. Furthermore, they may produce frequency artifacts in the processed image.

(2) Wavelet domain

Fourier transforms works well with periodic signals but it is not very effective with signals having sharp peaks and valleys [6]. It is also not effective to remove the small detail components that may be corrupted by noise; therefore wavelet domain analysis can be used to remove the small detail components (high frequency) which may be distorted by noise. Many investigations have been made to suppress the additive noise in images using wavelet transforms. Filtering operations in the wavelet domain can be categorized as wavelet thresholding model, statistical wavelet coefficient model and un-decimated wavelet domain transform based methods.

VI. Conclusion and Discussion

This paper gives the overview of noise and its sources in image processing applications. It is observed in literature that Gaussian and impulse are two dominating noises that get added in images. It is also observed that non-linear filters are more

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effective as compare to linear filters in terms of suppression of noise in images.

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Comparison of conventional optical amplifiers at different transmission distance in an optical communication system

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Abstract*—This paper presents an investigation on the performance of 16 × 10 Gbps Wavelength division multiplexing system with 100GHz channel spacing using different optical amplifiers . The apparent options of optical amplification used in the system includes Semiconductor optical amplifier (SOA) ,Raman amplifier and Erbium doped fiber amplifier (EDFA). The performance is compared at different distances and has been evaluated on the basis of optical output power , eye opening , bit error rate and Quality Factor. It is observed that maximal transmission distance of 325 Km is achieved in case of SOA with an input optical power of -10 dBm whereas in case of EDFA and Raman amplifier the signal can travel upto maximum distance of 209 and 213 Km respectively.

***Keywords*—Dispersion, EDFA, Raman, SOA**

I. INTRODUCTION

Wavelength division multiplexing system is the state of-the-art technology in optical communications [1]. The WDM optical networks are attracting more and more attention because of their ability to provide increased capacity and flexibility [2]. The advances in the optical communications have been promoted in part by development of efficient and powerful optical amplifiers which eliminate the need of costly conversions from optical to electrical signal and vice versa[3]. The variety of optical amplifier types has led to necessity of choosing a particular optical amplifier type for a specified transmission system [4]. Semiconductor optical amplifiers (SOA) are the most cost effective alternative to EDFAs, but this type of amplifiers produces great amount of amplified spontaneous emission (ASE) noise and other signal impairments. Nevertheless benefits include compactness and the ability to facilitate additional functionalities such as wavelength conversion and all-optical regeneration [5]. A particular attraction of EDFAs is their large gain bandwidth, which is typically tens of nanometers and thus actually more than enough to amplify data channels with the highest data rates without introducing any effects of gain narrowing [6]. Raman amplifiers improve the noise figure and reduce the nonlinear penalty of fiber systems, this improves the overall system performance thus allows us longer amplifier spans, higher bit rates, closer channel spacing [7]. Fiber amplifiers are preferable since the coupling loss due to fusion splice is negligible, insensitive to polarization and have negligible noise for interchannel crosstalk [8].

Kim et al. [9] successfully transmitted 10-Gb/s optical signals over 80 km through SSMF (Standard single mode fiber) with the transmitter using SOAs as booster amplifiers. They have further found the appropriate parameters of input signals for SOAs, such as extinction ratio, rising/falling time, and chirp parameter to maximize output dynamic range and available maximum output power.

Singh et al. [10] concluded that the post-power compensation method shows good performance in terms of bit error rate, eye closure penalty and received power as compared to pre- and symmetrical power compensation methods. The bit error rate and eye closure penalty increases with increase in the signal input power.

R. Deepa et al. [11] analyzed computational and experimental results of a high power erbium doped fiber amplifier using the bidirectional pumping scheme. The differences between the signal evolution were discussed for unidirectionally and bidirectionally pumped amplifier for a single channel CW input. A comparison is made between the theoretically predicted gain and the experimental results for bidirectional pumping. The numerical analysis is further extended to multiwavelength propagation in the forward and bidirectional pumping schemes. The modifications of a Gaussian pulse in the time and spectral domains due to propagation through the doped fiber are analyzed qualitatively to emphasize the advantages of bidirectional pumping for high power amplification.

In this paper we extended the previous work [4] by increasing the single span distance when the optimized optical amplifier is used which amplifies 16 channels simultaneously. These results have been checked in terms of Quality Factor, Output Power and eye opening by varying distance.

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The paper is organized into four sections. In Section 2, the optical simulation setup is described. In Section 3, optimized results have been reported for the different dispersion and finally in Section 4, conclusions are made.

II. SIMULATION SET UP

In this model sixteen channels are transmitted at 10 Gb/s with 100 GHz channel spacing . Each transmitter section consists of the data source, electrical driver, laser source and external Mach–Zehnder modulator. The data source is generating signal of 10 Gb/s with pseudo random sequence. The electrical driver converts the logical input signal into an electrical signal. The CW laser sources generate the 16 laser beams at 192.35–193.85 THz with 100 GHz channel spacing. The signals from data source and laser are fed to the external Mach–Zehnder modulator where the input signals from data source are modulated through a carrier (optical signal from the laser source). The laser power is set to -10 dBm because at higher power the wavelengths tend to overlap each other causing more dominance of non-linear effects like XPM and FWM . The amplitude modulator is a sine square with an excess loss of 3 dB. The output optical signal is fed to the channel where it is pre-amplified by booster. The simulations setup of EDFA, SOA, RAMAN at different transmission distance are shown in Fig. 1.

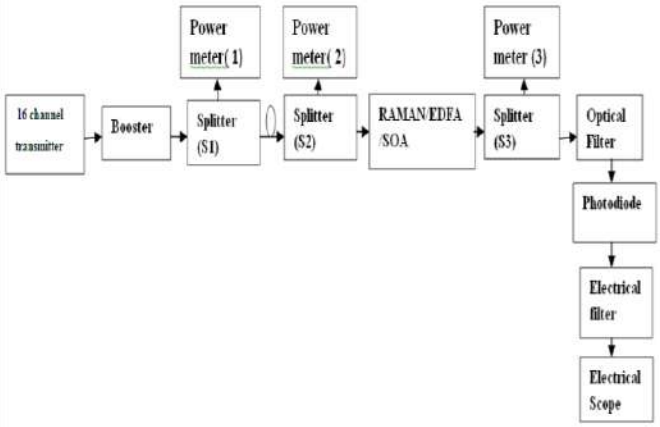

Fig. 1. Block Diagram for simulation set up

The optical signal is transmitted and measured over different distance for 50, 100, 150, 200, 250, 300, and 350 km respectively. Optical power meter (P1, P2, P3) and optical probe (O1, O2, O3) with splitters (S1, S2, S3) are used for measuring the signal power and spectrum at different levels. Single receiver is used to detect the output at the receiving side.

The DS anomalous fiber is used to transmit the optical signal. Its various parameters are reference frequency is 193.414 THz, attenuation is 0.2 dB/km . The fixed output power EDFA is used for amplification and its parameters are output power is 25mW, gain shape is flat and noise figure is 4.5 dB. The various parameters for SOA are biased current is 100 mA, amplifier length is 300×10^{-6} m, confinement factor is 0.35, insertion loss is 3 dB and output insertion is 3 dB. The various parameters for RAMAN are Raman fiber length is 10 km, operating temperature is 300 K, pump wavelength is 1450 nm and pump power is 300 mW.

III.RESULTS AND DISCUSSIONS

To analyze the performance of the system Quality Factor, Bit error rate and output power is examined at the channel 1. Performance of different amplifiers EDFA/SOA/RAMAN is compared at different distance. The maximum achievable transmission distance in case of SOA, EDFA and Raman amplifier are 325, 209 and 223 Km respectively with acceptable BER and quality Factor. The results in [4] were limited to 112 and 119 Km for SOA and Raman amplifier.The simulation results are shown in table 1.

Table 1. Simulation Results

Sr. No	Amplifier Type	SOA	EDFA	Raman
1	Acceptable Distance	325 Km	209 Km	223 Km
2	Quality Factor	15.58 dB	16.23 dB	15.46 dB
3	BER	10^{-9}	10^{-11}	10^{-9}
4	Output Power	-35.803 dBm	6.259 dBm	-26.216 dBm

In order to observe the performance the output power vs transmission distance graphs is shown in Fig. 2. The graph shows that as we increase the transmission distance from 50 Km to 350 Km, the output power decreases simultaneously. The variation in output power from different optical amplifiers at dispersion of 2 ps/nm/km is 9.999 to -40.795 dBm for SOA, 13.995 to 0.307dBm for EDFA and 7.382 to -33.444 dBm for Raman Amplifier.

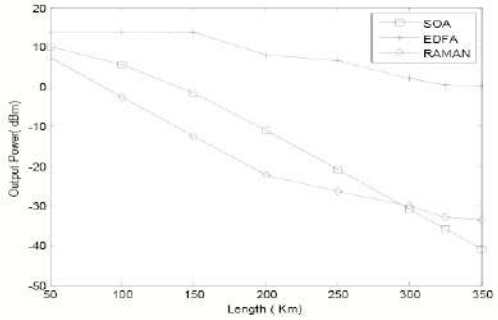

Fig. 2. Length vs Output Power for dispersion of 2 ps/nm/km.

Figure 3 depicts the transmission distance vs Quality factor graph. It is observed that by increasing the transmission distance from 50 to 350 km, Q factor is decreasing. The variation in Q factor at dispersion D = 2 ps/nm/km is 17.52

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to 14.27 dB for SOA,27.54 to 6.02 dB for EDFA, and 27.77 to 6.02 dB for Raman amplifier.

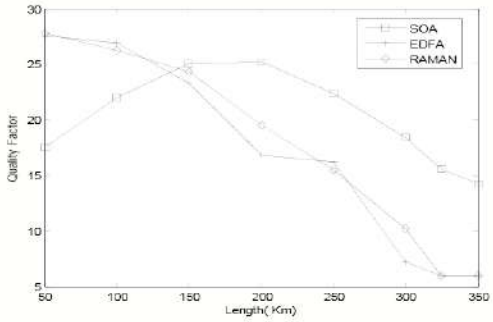


Fig. 3. Length vs quality Factor for dispersion of 2 ps/nm/km.

The eye opening from different amplifiers verses transmission distance at dispersion of 2 ps/nm/km is shown in Fig. 4 . Large eye opening means less BER and good communication. It is observed that by increasing the transmission distance from 50 to 350 km, eye opening is also decreasing. The variation in eye opening from different optical amplifiers at dispersion D = 2 ps/nm/km is 0.0020 to $3.37e^{-008}$ for SOA, 0.0517 to $1.61e^{-005}$ for EDFA and 0.0010 to $1.17e^{-008}$ for Raman Amplifier.

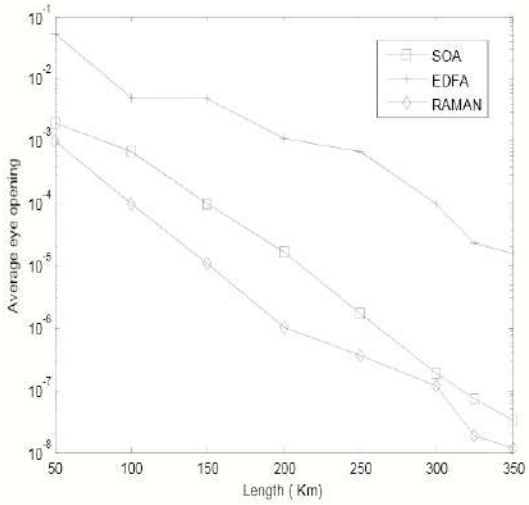


Fig. 4. Length vs Average Eye Opening for 2 ps/nm/Km

Fig. 5 shows the transmission distance vs Bit error rate graph. The variation in BER from different optical amplifiers at dispersion at 2ps/nm/Km is $1.67e^{-013}$ to $2.31e^{-007}$ for SOA, 10^{-40} to 0.022 for EDFA and 10^{-40} to 0.022 for Raman amplifier.

Fig 6. Eye diagram for SOA at 325 Km

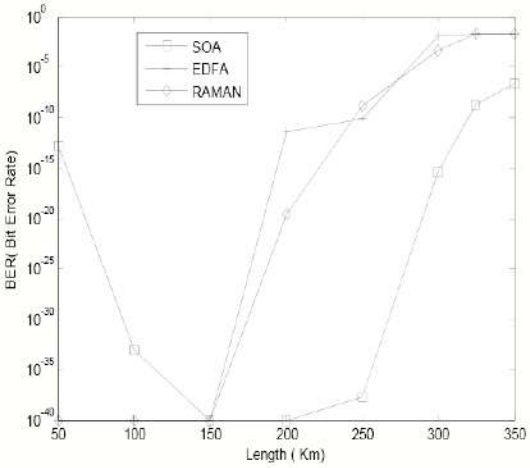
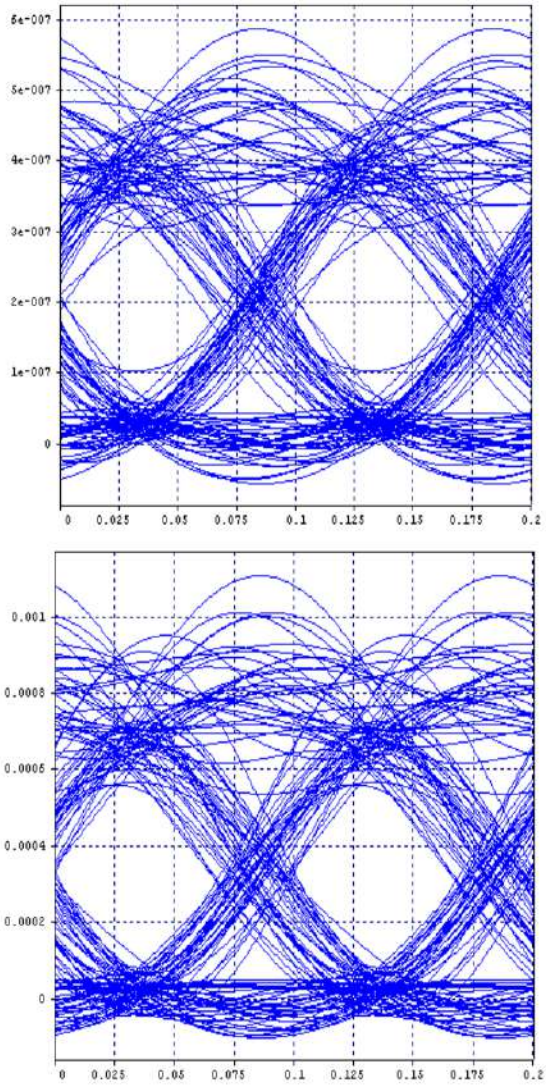


Fig. 5. Length vs Bit error rate for dispersion of 2ps/nm/km



The eye diagrams of signal for 16 channel SOA, EDFA, Raman are are shown in figure.

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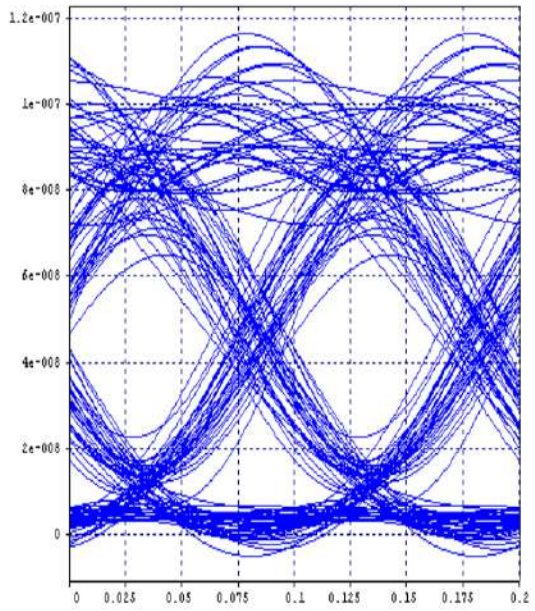

Fig. 7 Eye diagram for EDFA at 209 Km

Fig. 8 Eye Diagram For Raman at 209 Km

IV. CONCLUSION

The 16 channel wavelength division multiplexing system at 10 Gbps with 100 GHz has been investigated with the placement of optical amplifier and the performance has been compared on the basis of transmission distance. The performance of optical amplifiers was evaluated using the power level, eye patterns, BER measurement, eye opening and Q factor. It is observed that maximum output power (13.935dBm) and maximum eye opening (0.0517dBm) is achieved using EDFA. However the maximum reachable distance of 325 Km with acceptable Quality Factor of 15.58 and bit error rate of 10^{-9} is achieved using Semiconductor optical amplifier.

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Comparison of Routing Protocols in MANET

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Abstract*— *The advancement in information technology and the need for large-scale communication infrastructures has triggered the era of Wireless Sensor Networks (WSNs). Mobile ad-hoc network (MANET) is a network of wireless mobile nodes which communicate with each other without any centralized control or established infrastructure. The goal of MANETs is to extend mobility into the realm of autonomous, mobile and wireless domains, where a set of nodes form the network routing infrastructure in an ad-hoc fashion. Routing is the process of selecting paths in a network along which data is to be sent. Dynamic and reliable routing protocols are required in the ad-hoc wireless networks, as they have no infrastructure (base station) and their network topology changes. There are various protocols for handling the routing problem in the ad-hoc wireless network environment. In this paper, we compare the performance of different routing protocols–Reactive, Proactive and Hybrid Routing Protocols.

***Keywords*— Ad-hoc Networks, Hybrid, Proactive and Reactive Routing Protocols.**

I. INTRODUCTION

In recent years, the progress of communication technology has made wireless devices smaller, less expensive and more powerful. The rapid technology advancement has provoked great growth in mobile devices connected to the Internet. Mobile means moving and ad-hoc means temporary without any infrastructure. So, mobile ad hoc network (often referred to as MANET) is the one consisting of a collection of wireless mobile nodes (MNs) sharing a wireless channel without any centralized control or established communication backbone [1]. The nodes themselves are responsible for creation, operation, maintenance of the network and also self-organize to form a network over radio links. Usually, these nodes act as both end systems and routers at the same time. Nodes of these networks, which function as routers, discover and maintain routes to other nodes in the network. The topology of the ad hoc network depends on the transmission power of the nodes and the location of the MNs, which may change with time, new nodes can join the network and other nodes can leave it. The set of applications for MANETs is diverse, ranging from small static networks that are constrained by power sources to large-scale, mobile, highly dynamic networks. Unfixed topology in ad-hoc networks results in finding the delivery path dynamically, maintain the integrity and stability of the path during data delivery process. This ensures the data packets are transferred to the destination node completely. The traditional routing mechanisms and protocols of wired network are inapplicable to ad -hoc networks, which initiated the need to use a dynamic routing mechanism in ad-hoc network [2]. The network has no base stations, access points, remote servers, etc. Such constraints make routing a challenging task in MANET where all network functions are performed by the nodes forming the network and each node performs the functionality of host and router.

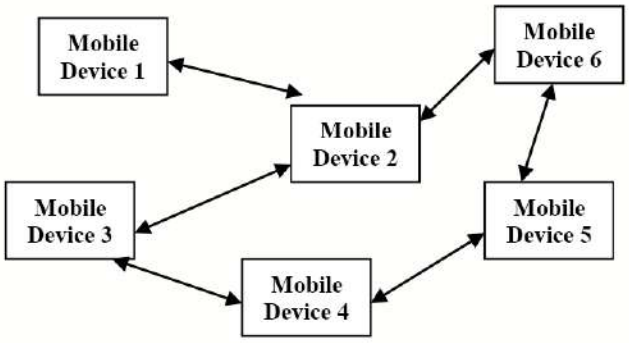

Figure 1. *Mobile ad-hoc Network*

A fundamental problem in ad hoc networking is how to deliver data packets among MNs efficiently without predetermined topology or centralized control, which is the main objective of ad hoc routing protocols. Since mobile ad hoc networks change their topology frequently, routing in such networks is a challenging task. Due to mobility of nodes, path between nodes may change. Therefore, it is not possible to apply techniques of fixed network in MANET. Because of this, routing is the most studied problem in MANET therefore,

to support mobile computing, a mobile host must be able to communicate with other mobile hosts which may not lie within its radio transmission range. Hence routing protocols will need to perform four important functions of determination of network topology, maintaining network connectivity,

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transmission scheduling and channel assignment, and packet routing. Routing protocols in MANETs were developed based on the design goals of minimal control overhead, minimal processing overhead, multi hop routing capability, dynamic topology maintenance and loop prevention [3]. Classification on routing protocols in MANETs can be done on routing strategy wise or network structure wise. According to routing strategy, the routing protocols can be categorized as table-driven or proactive and source-initiated or reactive or on-demand routing. Each of these types of protocols behaves differently on different wireless conditions. Several factors will affect the overall performance of any protocol operating in an ad hoc network. For example, node mobility may cause link failures, which negatively impact on routing and quality of service (QoS) support. Network size, control overhead, and traffic intensity will have a considerable impact on network scalability along with inherent characteristics of ad hoc networks may result in unpredictable variations in the overall network performance.

The intent of this paper is to compare the performance of various routing protocols like in Proactive routing protocols- Optimized Link State Routing protocol (OLSR), Destination Sequenced Distance Vector (DSDV), Routing Information Protocol (RIP), Cluster Head Gateway Switch Routing (CGSR), Wireless Routing Protocol (WRP) In Reactive routing protocols- Ad-hoc On-demand Distance Vector routing (AODV), Dynamic Source Routing (DSR), Temporally Ordered Routing Algorithm (TORA), Location Aided Routing (LAR), Dynamic MANET On-demand (DYMO) and in Hybrid Routing Protocols- Zone Routing Protocol (ZRP) are studied. The present paper is organized in such a way that Section II depicts the MANET Routing Protocols where Section III concludes the entire report of MANET Routing Protocols.

II. MANET ROUTING PROTOCOLS

Routing is the process of selecting paths in a network along which data to be sent. In an ad-hoc network, mobile nodes communicate with each other using multihop wireless links. There is no stationary infrastructure; each node in the network also acts as a router, forwarding data packets for other nodes. A central challenge in the design of ad-hoc networks is the development of dynamic routing protocols that can efficiently find routes between two communicating nodes. The routing protocol must be able to keep up with the high degree of node mobility that often changes the network topology drastically and unpredictably [4]. Ad-hoc radio networks have various implementation areas like military, emergency, conferencing and sensor applications. Each of these application areas has their specific requirements for routing protocols. In military applications low probability of detection and interception is a key factor, in sensor applications low or minimum energy consumption is a precondition for an autonomous operation. In conference applications a guaranteed quality of service for multimedia services is a needed feature. All these application areas have some features and requirements for protocols in common. Because of multiple and diverse ad-hoc protocols, there is an obvious need for a general taxonomy to classify protocols considered [5].

Routing protocols are divided into three categories namely, proactive, reactive and hybrid;

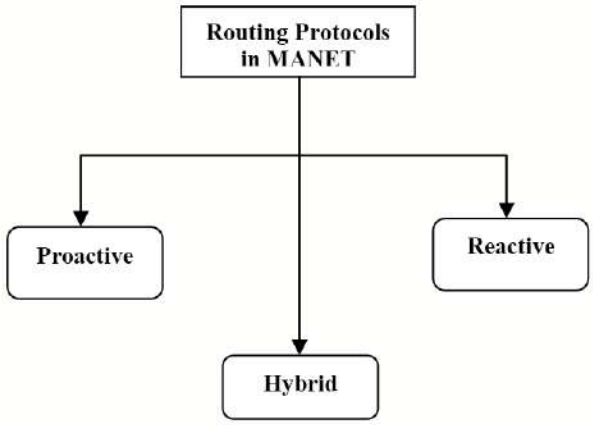

Figure 2. *Types of Routing Protocols in MANET*

Proactive Routing Protocols

In proactive routing each node continuously maintain route between pair of nodes. Hence, route creation and maintenance is accomplished through some combination of periodic and event-triggered routing updates derived from distance-vector or link-state method. In this routing protocol each node has one or more tables that contain the latest information of the routes to any other node in the network. Various table-driven protocols differ in the way how the information propagates through all nodes in the network when topology changes. The proactive routing protocols are not suitable for larger networks as they need to maintain each and every node entries in the routing table. Periodic route updates are exchanged in order to synchronize the tables. Various proactive routing protocols are:

- *Destination Sequenced Distance Vector (DSDV)*

DSDV is a hop-by-hop distance vector routing protocol requiring each node to periodically broadcast routing updates based on the idea of classical Bellman-Ford Routing algorithm [6]. Each node maintains a routing table listing the "next hop" for each reachable destination, number of hops to reach destination and the sequence number assigned by destination node. The sequence number is used to distinguish stale routes from new ones and thus avoid loop formation. The stations periodically transmit their routing tables to their immediate neighbors. A station also transmits its routing table if a significant change has occurred in its table from the last update sent. So, the update is both time-driven and event-driven. The routing table updates can be sent in two ways: a "full dump" or an "incremental" update.

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- *Optimized Link State Routing protocol (OLSR)*

OLSR is an optimization of pure link state algorithm [7], uses the concept of Multi point Relays (MPR) for forwarding control traffic, intended for diffusion into the entire network. The MPR set is selected such that it covers all nodes that are two hops away. Due to proactive nature, OLSR works with a periodic exchange of messages like *Hello* messages and Topology Control (*TC*) message only through its MPR. The parameters used by OLSR to control the protocol overheads are Hello-interval parameter, TC-interval parameter, MPR coverage parameter and TC-redundancy parameter. So, contrary to classic link state algorithm, instead of all links, only small subsets of links are declared.

- *Routing Information Protocol (RIP)*

A Routing Protocol Based on the Distance-Vector Algorithm. A router in the network needs to be able to look at a packet's destination address and then determine which of the output ports is the best choice to get the packet to that address. The router makes this decision by consulting a forwarding table. Routing algorithms are required to build the routing tables and hence forwarding tables. The basic problem of routing is to find the lowest-cost path between any two nodes, where the cost of a path equals the sum of the costs of all the edges that make up the path. Routing is achieved in most practical networks by running routing protocols among the nodes. The protocols provide a distributed, dynamic way to solve the problem of finding the lowest-cost path in the presence of link and node failures and changing edge costs. One of the main classes of routing algorithms is the distance-vector algorithm. Each node constructs a vector containing the distances (costs) to all other nodes and distributes that vector to its immediate neighbors. RIP is the canonical example of a routing protocol built on the distance-vector algorithm. Routers running RIP send their advertisements regularly (e.g., every 30 seconds). A router also sends an update message whenever a triggered update from another router causes it to change its routing table [8].

- *Cluster Head Gateway Switch Routing (CGSR)*

Cluster Head Gateway Switch Routing protocol [9] is a multichannel operation capable protocol. It enables code separation among clusters. The clusters are formed by cluster head election procedure, which is quite intensive process. On that reason the protocol uses so called Least Cluster Change (LCC) algorithm for that election. By using LCC can cluster heads only changed when two cluster heads come into contact with each other or when a node moves out of contact of all other cluster heads. CGSR is not an autonomous protocol. It uses DSDV as the underlying routing scheme. The DSDV approach is modified to use a hierarchical cluster head-to-gateway routing. A packet sent by a node is first routed to its cluster head, and then the packet is routed from the cluster head to a gateway to another cluster head, until the destination node's cluster head is reached. That destination cluster head then transmits the packet to the destination node.

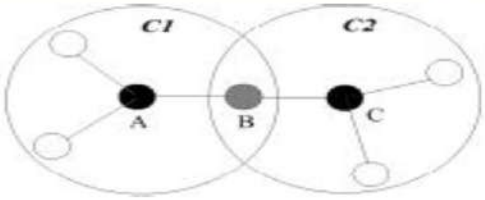

Figure 3: *CGSR Routing*

- *Wireless Routing Protocol (WRP)*

The Wireless Routing Protocol [10] is a proactive, destination-based protocol. WRP belong to the class of path finding algorithms. The typical feature for these algorithms is that they utilize information about distance and second-to-last hop (predecessor) along the path to each destination. Path-finding algorithms eliminate the counting-to-infinity problem of distributed Bellman-Ford-algorithms by using that predecessor information, which can be used to infer an implicit path to a destination and thus detect routing loops. In WRP there is a quite complicated table structure. Each node maintains four different tables as in many other table-driven protocols only two tables are needed. These four tables are:

1) Distance table
2) Routing table
3) Link cost table and
4) Message retransmission list (MRL) table.

Each entry of MRL contains the sequence number of the update message, a retransmission counter, an acknowledgement-required flag with one entry per neighbor and a list of updates sent in the update message. The MRL records which updates in an update message need to be retransmitted and which neighbors should acknowledge the retransmissions. In WRP nodes exchange routing-table update messages only from a node to its neighbors. An update message contains such components as an update list. An update list entry specifies a destination, a distance to the destination and a predecessor to the destination. When a link fails or a link-cost changes, node re computes the distances and predecessors to all affected destinations, and sends to all its neighbors an update message for all destinations whose distance have changed.

Reactive Routing Protocols

In Reactive or on-demand routing routes are only discovered when they are actually needed. Hence, a node that wants to send a packet to another node, the reactive protocols searches for the route in an on-demand basis and establishes a connection to transmit and receive a packet. The route discovery typically consists of network wide flooding of request message. If a node wants to send a packet to another node then this protocol searches for the route in an on-demand manner and establishes the connection in order to transmit and receive the packet. The route discovery occurs by flooding the route request packets throughout the network. Various reactive routing protocols are:

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- *Ad-hoc On-demand Distance Vector routing (AODV)*

Ad-hoc On-Demand Distance Vector is a routing protocol in which each node maintains a routing table, one entry per destination which records the next hop to the destination and its hop count. AODV also uses a sequence number to ensure the freshness of routes. AODV discovers a route through network-wide broadcasting. It does not record the nodes it has passed but only counts the number of hops. It builds the reversed routes to the source node by looking into the node that the route request has come. The intermediate nodes checks for fresh routes according to the hop count and destination sequence number and forwards the packets that they receive from their neighbours to the respective destinations. AODV utilizes periodic beaconing (HELLO packets) for route maintenance. If a node does not receive a HELLO packet within a certain time, or it receives a route break signal that is reported by the link layer, it sends a route error packet by either unicast or broadcast, depending on the precursor lists (i.e. active nodes towards the destination), in its routing table. AODV avoids the stale route cache problem of DSR and it adapts the network topology changes quickly by resuming route discovery from the very beginning [11].

- *Dynamic Source Routing (DSR)*

DSR is a simple and efficient routing protocol designed specifically for use in multihop wireless ad-hoc networks of mobile nodes [12]. It allows nodes to dynamically discover a source route across multiple network hops to any destination in the ad-hoc network. Each data packet sent then carries in its header the complete ordered list of nodes through which the packet must pass, allowing packet routing to be a trivially loop free and avoiding the need for up-to-date routing information in the intermediate nodes through which the packet is forwarded. With the inclusion of this source route in the header of each data packet, other nodes forwarding or overhearing any of the packets may easily cache this routing information for future use. It is a beacon-less protocol. During route construction phase, RREQ is flooded in network [13]. The destination nodes respond by RREP, which carries the route traversed by the RREQ packet. Each RREQ carries a sequence number generated by source which is used to prevent loop formation and to avoid multiple transmission of the same RREQ by intermediate node that receives it through multiple paths. Main advantage of this protocol is that it is beacon-less, thus bandwidth consumption is less and each packet carries full routing information. Disadvantage of this protocol is that the route maintenance mechanism does not locally repair a broken link and stale route cache information could also result in inconsistencies during the route reconstruction phase.

- *Temporally Ordered Routing Algorithm (TORA)*

TORA is an on-demand routing protocol. The main objective of TORA is to limit control message propagation in the highly dynamic mobile computing environment. Each node has to explicitly initiate a query when it needs to send data to a particular destination. It is a highly adaptive, efficient and scalable distributed routing algorithm based on the concept of link reversal [14]. It finds multiple routes from a source node to a destination node. The main feature of TORA is that the control messages are localized to a very small set of nodes near the occurrence of a topological change. TORA belongs to a class of algorithms called the link reversal algorithms. TORA essentially performs three tasks:

1) Creation of a route from a source to a destination.
2) Maintenance of the route.
3) Erasure of the route when the route is no longer valid.

TORA has a unique feature of maintaining multiple routes to the destination so that topological changes do not require any reaction at all. The protocol reacts only when all routes to the destination are lost. In the event of network partitions the protocol is able to detect the partition and erase all invalid routes.

- *Location Aided Routing (LAR)*

Location aided routing [15], is an enhancement to flooding algorithms to reduce flooding overhead. Most on-demand methods, including DSR and AODV use flooding to obtain a route to the destination. LAR aims to reduce the overhead to send the route requests only into a specific area, which is likely to contain the destination. For this purpose the notions of expected zone and request zone are introduced. The expected zone covers the area in which the destination is expected. Since the expected zone need not contain the source node, a larger area must be covered by flooding. This expanded expected zone is called request zone and is used to restrict the flooding; i.e. only nodes that are part of the request zone can forward a route request. On unsuccessful route discoveries, the request zone may need to be expanded further, possibly covering the whole network. Such subsequent route requests increase the initial latency for connections. This results in a tradeoff between reduced overhead and increased latency which needs to be balanced carefully.

- *Dynamic MANET On-demand (DYMO)*

The Dynamic Manet On-Demand is an On-Demand and fast reactive routing protocol for multi-hop communication in MANET currently under development by the Mobile Ad-hoc Networks Working Group of Internet Engineering Task Force (IETF). The basic operations of the DYMO protocol are route discovery and route management. During route discovery, the source node initiates a Route Request (RREQ) throughout the network to find a route to the destination node. During this hop-by-hop dissemination process, each intermediate node records a route to the source node. When the destination node receives the RREQ, it responds with a Route Reply (RREP) sent hop-by-hop toward the source node. Each node that receives the RREP records a route to the destination node, and then the RREP is unicast hop-by-hop toward the source node. When the source node receives the RREP, routes have then been established between the source node and the destination node in both directions.

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During route management, if there is a change in the network topology, nodes maintain their routes and monitor links over which traffic is moving. When a data packet is received for a destination to which the route is broken, and then the source node is notified with a Route Error (RERR).When the source receives the RERR, it knows that it must perform route discovery if it still has packets to deliver to that destination. DYMO uses sequence numbers to avoid loop formation. Sequence numbers also enable nodes to determine the order of DYMO route discovery messages, thus stale routing information can be avoided [16].

Hybrid Routing Protocols (HRP)

Proactive protocols have large overhead and less latency while Reactive protocols have less overhead and more latency. So, Hybrid Routing Protocols combines the merits of proactive and reactive routing protocols by overcoming their demerits. In this section we put some light on existing hybrid routing protocol.

- *Zone Routing Protocol (ZRP)*

Proactive routing uses excess bandwidth to maintain routing information, while reactive routing involves long route request delays. Reactive routing also inefficiently floods the entire network for route determination. The zone routing protocol aims to address the problems by combining the best properties of both the proactive and reactive approaches. In ad-hoc network, it can be assumed that the largest part of the traffic is directed to nearby nodes. Therefore, ZRP reduces the proactive scope to a zone centered on each node. In a limited zone, the maintenance of routing information is easier. Further, the amount of routing information never used is minimized. In ZRP each node is assumed to maintain routing information only for those nodes that are within its routing zone. Because the updates are only propagated locally, the amount of update traffic required to maintain a routing zone does not depend on the total number of network nodes. A node learns its zone through a proactive scheme Intra zone Routing Protocol (IARP). For nodes outside the routing zone, Inter-zone Routing Protocol (IERP) is responsible for reactively discovering routes to destinations located beyond a node's routing zone. The IERP is distinguished from standard flooding-based query/response protocols by exploiting the structure of the routing zone. The routing zones increase the probability that a node can respond positively to a route query. This is beneficial for traffic that is destined for geographically close nodes [17].

TABLE I. COMPARISON OF DIFFERENT ROUTING PROTOCOLS [18-19]

Sr.No.	Parameters	Reactive	Proactive	Hybrid
1	Routing Overhead	Low	High	Medium
2	Routing Philosophy	Flat	Flat/Hierarchical	Hierarchical
3	Storage Requirements	Depends on the number of routes maintained	High due to routing tables	Depends upon the size of zone
4	Scalability	Not suitable for large networks [>100nodes]	Low [100 nodes]	Designed for large networks [>1000nodes]
5	Latency	High	Low	Low for intra-zone and high for inter- zone
6	Periodic Route Updates	Not required	Required always when there is change in topology	Required inside the zone

III. CONCLUSION

In this paper, it can be concluded that the goal of MANET is to extend mobility into the realm of autonomous, mobile and wireless domains, where a set of nodes form the network routing infrastructure in an ad-hoc fashion. Routing is the process of selecting paths in a network along which data is to be sent. Dynamic and reliable routing protocols are required in the ad-hoc wireless networks, as they have no infrastructure (base station) and their network topology changes. There are various protocols for handling the routing problem in the ad-hoc wireless network environment and in this paper, we compare the performance of Reactive, Proactive and Hybrid Routing Protocols.

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Edge Detection Methods: An Overview

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Abstract - **This paper introduces various traditional edge detection techniques. Edge detection is process of locating edge in images. Detection of edges is very important steps towards understanding image features. Edge detection is an approach used in image segmentation based on abrupt changes in intensity. In this paper, traditional methods of edge detection that are Canny, Prewitt, Roberts, Sobel and Log are introduced using MATLAB.**

Index Terms - Edge detection, Canny, Prewitt, Robert, Sobel, Log.

I. INTRODUCTION

Today computer vision has an important role in our life and has many different application areas [1, 2]. To use computers in image processing has different objectives. One of the major objectives to use computers in image processing is to create more suitable images for people to recognize. Image segmentation is the process of assigning a label to every pixel in an image such that the pixels with same label share certain visual characteristics. Segmentation is basically done to locate objects and boundaries in an image. Several image segmentation techniques have defined so far [3, 4]. Edge detection is one of the image segmentation techniques. The edge is the most important feature in an image. Edges contain a lot of information and meaningful features

about an image. The edges in an image refer to rapid changes in physical properties such as geometry, reflectivity and illumination [5]. Edge detection is one of major research area in field of image processing. Edge detection is the process of identifying edges in images. Edges are the points in images where image sharpness increases rapidly. Edge detection decreases the size of image and filters out the redundant information that does not play any important role in images. Different types of edge detection algorithms are used. In this paper, Canny, Sobel, Prewitt, Log and Roberts's methods are presented.

II. THE PRINCIPLE OF EDGE DETECTION

Edges are the discontinuities that bring changes in pixel intensities which defines the boundaries of an object. An edge pixel is defined by two important features, primarily the edge strength, which is equal to the magnitude of the gradient and secondly the edge direction which is equal to the direction of the gradient [6]. Magnitude of the derivative of gradient measures the contrast of the edge and direction of derivative of gradient measures the edge orientation. The basic idea of edge detection is as follows- First edge enhancement operator is used to highlight the local edge of an image. Then define the pixel "edge strength" and set the threshold to extract the edge point set. Sometimes the edges detected may not be continuous because of noise present in image and also due to blurredness present in image. So edge detection involves two steps- First is to use edge operator to extract the edge point set. Second is to remove some of edge points from the edge point set, filling it with some another and linking the obtained edge point set into lines [6].

III. EDGE DETECTION TECHNIQUES

Different types of Edge detection techniques are used. In this paper, we discuss five types of edge detection techniques- Canny edge detector, Prewitt edge detector, Sobel edge detector, Roberts edge detector and Log edge detector which as explained as below-

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i) Canny edge detector:- Canny edge detector is the traditional edge detector method. Gaussian function operator is used for smoothing of noise. This method is optimal for step edges corrupted by white noise [7]. This edge detection method introduced by Canny is based on gradient calculation on images. This method also provides the maximize signal to noise ratio for better and proper detection. It also minimizes the number of positive responses around a single edge. It provides very good localization of edge points.

Canny followed a list of criteria to have better edge detection. First is good detection with low error rate. It is very important to mark all the edges in the image. Second criteria are good localization which means that the distance between the actual and located position of the edge should be minimal. The third criteria are minimal response. It means that the given edge in the image should be marked once and image noise should not create false edges. The third criteria are implemented because the first two criteria were not sustainability enough to completely eliminate the possibility of multiple responses in an edge [7]. Canny detectors are formulated as an optimization problem for being used under noisy environment [8].

ii) Prewitt edge detector:- The Prewitt operator is named after Judith Prewitt. Prewitt edge detector is used to detect vertical and horizontal edges in images. It is a discrete differentiator operator that computes the approximation of gradient of image intensity function. This operator does not place any emphasis on pixels that are closer to the centre of masks [9]. The primary advantage of this edge detector is its simplicity. The detection and orientation of edges is simple due to approximation of magnitude of gradient. Prewitt operator convolves the image with small, separable and integer valued filter in horizontal and vertical direction.

iii) Sobel edge detector: - Sobel operator performs a 2D spatial gradient measurement on an image. This operator has smoothing effect to random noise of the image due to introduction of an average factor. The elements of edges in both sides have enhanced because it is he differential of two or more rows and columns. As a result, the edges seem to be thick and bright. Sobel operator is a kind of orthogonal gradient operator. Although the Sobel operator is slower to compute, its larger convolution kernel smoothens the input image to greater extent and makes the operator less sensitive to noise.

iv) Robert's edge detector: - Roberts's edge detector performs a quick to compute, simple edge detection method. It performs a 2D spatial gradient measurement on an image. The kernels are designed to respond maximally to edges running at 45 degree to the pixel grid, one kernel for each of the two perpendicular orientations. The kernels can be applied separately to input images to produce separate measurements of the gradient components in each orientation. This operator can also work under noisy conditions.

v) Log edge detector:- Marr Hildreth uses the Gaussian to improve the response to noise, which is differentiated by the Laplacian of Gaussian is called the log operator [10]. Log edge detector consists of adjustable features. LOG stands for Laplacian of the Gaussian. The Laplacian is a 2D isotropic measure of the second spatial derivative of the image. The Laplacian of an image highlights the region of rapid change. The Laplacian is applied to an image that has been first smoothed with Gaussian smoothing filter in order to reduce its sensitivity to noise.

IV. MASKS USED IN EDGE DETECTION

Mask is a small matrix used for sharpening and edge detection. A mask is black and white image of the same dimensions as the original image. Each of the pixels in masks has value 0 or 1. 0 stands for black and 1 for white. When executing operations on the image, the mask is used to restrict the results to the pixels that are 1in the mask. Thus the operation restricts to some parts of the image.

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Different edge detector operators make use of different types of masks.

IV. i MASKS USED BY CANNY OPERATOR

Canny operator uses mask as shown above. First value is of gradient in x direction G_x and second value is of gradient in y direction G_y. The magnitude of edge is calculated as:

$$|G| = [G_x^2 + G_y^2]^{1/2} \quad \text{Eq.(1)}$$

And orientation as:

$$\phi = \arctan(G_y / G_x) \quad \text{Eq.(2)}$$

$$\begin{pmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{pmatrix}$$

IV. ii. MASKS USED BY PREWITT OPERATOR

$$\begin{pmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ -1 & -1 & -1 \end{pmatrix}$$

IV. iii. MASKS USED BY SOBEL OPERATOR

$$\begin{pmatrix} -1 & 0 & 1 \\ -2 & 0 & 2 \\ -1 & 0 & 1 \end{pmatrix}, \begin{pmatrix} 1 & 2 & 1 \\ 0 & 0 & 0 \\ -1 & -2 & -1 \end{pmatrix}$$

IV. iv. MASKS USED BY ROBERTS OPERATOR

$$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$$

IV. iii. MASKS USED BY LOG OPERATOR

$$\begin{pmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

V. RESULTS

The following figures show the results of edge detection algorithms performed on an image that is first converted into grayscale image.

ORIGINAL IMAGE

Figure 1:- Original Grayscale image

CANNY FILTER

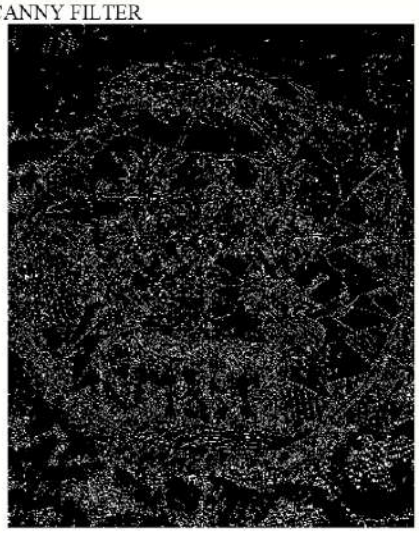

Figure 2:- Canny edge detector image

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PREWITT FILTER

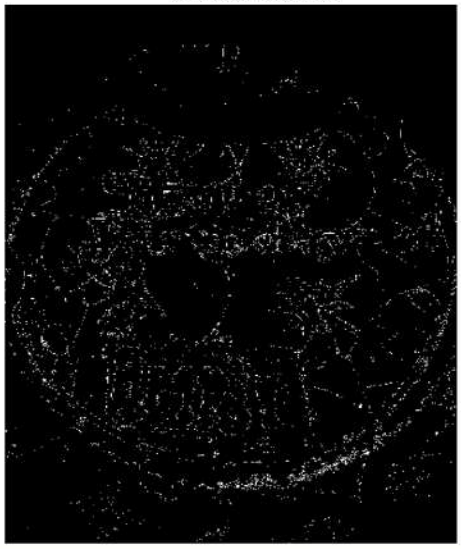

Figure 3:- Prewitt edge detector image

SOBEL FILTER

Figure 4:- Sobel edge detector image

ROBERTS FILTER

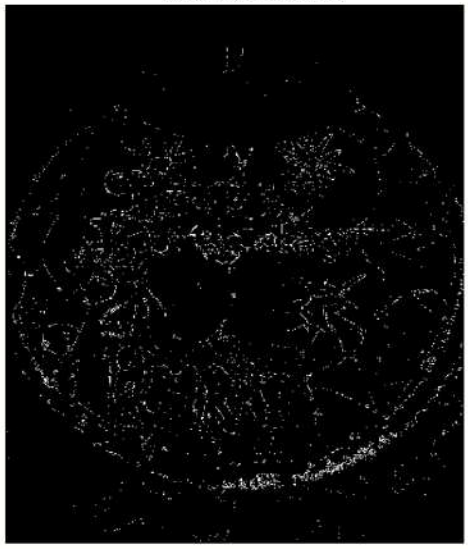

Figure 5:- Robert's edge detector image

LOG FILTER

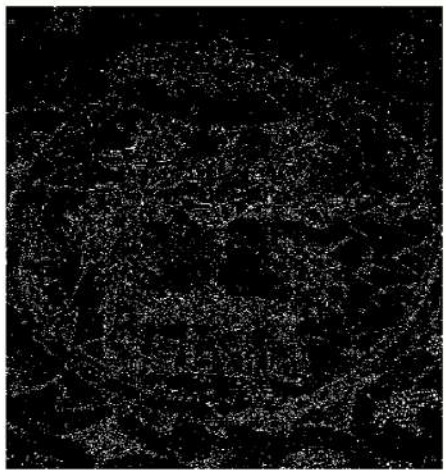

Figure 6:- Log edge detector image

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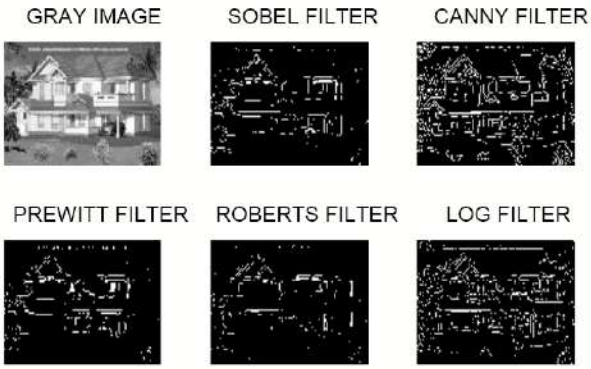

Figure 7:- Different edge detector operators

VI. CONCLUSION

Edge detection is the fundamental step in identifying an image object. It helps in extraction of useful features in images that can be used in pattern recognition. So Edge detection is very important step in computer vision. In this paper, traditional methods of edge detection that are Canny, Sobel, Prewitt, Roberts and Log edge detectors are presented. The major advantages of these traditional methods are their simplicity. Canny edge detection algorithm shows better performance as compared to Sobel, Prewitts and Roberts's algorithms but canny edge detection algorithm is more costly to implement as compares with others. Under noisy conditions Canny, Log, Sobel, Prewitts and Roberts perform well respectively. Prewitt algorithm has major drawback of very sensitive to noise. Canny edge detection algorithm performs better than all others algorithm under all scenarios.

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Future Technology Li-Fi (Light Fidelity) In Optical Wireless Networks

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***Abstract*—Li-Fi, or light fidelity, refers to 5Gvisible light communication systems using light from light-emitting diodes (LEDs) as a medium to deliver networked, mobile, high-speed communication in a similar manner as Wi-Fi and Optical fiber[1]. Li-Fi has the advantage of being able to be used in electromagnetic sensitive areas such as in aircraft cabins, hospitals and nuclear power plants without causing electromagnetic interference[2]. Both Wi-Fi and Li-Fi transmit data over the electromagnetic spectrum, but whereas Wi-Fi utilises radio waves. The term Li-Fi was coined by Prof. Haas when he amazed people by streaming high-definition video from a standard LED lamp, at TED Global in July 2011. Li-Fi is now part of the Visible Light Communications (VLC) PAN IEEE 802.15.7 standard[3]. Present paper reflects the Future of Communication (LI-FI) which may affect all lives. It a technology that may be as fast as 500MBPS (30GBPS per minute) an alternative, cost effective and more robust and useful than Wi-Fi. The Visible light communication which may be the future of Internet. This paper provides an over view of li-fi by presenting Li-Fi working, construction and comparison between Li-Fi and Wi-Fi and also discussion of applications.**

***Keywords*—Wi-Fi, Li- Fi, VLC, Visible light communication, MBPS.**

I. INTRODUCTION

Li-Fi is transmission of data through illumination by taking the fiber out of fiber optics by sending data through a LED light bulb that varies in intensity faster than the human eye can follow. Li-Fi is the term some have used to label the fast and cheap wireless-communication system which is the optical version of Wi-Fi[4]. It is possible to encode data in the light by varying the rate at which the LEDs flicker on and off to give different strings of 1s and 0s.The LED intensity is modulated so rapidly that human eye cannot notice, so the output appears constant. More sophisticated techniques could dramatically increase VLC data rate. The makers of Li-Fi note that this quality might actually be an advantage in some scenarios, making Li-Fi more secure than Wi-Fi with hackers unable to access unsecured internet connections from out of sight of the transmitter. The next generation of wireless internet could use converted LED light bulbs to transmit data faster and more cheaply than traditional Wi-Fi signals. LI-FI is a new class of high intensity light source of solid state design bringing clean lighting solutions to general and specialty lighting. With energy efficiency, long useful lifetime, full spectrum and dimming, LIFI lighting applications work better compared to conventional approaches. This technology brief describes the general construction of LIFI lighting systems and the basic technology building blocks behind their function.

II. LI-FI CONSTRUCTION

The LI-FI product consists of 4 primary sub-assemblies:

- RF power amplifier circuit (PA)
- Bulb
- Printed circuit board (PCB)
- Enclosure

The PCB controls the electrical inputs and outputs of the lamp and houses the microcontroller used to manage different lamp functions. An RF (radio-frequency) signal is generated by the solid-state PA and is guided into an electric field about the bulb. The high concentration of energy in the electric field vaporizes the contents of the bulb to a plasma state at the bulb's center; this controlled plasma generates an intense source of light. All of these subassemblies are contained in an aluminum enclosure[5]. Figure 1 shows li-fi block diagram.

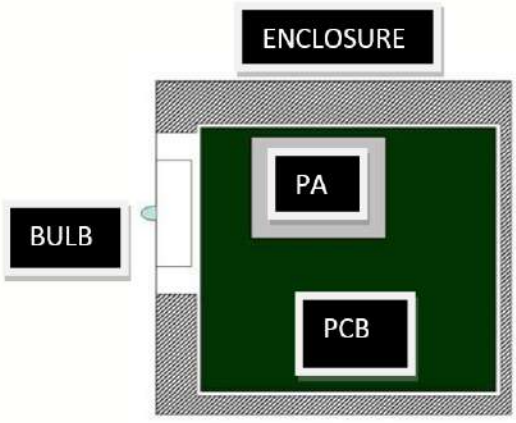

Fig. 1. LIFI Block Diagram [5]

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III. FUNCTION OF THE BULB SUB ASSEMBLY

At the heart of LIFI is the bulb sub-assembly where a sealed bulb is embedded in a dielectric material. This design is more reliable than conventional light sources that insert degradable electrodes into the bulb. The dielectric material serves two purposes; first as a waveguide for the RF energy transmitted by the PA and second as an electric field concentrator that focuses energy in the bulb. The energy from the electric field rapidly heats the material in the bulb to a plasma state that emits light of high intensity and full spectrum[5]. Figure 2 shows li-fi bulb sub-assembly.

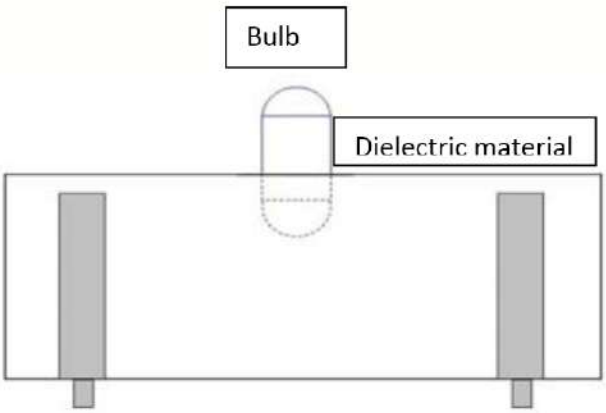

Fig. 2. LIFI Bulb Sub-Assembly [5]

IV. HOW LI-FI WORKS?

This brilliant idea was first showcased by Harald Haas from University of Edinburgh, UK, in his TED Global talk on VLC. He explained," Very simple, if the LED is on, you transmit a digital 1, if it's off you transmit a 0. The LEDs can be switched on and off very quickly, which gives nice opportunities for transmitting data." So what you require at all are some LEDs and a controller that code data into those LEDs. We have to just vary the rate at which the LED's flicker depending upon the data we want to encode. Further enhancements can be made in this method, like using an array of LEDs for parallel data transmission, or using mixtures of red, green and blue LEDs to alter the light's frequency with each frequency encoding a different data channel. Such advancements promise a theoretical speed of 10 Gbps – meaning you can download a full high-definition film in just 30 seconds. Simply awesome! But blazingly fast data rates and depleting bandwidths worldwide are not the only reasons that give this technology an upper hand. Since Li-Fi uses just the light, it can be used safely in aircrafts and hospitals that are prone to interference from radio waves. This can even work underwater where Wi-Fi fails completely, thereby throwing open endless opportunities for military operations[6].Figure 3 shows the data transmission using LED.

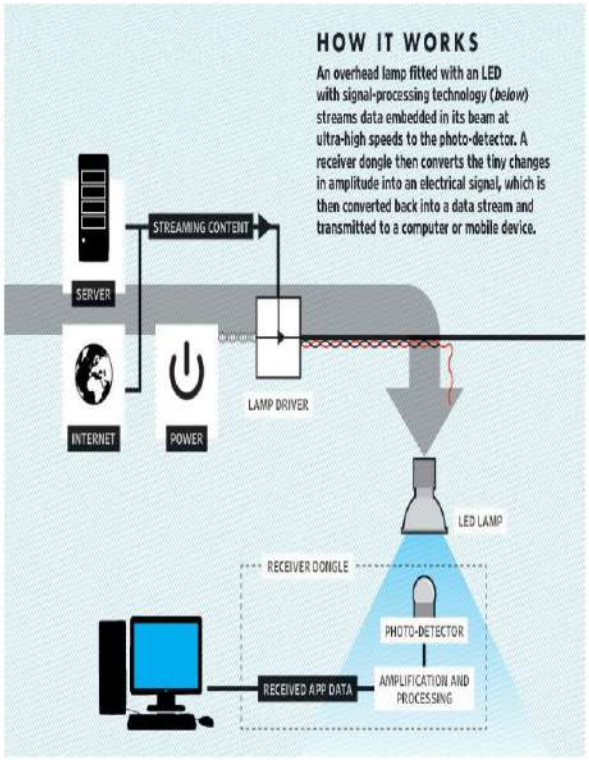

Fig. 3. Data transmission using LED [4]

V. REASONS TO PROMOTE LI-FI TECHNOLOGIES

Although the use of light in order to transmit data can be limited in comparison to radio waves, there is a great amount of possibilities that can be developed due to this technology. In essence, a single pixel of a monitor could transmit a single channel of information to a source. Although this technology is still in its infant stages, the usefulness of this Li-Fi technology has implications for a great amount of good.

- *Distance*: The sheer range of transmitting information could be worth the decrease in data speeds. Ethernet-type link just under a mile. As developments of this aspect continue, the range could be entirely up to the strength of the light which is emitting the information. Although the speeds are less than what they are for gigabit Ethernet, the power of the beam can allow DVD-quality streaming of video to any location connected to the Li-Fi device.
- *Cost*: Instead of running close to a mile worth of cable, the LED-powered Li-Fi connection could be used to beam the information directly to the destination. Using a point-to-point array, office buildings can stay connected to each other without the use of additional cables being laid from one access point to another. The only problem the two buildings would be faced with is obstruction by

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solid objects or dense weather patterns such as heavy fog or snow.

- *Traffic Updates*: There is a kind of system like that already in play for GPS navigational systems, but the traffic lights could be updating drivers using basic information or streaming video directly from news broadcasts.
- *Game Consoles*: An innovative idea would be to put sensors on a television in order to receive information from game consoles. This would allow the unit to be place literally anywhere within the room as long as there is a direct line of sight to the sensor. That will be tackled once wireless energy is perfected for practical home use.
- *Television Interaction*: Instead of using apps or additional installations, you could theoretically hold your phone up as you sit on the couch and have every piece of information regarding the show or movie you are currently watching sent to your display – even recording directly to your mobile device. Even if the technology was merely developed as a small scale indoor application to "beam" information directly to a computer system without the use of Ethernet cable being strewn about the floor, visible-light communications could set the benchmark higher for wireless transmissions.

VI. COMPARISON BETWEEN LI-FI & WI-FI

LI-FI is a term, one used to describe visible light communication technology applied to high speed wireless communication. It acquired this name due to the similarity to WI-FI, only using light instead of radio. WI-FI is great for general wireless coverage within buildings and li-fi is ideal for high density wireless data coverage in confined area and for relieving radio interference issues, so the two technologies can be considered complimentary.

Technology	**Speed**	**Data density**
Wireless(current)		
Wi- Fi – IEEE 802.11n	150 Mbps	*
Bluetooth	3Mbps	*
IrDA	4Mbps	***
Wireless(future)		
Wi-Gig	2Gbps	**
Giga-IR	1Gbps	***
Li-fi	>1Gbps	****

TABLE 1: COMPARISON BETWEEN CURRENT AND FUTURE WIRELESS TECHNOLOGY [3]

VII. LI-FI ADVANTAGES OVER WI-FI

- High speed, as high as 500mbps or 30GB per minute.
- VLC could be used safely in aircraft.
- Security is another benefit, he points out, since light does not penetrate through walls.
- It can be underwater where radio waves cannot.
- In streets for traffic control. Cars have LED based headlights, LED based backlights, and Car can communicate each other and prevent accidents in the way that they exchange Information. Traffic light can communicate to the car and so on.
- By implementing the Technology worldwide every street lamp would be a free access point.
- Li-Fi may solve issues such as the shortage of radio frequency bandwidth[7].

VIII. LIMITATIONS OF LI-FI

- There should be line of sight between sender and receiver.
- Visible light cannot penetrate through solid objects.
- Light cannot approach the range and penetration of radio waves.
- High installation cost of the VLC systems.
- A major challenge facing LI-FI is how the receiving device will transmit back to transmitter.
- Interference with other electromagnetic waves makes the transmitting data to distort.
- Interferences from external light sources like sun light, normal bulbs and opaque materials in the path of transmission will cause interruption in the communication.

IX. REPLACEMENT FOR OTHERS TECHNOLOGIES

This technology doesn't deal with radio waves, so it can easily be used in the places where Bluetooth, infrared, WIFI and Internet are banned. In this way, it will be most helpful transferring medium for us. It includes other benefits like:

- A very wide spectrum over visible wave length range.
- Extremely high colour fidelity.
- Instant start time.
- Easy terminal Management.
- Dynamic dark i.e. brightness Modulation of lamp output to enhance video contrast.
- Trouble-free integration into existing light engine platform[12].

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Li-Fi is the upcoming and on growing technology acting as competent for various other developing and already invented technologies. Since light is d major source for transmission in this technology it is very advantageous and implementable in various fields that can't be done with the Wi-Fi and other technologies. Hence the future applications of the Li-Fi can be predicted and extended to different platforms like education fields, medical field, industrial areas and many other fields[12].

X. APPLICATIONS OF LI-FI

LI-FI can be used in the places where it is difficult to lay the optical fiber like hospitals. In operation theatre LiFi can be used for modern medical instruments. In traffic signals LiFi can be used which will communicate with the LED lights of the cars and accident numbers can be decreased. Thousand and millions of street lamps can be transferred to LiFi lamps to transfer data. In aircraft LiFi can be used for data transmission. It can be used in petroleum or chemical plants where other transmission or frequencies could be hazardous[4].

XI. CONCLUSION

As a growing number of people and their many devices access wireless internet, on one way, it can transmit the data at higher rate and on the other it is very cheap as compared with WI-FI. This may solve issues such as the shortage of radio-frequency bandwidth and also allow internet where traditional radio based wireless isn't allowed such as aircraft or hospitals[8]. The design and construction of the LIFI light source enable efficiency, long stable life, full spectrum intensity that is digitally controlled and easy to use[5]. Based on past experience that the number of wireless applications increases by the square of the number of available physical connections, Li-Fi could be at the heart of an entire new industry for the next wave of wireless communications.

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Fuzzy Logic Based Decision Making For Investment in Real Estate Market

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Abstract - **In this paper a real estate property refers to a single-family residence designed for intended occupancy. The main objective of this paper is to evaluate the parameters which are considered while making decision regarding investment in real estate property. Real properties possess value which is dependent on factors which are Financial Conditions, Locality, Eco-Friendly, Connectivity, Security, Parking Facility, Supply of Water and Resale Market value. Considering the amount of money involved in real estate, there is need of accurate prediction of returns and associated risks. In this research work, a Fuzzy Logic based system has been designed to make decision for investment in Real Estate market based on above mentioned parameters[1] [3].**

***Keywords*: Real Estate, Fuzzy Logic.**

I. INTRODUCTION

Housing is one of the basic needs of a human being [2]. Property prices have been major criteria for buyers in purchase decision since it is a one-time investment. For an average person a home is one of the largest investments. The most common type is income-producing real estate. Owning real estate for its income-generating potential has been profitable. Fuzzy sets can be combined to produce meaningful conclusions, and inferences can be made by giving specified fuzzy input function. The article demonstrates the application of fuzzy logic to a decision making for investment in Real Estate Market. There are many qualitative and quantitative methods used for evaluating the complex risk in Real Estate investment. These methods are assessed using labels low, medium or high. The intelligent methods are an appropriate tool for real estate investment and these are as follows-

1) Financial Condition- It is the first and foremost parameter. A person should consider his/her Financial Condition while investing in a Real Estate Property. If the Financial Condition of a person is 'Low' then there is lesser probability of investing in real estate. If the Financial Condition is medium then he/she must consider some of the following factors and if the financial condition of the person is high then he /she should consider all the following parameters.
2) Locality- A person considers the locality very keenly while investing in a Real Estate. He/she should see whether the residents of the locality are more of urban lifestyle, modern lifestyle or of rural lifestyle.
3) Eco-Friendly- A person would like to invest in an area which is far away from factories and industries. The area with green cover and lesser amount of pollution is preferred.
4) Connectivity- Now a days it is very important for a person to reside at a place which is connected to well-maintained roads, hospitals, markets etc. This is also considered as one of the main factors while investing in a real estate.
5) Security-Security of the colony is always considered to be one of important factors. With the increase in the rate of crime, every person wants Video cameras and security guards in their colonies.
6) Parking Facility-While investing in a real estate most of the people find this factor to be quite important. Thus a person wants a good parking place or a garage to park his/her vehicle.
7) Supply of Water, Electricity-As our life is dependent on electronic gadgets like LED's, microwave, washing machines etc. A 24*7 supply of electricity is a necessity.
8) Resale Market Value- This parameter is given highest priority before buying real estate property. Person always considers that the resale market value of that property should be high in future.

II. FUZZY INFERENCE SYSTEM

A Fuzzy Inference System (FIS) is a way of mapping an input space to an output space using fuzzy logic FIS uses a collection of fuzzy membership functions and rules, instead of Boolean logic, to reason about data. The rules in FIS are sometimes may be called as fuzzy expert system.

The functional operations in fuzzy expert system proceed in the following steps.

- Fuzzification
- Inference
- Defuzzification

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A. Structure of a Fuzzy Expert System

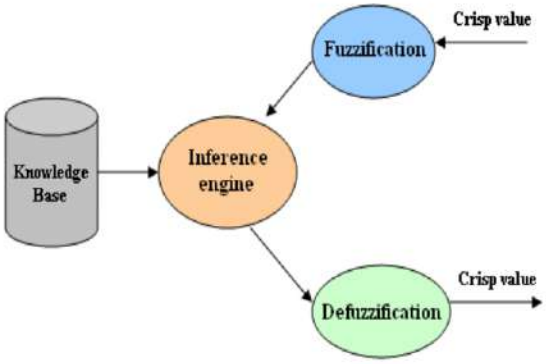

Fig. 1

Fuzzification

In the process of fuzzification, membership functions defined on input variables are applied to their actual values so that the degree of truth for each rule premise can be determined. Fuzzy statements in the antecedent are resolved to a degree of membership between 0 and 1. If there is only one part to the antecedent, then this is the degree of support for the rule and if there are multiple parts to the antecedent, apply fuzzy logic operators and resolve the antecedent to a single number between 0 and 1. There are different shapes of membership function triangular, trapezoidal, Gaussian bell-shaped, etc.

Inference

In the process of inference truth value for the premise of each rule is computed and applied to the conclusion part of each rule. This results in one fuzzy set to be assigned to each output variable for each rule. The use of degree of support for the entire rule is to shape the output fuzzy set. The consequent of a fuzzy rule assigns an entire fuzzy set to the output. If the antecedent is only partially true, (i.e., is assigned a value less than 1), then the output fuzzy set is truncated according to the implication method but if the consequent of a rule has multiple parts, then all consequents are affected equally by the result of the antecedent. The consequent specifies a fuzzy set to be assigned to the output. The implication function then modifies that fuzzy set to the degree specified by the antecedent. Aggregation of all outputs is the process where the outputs of each rule are combined into a single fuzzy set. The input of the aggregation process is the list of truncated output functions returned by the implication process for each rule. The output of the aggregation process is one fuzzy set for each output variable, all fuzzy sets assigned to each output variable are combined together to form a single fuzzy set for each output variable using a fuzzy aggregation operator[4] .

Defuzzification

In Defuzzification, the fuzzy output set is converted to a crisp number that can actually be used. It is done after evaluation of inputs and applies them to the rule base. Some commonly used techniques are the *centroid* and *maximum* methods. In the *centroid method*, the crisp value of the output variable is computed by finding the variable value of the centre of gravity of the membership function for the fuzzy value. In the *maximum method*, one of the variable values at which the fuzzy set has its maximum truth value is chosen as the crisp value for the output variable.

B. The GUI Tools

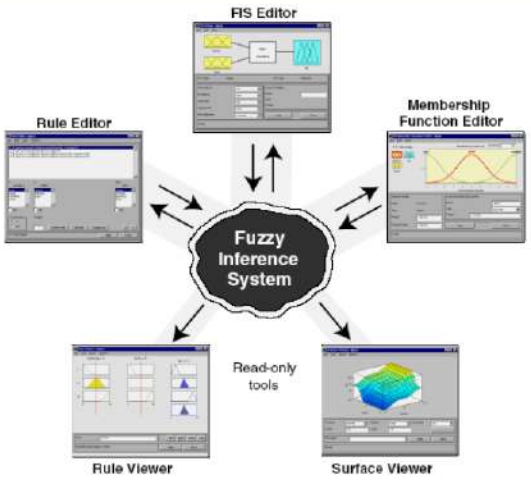

Fig. 2

These GUIs are dynamically linked, in that changes you make to the FIS using one of them, affect what you see on any of the other open GUIs. For example, if you change the names of the membership functions in the Membership Function Editor, the changes are reflected in the rules shown in the Rule Editor. You can use the GUIs to read and write variables both to the MATLAB workspace and to a file (the read-only viewers can still exchange plots with the workspace and save them to a file). You can have any or all of them open for any given system or have multiple editors open for any number of FIS systems.

III. STRUCTURAL DESIGN OF PROPOSED SYSTEM

For the analysis of real estate property the parameters are tabulated below. Each parameter is accessed whether it is low, medium or high and at the output result is generated taking into consideration the importance of each parameter.

Input Name	Linguistic
Financial Condition	Low
	Medium
	High
Locality	Low
	Medium
	High
Eco Friendly	Low
	Medium
	High
Connectivity	Low
	Medium

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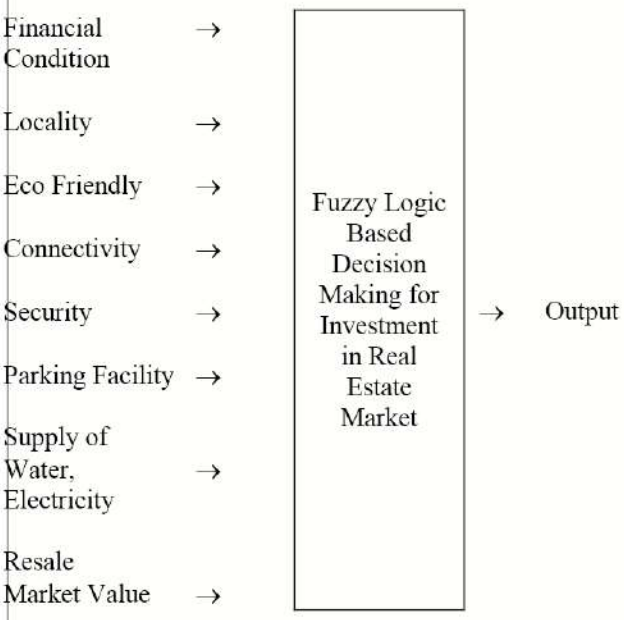
	High
Security	Low
	Medium
	High
Parking Facility	Low
	Medium
	High
Supply of Water, Electricity	Low
	Medium
	High
Resale Market Value	Low
	Medium
	High

Table 1: Rating scales of input parameters.



Architecture of Proposed FIS

IV. IMPLEMENTATION IN MATLAB

There are five primary GUI tools

- Fuzzy Inference System (FIS) Editor
- Membership Function Editor
- Rule Editor
- Rule Viewer
- Surface Viewer

Fuzzy Inference System Editor

The FIS Editor GUI tool allows you to edit the highest level features of the fuzzy inference system, such as the number of input and output variables. In this we have considered eight input parameters and one output parameter as shown in fig. 3 .We have assigned labels low, medium, high to the input parameters and at the output yes or no are obtained as shown in. You should see the box highlighted in red. Double-click one of the variables to bring up the Membership Function Editor. Double-click the fuzzy rule processor to bring up the Rule Editor [5].

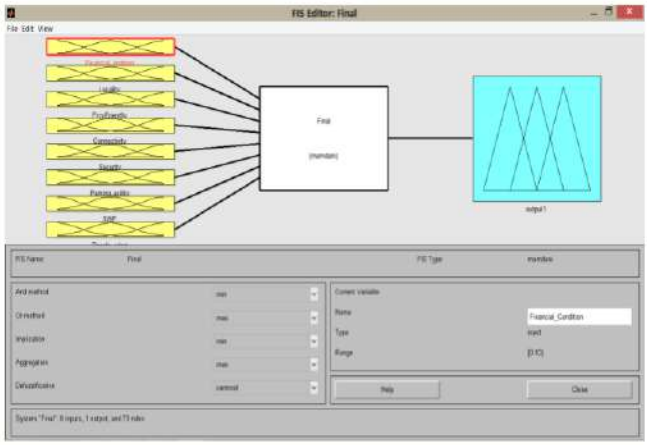


Fig.3- Input and output parameters

C. Membership Function Editor

For each membership function you can change the name, the type, and the parameters. Eleven built-in membership functions are provided to choose from, although of course one can always create an own specialized versions. Select the icon for the variable on the upper left side of the diagram (under **FIS Variables**) to display its associated membership functions in the plot region. The membership function editor is used to define the properties of membership function for the system variables. The membership functions are overlapping with each other for achieving better results. Select membership functions by clicking once on them or their labels. Here in fig 4 for each input there are three membership functions low, medium and high. Each label represents specific range of values between 0-10.

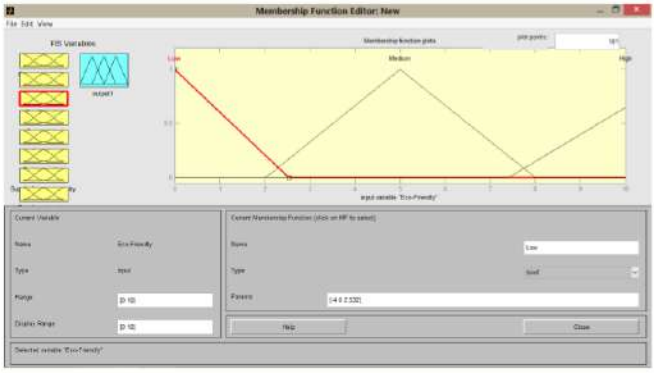


Fig. 4 Membership Function for input "Financial condition"

Simulation and Results

The proposed method is applied for evaluation of real estate property. Randomly selected data is examined.The figure- 5 is snapshot of if –then rules made in matlab.Fig 6

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and 7 shows the rule viewer and surface viewer of the results of work done in matlab.

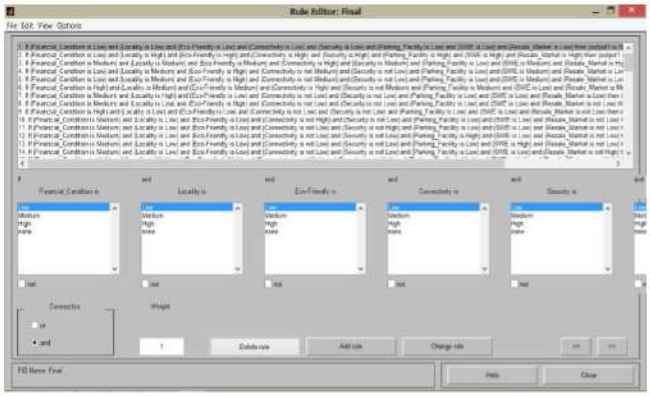

Fig.5- If-then rules

Fig. 6 Rule viewer view of input, output parameters

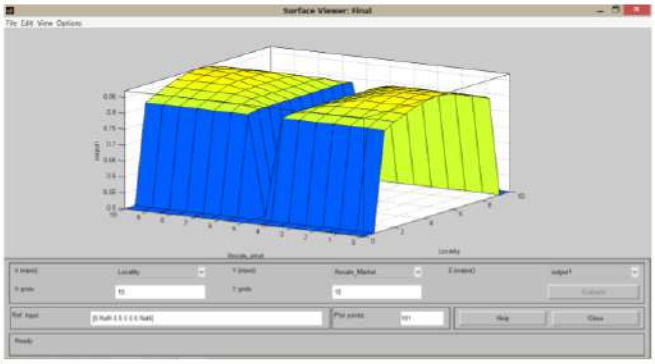

Fig. 7 Surface view of input, output parameters

Real Estate	Input Variable								Outputs
Sr. No.	Financial Condition (0-7)	Locality (0-7)	Eco Friendly (0-10)	Connectivity (0-10)	Security (0-10)	Parking Facility (0-10)	Supply of Water, Electricity (0-10)	Resale Market Value (0-10)	Fuzzy Logic Based Decision Making for Investment in Real Estate Market
1	2	2	3	4	3	1	4	3	0.1230
2	3	2	5	6	7	2	4	8	0.3251
3	5	4	7	3	2	1	6	7	0.4322
4	7	9	5	3	5	6	7	9	0.5677
5	9	9	8	8	9	8	8	8	0.7628
6	10	10	7	8	9	5	7	8	0.8652

Table 2-Inputs and outputs for selected cases

V. CONCLUSION

The system was developed to help the buyers/investors to give them the idea about investing in a real estate. The nature and workings of the direct real estate investment market differ from those of the other main asset classes. The main objective of this paper is to evaluate the parameters for investing in real estate property. No two properties are the same, whether in terms of physical size, accommodation, structure, condition, differences in tenure or simply location. There is a paucity of information within the direct real estate market, exacerbated by there being no central market place for its transactions. Even where prices are published e.g. auction results; the full details of a deal are rarely made known. Using this method we can focus on the selection of the best suited real property according to our financial status which is the most important parameter of investment.

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Image Denoising Filters for Salt & Pepper noise
(A Review Paper)

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***Abstract*— In this paper, various well-known image denoising techniques like Median, Double Bilateral and Trilateral, available in literature to remove the salt & pepper noise, are studied and their performance is analyzed in objective as well as in subjective domain. For objective domain, three performance measures i.e. PSNR, MAE and IEF are evaluated and a comparison is made to judge the filtering performance of existing filters under various noise densities of Salt & Pepper noise. At the end of this paper, subjective analysis is done in terms of Visual Comparison of output images.**

***Index Terms*— Double Bilateral, Gaussian noise, IEF, MAE, Median, PSNR, Salt & Pepper noise, Trilateral.**

I. INTRODUCTION

Digital images get contaminated by impulse noise during image acquisition/transmission. The intensity of impulse noise has the tendency of being either relatively high or relatively low. Thus, it could severely degrade the image quality and cause great loss of information details. So it becomes important to suppress this noise in the images before some subsequent processing, such as edge detection/extraction, image segmentation and object recognition. In the literature, various filtering techniques have been proposed for removing impulse noise and it is well-known that linear filters could produce serious image blurring. As a result, nonlinear filters have been widely exploited due to their much improved filtering performance, in terms of impulse noise attenuation and edge/details preservation. One of the most popular nonlinear filters is the standard median (SM) filter [1], which exploits the rank-order information of pixel intensities within a filtering window and replaces the center pixel with the median value. Due to its effectiveness in noise suppression and simplicity in implementation, various modifications of the SM filter have been introduced, such as the weighted median (WM) [2] filter and the center weighted median (CWM) [3] filter. Conventional median filtering approaches apply the median operation to each pixel unconditionally i.e. without considering whether it is uncorrupted or corrupted. As a result, even uncorrupted pixels are filtered, and this causes image quality degradation. A better solution to overcome this problem is to implement an impulse-noise detection mechanism prior to filtering; hence, only those pixels identified as "corrupted" would undergo the filtering process, while those identified as "uncorrupted" would remain intact. In this paper, an adaptive window based salt & pepper noise removal filter is proposed. In this filter, ROAD statistics is introduced to quickly identify the noisy pixels.

II. MODEL OF IMPULSE NOISE

Consider an image I and an observation image X of same size

$$X_{i,j} = N_{i,j} \text{ with probabilty p}$$
$$Xi,j = I_{i,j} \text{ with probability 1- p}$$

Where $i=1,2,.....s1$ and $i=1,2,.....s2$ and $0<p<1$.
I_{ij} and N_{ij} denotes the pixel values at location (i,j) of the original image and the noisy image, respectively and N_{ij} a noise value independent from I_{ij}. For gray level images with 8 bits per pixel, when the images are contaminated by fixed value impulse noise, N_{ij} the corrupted pixel is equal to 0 or 255 each with equal probability (p/2).

III. MEDIAN FILTER

The best known order statistic filter is the median filter which replaces the value of the pixel by the median of the gray levels in the neighbourhood of that pixel [1] i.e.

$$Z_{(x,y)} = \text{median}_{(s,t)\in S_{xy}}\{g(x,y)\} \quad (1)$$

The value of the pixel at (x,y) is included in the computation of the median. Since the median value must actually be the value of one of the pixels in the neighbourhood, the median filter does not create new unrealistic pixel values when the filter straddles an edge. For this reason, the median filter is much better in preserving sharp edges than the mean filter. These advantages aid median filters in suppressing the uniform noise as well as other noises.

IV. DOUBLE BILATERAL FILTERING

In this filter, a median metric weighting function is included to the bilateral filter which is combined with original bilateral filter to form a double bilateral filter [18]. It is used for removal of Gaussian, impulse and mixed noise.
Weighting function is given by

$$W^{M}_{\theta_x,\theta_y}(\mu_x, \mu_y) = \exp\left[\frac{-\left|I^{M}(\mu_x,\mu_y) - I^{M}(\theta_x,\theta_y)\right|^2}{2\sigma_M^2}\right] \quad (2)$$

Where $W^{M}_{\theta_x,\theta_y}$ represents the median-metric component and $I^{M}(\cdot,\cdot)$ represents median intensity in (2D+1)×(2D+1)

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neighbourhood of corresponding position (',').Accordingly, the ensemble weight of the second bilateral filter is defined as

$$W'_{\theta_x,\theta_y}(\mu_x, \mu_y) = W^S_{\theta_x,\theta_y}(\mu_x, \mu_y)\, W^M_{\theta_x,\theta_y}(\mu_x, \mu_y) \quad (3)$$

The new bilateral weighting function is used to filter the median intensity of each pixel through normalization as

$$\tilde{I}^M(\theta_x, \theta_y) = \frac{\sum_{(\mu_x,\mu_y)\in\Psi} W'_{\theta_x,\theta_y}(\mu_x,\mu_y) I^M(\mu_x,\mu_y)}{\sum_{(\mu_x,\mu_y)\in\Psi} W'_{\theta_x,\theta_y}(\mu_x,\mu_y)} \quad (4)$$

By combining the bilateral filter in eqn.(3.11) and eqn.(3.18), we obtain the double bilateral filtering:

$$I'(\theta_x, \theta_y) = (1-\beta)\tilde{I}(\theta_x, \theta_y) + \beta\tilde{I}^M(\theta_x, \theta_y) \quad (5)$$

where β, $0 \le \beta \le 1$, is a weight for balancing these two bilateral filters.This filter gives high PSNR values than bilateral filter and works equally well for Gaussian, impulse as well as for mixed noise.

V. TRILATERAL FILTER

Trilateral filter [17] is proposed in literature to remove the Gaussian as well as impulse noise. This filter works as either bilateral filter or impulse detector. It uses Rank Ordered Absolute Differences (ROAD) function and based on the value of ROAD function, J(x,y) function is defined. If ROAD function is higher than a particular threshold defined for an image then J(x,y)=1; otherwise zero. Trilateral filtering is defined as

$$(x, y) = W_s(x,y)\, W_R(x, y)^{1-J(x,y)}\, W_I(y)^{J(x,y)} \quad (6)$$

Referring to the Gaussian forms of W_S and W_R, It is seen that raising these functions to the specified exponents has the effect of modifying their effective standard deviations or 'thresholds'. When $J(x,y) \approx 1$ so that $1-J(x,y) \approx 0$, the radiometric threshold becomes very large so that radiometric differences become irrelevant, while the impulsive weight is unaffected. When $J(x,y) \approx 0$, the opposite happens and only the radiometric weight is used to distinguish between pixels because the effective impulsive threshold is so high. In this way, the appropriate weighting function is applied on a pixel-by-pixel basis. In other words, If J(x,y)≈1 that is ROAD function is high which shows higher difference between the central pixel and its neighbours thus it is corrupted by impulse noise hence $W_r(x,y)$ will be ignored and the filter will work as an impulse detector. Similarly with J(x,y)≈0 the filter will work as bilateral filter.

VI. EXPERIMENTAL RESULTS

We have extensively tested the performance of our algorithm and compared the results with some existing methods. Evaluation Parameters PSNR (dB),MAE and IEF are presented in this paper to validate the filtering performance of PF.

Calculation of PSNR (dB),MAE and IEF:

To calculate the PSNR,MAE and IEF, Let the original noise-free image, noisy image and the filtered image be represented by f (x, y), g(x, y) and $\tilde{f}$(x, y), respectively. Here, x and y represent the discrete spatial coordinates of the digital images. Let the image be of size M×N pixels, i.e. X=1,2,3,…,M, and Y=1,2,3,…,N.

Peak Signal to Noise Ratio (PSNR)

PSNR for grey scale images is defined in dB as:

$$PSNR(dB) = 20\log_{10}\left(\frac{255^2}{MSE}\right) \quad (7)$$

$$MSE = \frac{\sum_{x=1}^{M}\sum_{y=1}^{N}(\tilde{f}(x,y), -f(x,y))^2}{MN} \quad (8)$$

Mean Absolute Error (MAE)

Mean Absolute Error (MAE) gives measure of image dissimilarities between original image and restored image respectively.

$$MAE = \frac{1}{M\times N}\sum_{i=1}^{m}\sum_{j=1}^{n} abs(f(x, y - \tilde{f}(x, y)) \quad (9)$$

Image Enhancement Factor (IEF)

Image Enhancement Factor (IEF) gives a measure of image quality restored.

$$IEF = \frac{\sum_{i,j}(g(x,y)-f(x,y))^2}{\sum_{i,j}(\tilde{f}(x,y)-f(x,y))^2} \quad (10)$$

To evaluate the results of different approaches and to compare the quality of filtered images; various tests were conducted with these filters. In all these tests, salt & pepper noise with variance values ranging from 0.1 to 0.5 was added in the Lena image to get the test image. This test image was used for simulation purpose to obtain a thorough evaluation of the proposed algorithm and standard filters. A comparison has been made amongst Median filter, Double Bilateral filter and Trilateral filter. To demonstrate the filtering performance of all filters; results of various tests in terms of PSNR,MAE and IEF are given in table-1,2, and 3.

TABLE I. FILTERING PERFORMANCE, IN TERMS OF PSNR (DB), OPERATED ON 'LENA IMAGE' UNDER VARIOUS NOISE CONDITIONS OF SALT & PEPPER NOISE (Σ_i VARIES FROM 10% TO 50%).

Peak -Signal to Noise Ratio, PSNR(dB)						
		DENSITY OF SALT & PEPPER NOISE				
S.NO.	DENOISING FILTER	10%	20%	30%	40%	50%
1	MEDIAN	**59.1036**	**52.8188**	**44.9284**	**35.9464**	29.8304
2	TRILATERAL	39.4028	33.4504	29.8926	27.6568	25.8326
3	DOUBLE BILATERAL	47.989	42.9642	39.1892	35.794	33.1824

It is observed from table-I, that Median filter has higher PSNR values at all noise densities of salt & pepper noise, Double-bilateral filter is 2nd in this category.

From table-II., it is observed that MAE of median filter is least as compared to other filters. It shows that restoration ability of median filter is better than other filters.

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Table ii. Filtering performance, in terms of mae, operated on 'lena image' under various noise conditions of salt & pepper noise (σ_i varies from 10% to 50%).

S.No.	IMAGE DENOISING FILTERS	DENSITY OF SALT & PEPPER NOISE				
		10%	20%	30%	40%	50%
		Mean-Absolute-Error(MAE)				
1	MEDIAN	**3.9229**	**5.0723**	**7.103**	10.9557	18.9875
2	TRILATERAL	15.3287	24.1925	32.8634	39.3507	45.2931
3	DOUBLE BILATERAL	11.3161	16.2041	20.8027	25.2631	30.1066

From table-III, it is observed that IEF of Median is much higher than IEF of other filters, this shows that quality of filtered image of Median filter is better than other filters. Visual results shown in fig.1 and fig.2 confirmed the quantitative results and proved the outperformance of median filter.

Table iii. Filtering performance, in terms of ief, operated on 'lena image' under various noise conditions of salt & pepper noise (σ_i varies from 10% to 50%).

S.No.	IMAGE DENOISING FILTERS	DENSITY OF SALT & PEPPER NOISE				
		10%	20%	30%	40%	50%
		Image-Enhancement-Factor(IEF)				
1	MEDIAN	**25.4113**	**26.4086**	**16.3454**	8.2263	4.9418
2	TRILATERAL	2.8168	2.8832	2.9109	2.9388	2.9408
3	DOUBLE BILATERAL	7.6418	8.6087	8.4251	7.7378	6.8695

VII. Conclusion

In this paper, a detailed study of well-known image denoising filters i.e. Median, Double-Bilateral and Trilateral filter is presented. To evaluate the performance of these filters in terms of PSNR, MAE and IEF, various tests were conducted by taking Lena image corrupted by various densities of salt & pepper noise as a test images. It is observed from quantitative and visual results that Median filter outperforms than other filters. It is also observed that filtered images of median filters are more similar to original images with little distortion as compared to output images of Double-Bilateral filter and trilateral filters.

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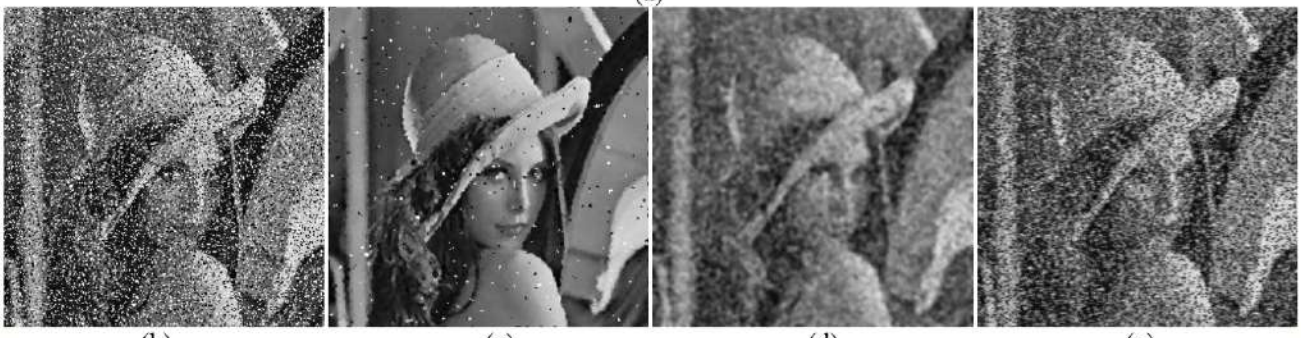
(a)

(b) (c) (d) (e)

Fig.1: Performance of Various Filters for Lena Image corrupted with salt & pepper noise (σ_1(standard Deviation) = 10%) (a) Original image (b) Noisy image (c) Output of Median Filter (d) Output of Double Bilateral Filter (e) Output of Trilateral Filter.

(a)



(b) (c) (d) (e)

Fig.2: Performance of Various Filters for Lena Image corrupted with salt & pepper noise (σ_1(standard Deviation) = 10%) (a) Original image (b) Noisy image (c) Output of Median Filter (d) Output of Double Bilateral Filter (e) Output of Trilateral Filter.

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Image Enhancement Techniques: A Selected Review

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***Abstract:** In Medical ultrasonography the image quality varies greatly between patients and organs. Improved image quality enhances the diagnosis accuracy and has the potential to open up for increased use of ultrasound imaging e.g. in breast and prostate cancer diagnosis and screening. This is main reason that image enhancing is used in huge number of applications. In this paper a number of image enhancing techniques have been defined from which researcher can get an idea.*

INTRODUCTION

Medical ultrasonography is used in a wide range of areas of patient diagnosis, where maybe obstetrics (woman and unborn child during pregnancy) and cardiology (heart and blood vessels) are the most well known to the general public. The image quality varies greatly between patients and organs. Improved image quality enhances the diagnosis accuracy and has the potential to open up for increased use of ultrasound imaging e.g. in breast and prostate cancer diagnosis and screening.

The medical ultrasound imaging modality suits especially well for imaging of soft tissue and muscles. It owes its popularity amongst others to its non-invasive nature, and that the equipment is inexpensive and portable compared to e.g. nuclear magnetic resonance (NMR) and X-ray computed tomography (CT). Furthermore, it has no known medical side effects, and the images are produced in real-time, therefore shortening the delay between patient examination and diagnosis. Ultrasound waves propagating in human tissue are longitudinal compression waves traveling at about 1540m/s. The temporal wave frequency utilized for most medical imaging is within the approximate interval from 1 to 15MHz, corresponding to wavelengths between 1.5 and 0.1mm.

Conventional ultrasound imaging is based on the pulse-echo technique, which essentially relies on transmission of a pulse, receiving echoes and interpreting them to form an image. The image reconstruction is done assuming the speed of sound to be constant within the object. Measurement of the amplitude of the received echoes, while relating to their respective time-of- flight, makes it possible to map the position of back-scattering targets along the direction of the ultrasound beam. By scanning the ultrasound beam in a plane or a volume, a two-dimensional (2D) or three dimensional (3D) image is constructed. The ultrasound pulse is generated by a piezo-electric transducer which converts an applied voltage pulse into the ultrasonic vibration which is transmitted into the body. The back-scattered vibrations are received by the transducer, which converts them into electric signals that are interpreted by the ultrasound scanner to generate the image. The transducer is often divided into an array of individual elements.

The principal objective of image enhancement is to process a given image so that the result is more suitable than the original image for a specific application. It accentuates or sharpens image features such as edges, boundaries, or contrast to make a graphic display more helpful for display and analysis. The enhancement doesn't increase the inherent information content of the data, but it increases the dynamic range of the chosen features so that they can be detected easily.

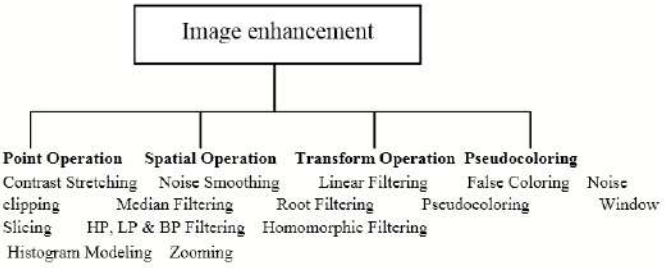

Figure 1: Image Enhancement

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LITERATURE REVIEW

In this section we are presenting the research work of some prominent authors in the same field and explaining a short description of various techniques for image enhancing.

A. Rivera et al. (2012), "Content-Aware Dark Image Enhancement through Channel Division"

This paper, propose a content-aware algorithm that enhances dark images, sharpens edges, reveals details in textured regions, and preserves the smoothness of flat regions. The algorithm produces an ad hoc transformation for each image, adapting the mapping functions to each image's characteristics to produce the maximum enhancement. Author analyze the contrast of the image in the boundary and textured regions, and group the information with common characteristics. The results are then adaptively mixed, by considering the human vision system characteristics, to boost the details in the image.

B. Zhengetal.(2001), "GeneticImage enhancement Basedon Saturation Feedback"

In this paper an adaptive approach for color image enhancement is proposed. In this approach, the saturation feedback technique is used as a means of supplementing color image sharpness and contrast. This technique of the saturation feedback can serve to bring out image details that have low luminance contrast. In the technique, the feedback parameters are the key component and are usually determined manually. In order to realize the adaptive color image enhancement, the genetic algorithm is employed to search global optimal parameters for saturation feedback automatically.

C. Verma et al. (2012), "High dynamic range optimal fuzzy color image enhancement using Artificial Ant Colony System"

This paper presents a novel approach for the enhancement of high dynamic range color images using fuzzy logic and modified Artificial Ant Colony System techniques. Two thresholds, the lower and the upper are defined to provide an estimate of the underexposed, mixed-exposed and overexposed regions in the image. The red, green and blue (RGB) color space is converted into Hue Saturation and Value (HSV) color space so as to preserve the chromatic information. Gaussian MFs suitable for the underexposed and overexposed regions of the image are used for the fuzzification. Parametric sigmoid functions are used for enhancing the luminance components of under and over-exposed regions. Mixed- exposed regions are left untouched throughout the process. An objective function comprising of Shannon entropy function as the information factor and visual appeal indicator is optimized using Artificial Ant Colony System to ascertain the parameters needed for the enhancement of a particular image. Visual appeal is preferred over the consideration of entropy so as to make the image human-eye-friendly. Separate power law operators are used for the saturation adjustment so as to restore the lost information. On comparison, this approach is found to be better than the bacterial foraging (BF)-based approach.

D. Kaur et al. (2013), "Image Enhancement Using Particle Swarm Optimization and Honey Bee"

In this paper, a new approach to automatic image enhancement using HB is implemented by specifying intensity of the edges pixels and also earlier reported PSO results were used. Further comparatively analysis is performed between HB and PSO results. The obtained results indicate that the proposed HB yields better results in the terms of both the maximization of number of the pixels in the edges and pick signal to noise ratio (PSNR). Computational time is also relatively small in the HB as compared to the PSO case which is earlier reported.

E. Anand et al. (2013) in the paper, "Sharpening enhancement of ultrasound images using contourlet transform"

The furry regions of ultrasound images are to be enhanced for good quality visual perception. This paper

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proposes a contourlet transform (CT) based sharpening technique (ST) for contrast enhancement in ultra-sound (US) images. While sharpening, noise emphasize is the drawback of the classical ST methods. The proposed ST is operated on the multiscale, multidirectional CT decomposition of the underlying US image. The new ST not only sharpens the US image but also control the noise effect with tunable parameters. The results are compared with common un sharp masking and recently proposed nonlinear un sharp masking. The parameters like enhancement measure, structural similarity, and blind image quality measure evaluate the improved performances of the proposed technique.

Table 1. Comparative Analysis of Various Techniques

S.No	Paper Name	Author Name	Technique Used	Application Area
1	**Content-Aware Dark Image Enhancement through Channel Division**	Ramirez Rivera, A.Byungyong Ryu ;Oksam Chae;	Content-aware algorithm	Human Visual system,In medical
2	**Genetic Image Enhancement Basedon Saturation Feedback**	Zheng, H., Pan, L., Xiang,Yong, Wong, A. and Nahavandi, Saeid	Saturation feedback technique	Human visual system
3	**High dynamic range optimal fuzzy color image enhancement using Artificial Ant Colony System**	Om Prakash Verma, Puneet Kumar, Madasu Hanmandlu, Sidharth Chhabra,	Fuzzy logic and modified Artificial Ant Colony System techniques	In Medical ForHuman eye
4	**Image Enhancement Using Particle Swarm Optimization and Honey Bee**	Jaspreet Kaur, Sukwinder Kaur and Maninder Kaur	Particle Swarm Optimization and Honey Bee"	In testing of Medical images for tumour detection.
5	**Sharpening enhancement of ultrasound images using contourlet transform**	S.Anand, R.Shantha Selva Kumari, T.Thivya, S.Jeeva	Contourlet transform	For image enhancement of ultrasound Images

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CONCLUSION

This paper presents a short description of various image enhancement techniques to make familiar with different ways to improved image quality which enhances the diagnosis accuracy and has the potential to open up for increased use of ultrasound imaging e.g. in breast and prostate cancer diagnosis and screening. From the mentioned techniques Counter let Transform is the best technique because it overcomes the problem of the classical ST that improves the noise while enhancing. Being multiscale, multidi-rectional, and anisotropic,CT efficiently captured the geometrical features. But one of the limitations of CT is that the image enhancement is not much better.

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Impact of Atmospheric Conditions on the Performance of Free Space Optical Communication

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***Abstract*—Free space optical communication or wireless optics is last mile solution for drastically increasing bandwidth requirements. The FSO uses beam of LED or LASER to provide high data rate optical connection that can transmit and receive multimedia information. While FSO can be deployed at one-fifth of the cost of fibre, it requires Line of Sight (LOS) communication between transmitter and receiver. The FSO not only has many advantages but also hampered by some atmospheric conditions, which degrades the link performance. This paper reviews the FSO link design and effect of different atmospheric condition like- fog, scintillation, turbulence, rain etc.**

***Index Terms*—FSO, OW, Link margin, Scintillation, Turbulence,**

I. INTRODUCTION

Free Space Optics (FSO) is a telecommunications technology that transmits data in the form of optical signals across the air and, as such, can be considered as a wireless (line-of-sight) [5] transmission system; this technology is capable of handling data rates at the Gbps level, does not require licensing, and can be deployed at one-fifth of the cost of fiber; also, the narrow beams employed in the transmission of signals are very difficult to be affected by jamming, interception or interference [13].

An optical wireless (OW) or Free Space Optics (FSO) link can be established using Lasers or light emitting diode (LED) between any two line of sight points in free space for a certain link distance, enabling point-to-point data links at rates exceeding 1 Gbits/s [1]. Lasers work in the visible and near infrared spectrum of the electromagnetic radiations. The inherent advantage of using lasers for establishing connection between two geographically separated line of sight points provides a well-focused narrow beam that on one hand is secured and on the other hand is less scattered as it traverses the free space mostly the earth atmosphere[1, 11]. OW is now finding niche applications both in military as well as commercial services sectors and is being researched for scenarios involving communication between fixed as well as mobile platforms. Few of the potential application scenarios of OW links are transmission links between satellites, links for deep space missions, links between unmanned aerial vehicles (UAV), high altitude platforms (HAP) [1,8], data links from earth to satellites and re-establishing high speed connections in case of emergency or disaster recovery situations.

The optical beam traversing through the earth atmosphere is attenuated by absorption and scattering of radiation from fog, clouds, snow, rain, sleet and dust etc. This attenuation is typically dominated by fog, clouds and snow. However, the attenuation due to snow, rain and sleet etc., is generally less significant as compared to signal transmission through fog and clouds, such that the optical signal becomes weak enough that the communication system will cease to operate. The real challenge to these optical wireless links arise in the presence of different fog conditions: as the size of the fog particles is comparable to the optical wavelengths used for transmission. The most commonly used wavelengths (650 nm, 750 nm, 850 nm, 950 nm, 1050 nm, 1550 nm) [1] in FSO fall inside the transmission window such that the contribution of attenuations from phenomena like absorption to total extinction are almost negligible as compared to scattering, the most dominant factor of optical signal attenuation in free space.

II. FSO COMMUNICATION SUBSYSTEM

FSO communication is a line of sight technology that uses laser beam for sending the very high bandwidth digital data from one point to another through atmosphere. This can be achieved by using a modulated narrow laser beam lunched from a transmission station to transmit it through atmosphere and subsequently received at the receiver station. The block diagram of FSO subsystem is as shown in figure 1 [3]. The main components of FSO transmitter and receiver are laser modulator, driver, optical source, transmit telescope, receiver telescope, optical filter, detector, amplifier and a demodulator.

Laser is the heart of FSO technology [4]. Laser modulation means the data were carried by a laser beam [3]. The modulation technique can be implemented in following two common methods: internal modulation and external modulation. Internal modulation is a process which occurs inside the laser resonator and it depends on the change caused by the additive components and change the intensity of the laser beam according to the information signal. External modulation is the process which occurs outside the laser [7] resonator and it depends on both the polarization phenomena and the refractive dualism phenomenon. Driver circuit of a

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transmitter transforms an electrical signal to an optical signal by varying the current flow through the light source[3].

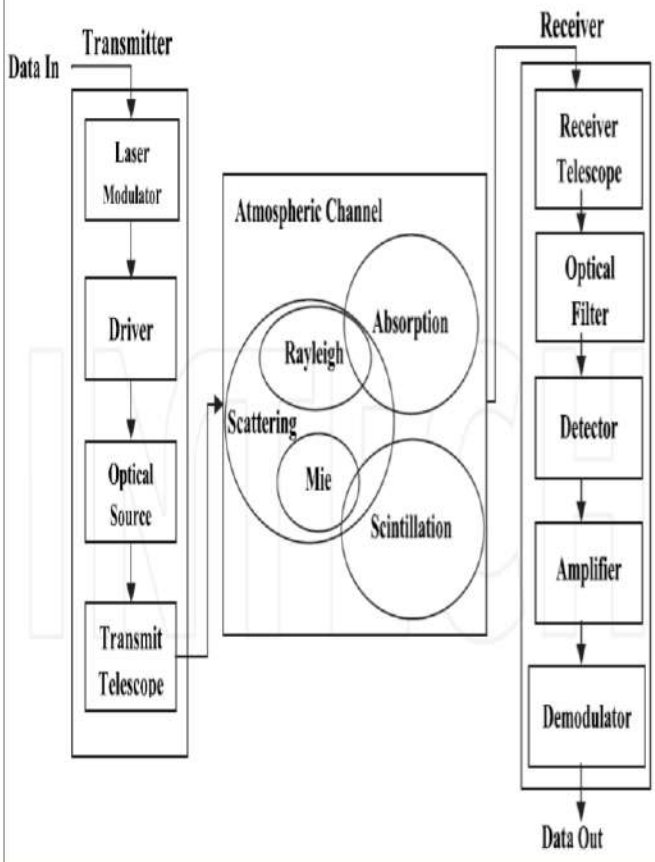

Figure 1: Basic block diagram of the FSO system [3]

Optical source may be a laser diode (LD) or light emitting diode (LED), which used to convert the electrical signal to optical signal. A laser diode is a device that produces optical radiation by the process of stimulated emission photons from atoms or molecules of a lasing medium, which have been excited from a ground state to a higher energy level. A laser diode emits light that is highly monochromatic and very directional. This means that the LD's output has a narrow spectral width and small output beam angle divergence. LDs produce light waves with a fixed phase relationship between points on the electromagnetic wave. There are two common types of laser diode: Nd:YAG solid state laser and fabry-perot and distributed-feedback laser (FP and DFB) [3,7]. The transmitter telescope collects, collimates and directs the optical radiation towards the receiver telescope at the other end of the channel. For FSO links, the propagation medium is the atmosphere. The atmosphere may be regarded as series of concentric gas layers around the earth. Three principal atmospheric layers are defined in the homosphere, the troposphere, stratosphere and mesosphere. These layers are differentiated by their temperature gradient with respect to the altitude. In FSO communication, we are especially interested in the troposphere because this is where most weather phenomena occur and FSO links operate at the lower part of this layer. The receiver telescope collects and focuses the incoming optical radiation on to the photo detector. It should be noted that a large receiver telescope aperture is desirable because it collects multiple uncorrelated radiation and focuses their average on the photo detector. By introducing optical filters that allow mainly energy at the wavelength of interest to impinge on the detector and reject energy at unwanted wavelengths, the effect of solar
illumination can be significantly minimized. The detector also called photodiode (PD) [3, 4] is a semiconductor devices which converts the photon energy of light into an electrical signal by releasing and accelerating current conducting carriers within the semiconductors. Photodiodes operate based on photoconductivity principals, which is an enhancement of the conductivity of p-n semiconductor junctions due to the absorption of electromagnetic radiation. The diodes are generally reverse-biased and capacitive charged. The two most commonly used photodiodes are the pin photodiode and the avalanche photodiode (APD) because they have good quantum efficiency and are made of semiconductors that are widely available commercially [3, 9].

III. FREE SPACE CHANNEL MODEL

The link equation for a free-space optical communication is illustrated in figure 2. The amount of received power is proportional to the amount of power transmitted and the area of the collection aperture. It is inversely proportional to the square of the beam divergence and the square of link range. It is also inversely proportional to the exponential of the product of the atmospheric attenuation coefficient (in units of 1/distance) times the link range [20].

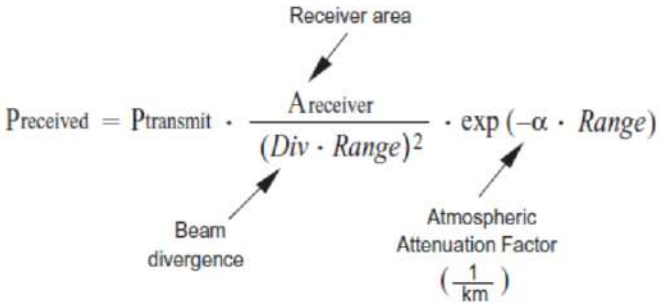

Figure 2. Basic FSO link equation [20]

Looking at this equation, the variables that can be controlled are: transmit power, receive aperture size, beam divergence, and link range. The atmospheric attenuation coefficient is uncontrollable in an outdoor environment and is roughly independent of wavelength in heavy attenuation conditions. Bean divergence is taken as the full angle of opening of the beam. Range of link is the distance between the transmitter and the receiver.

For calculating the power at the receiver and calculating the link margin, one can determine factors that affect quality of the link. Link Margin (LM), usually expressed in decibels, is a ratio of the received power P_R and receiver threshold (s), or

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amount of power received above minimum detectable power [2, 12]:

$$LM = \text{Log } P_R/S \quad (1)$$

IV. Atmospheric Effects on FSO Availability

The performance of FSO depends upon several parameters. In general, these parameters can be divided into two different categories: internal parameters and external parameters. Internal parameters are related to the design of a FSO system and include optical power, wavelength, transmission bandwidth, divergence angle, and optical loss on the transmit side and receiver sensitivity, bit-error rate (BER), receive lens diameter, and receiver field of view (FOV) [2] on the receive side. External parameters, or non-system-specific parameters, are related to the environment in which the system must operate and include visibility and atmospheric attenuation, scintillation, deployment distance [18].

A. Atmospheric attenuation

Atmospheric attenuation is defined as the process whereby some or all of the electromagnetic wave energy is lost when traversing the atmosphere. Thus, atmosphere causes signal degradation and attenuation in a FSO system link in several ways, including absorption, scattering, and scintillation. All these effects are time-varying and will depend on the current local conditions and weather. In general, the atmospheric attenuation is give by the following Beer's law "Eq. 2" [20].

$$\tau = \exp(-\tau\beta L) \quad (2)$$

Where τ is the atmospheric attenuation, β is the attenuation coefficient and is given by [6]:

$$\beta = \beta_{abs} + \beta_{scat} \quad (3)$$

Where β_{abs} is the molecular and aerosol absorption and βscat is the molecular and aerosol scattering.

B. Absorption

Absorption is caused by the beam's photons colliding with various finely dispersed liquid and solid particles in the air such as water vapor, dust, ice, and organic molecules. The aerosols that have the most absorption potential at infrared wavelengths include water, O_2, O_3, and CO_2 [19]. Absorption has the effect of reducing link margin, distance and the availability of the link. The absorption coefficient depends on the type of gas molecules, and on their concentration. Molecular absorption is a selective phenomenon which results in the spectral transmission of the atmosphere presenting transparent zones, called atmospheric transmission windows and shown in Fig. 3 [6], which allows specific frequencies of light to pass through it. These windows occur at various wavelengths. The atmospheric windows due to absorption are created by atmospheric gases, but neither nitrogen nor oxygen, which are two of the most abundant gases, contribute to absorption in the infrared part of the spectrum. It is possible to calculate absorption coefficients from the concentration of the particle and the effective cross section such as shown in "Eq. 4" [8].

$$\beta_{abs} = \alpha_{abs} N_{abs} \left[\frac{1}{km}\right] \quad (4)$$

where α_{abs} is the effective cross section of the absorption particles [km^2] and N_{abs} is the concentration of the absorption particles [$1/km^2$]. The absorption lines at visible and near infrared wavelengths are narrow and generally well separated. Thus, absorption can generally be neglected at wavelength of interest for free space laser communication. Another reason for ignoring absorption effect is to select wavelengths that fall inside the transmittance windows in the absorption spectrum.

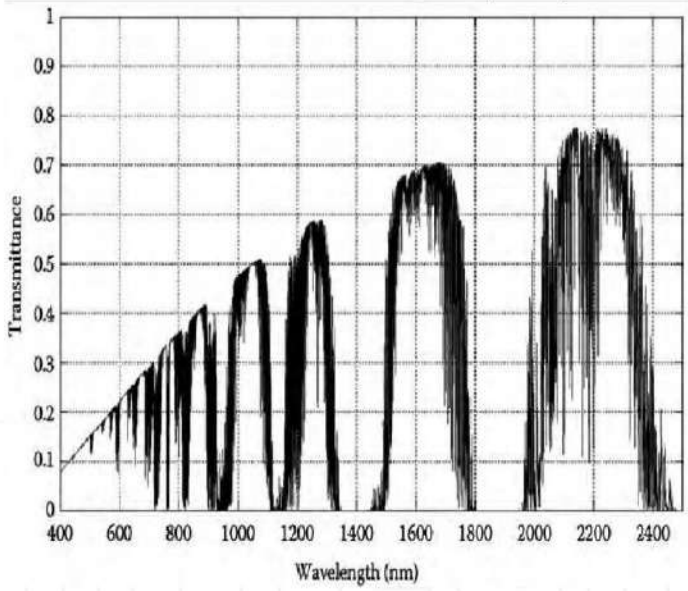

Figure 3: Atmospheric Transmittance Window with Absortion Contribution [3]

C. Scattering

Scattering is defined as the dispersal [3, 10] of a beam of radiation into a range of directions as a result of physical interactions. When a particle intercepts an electromagnetic wave, part of the wave's energy is removed by the particle and re-radiated into a solid angle centered at it. The scattered light is polarized, and of the same wavelength as the incident wavelength, which means that there is no loss of energy to the particle. There are three main types of scattering: (1) Rayleigh scattering, (2) Mie scattering, and (3) non-selective scattering.

Rayleigh (molecular) scattering refers to scattering by molecular and atmospheric gases of sizes much less than the

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incident light wavelength. The Rayleigh scattering coefficient is given by "Eq. 5 [20]".

$$\beta_m = \alpha_m N_m [1/km] \quad (5)$$

Where α_m is the Rayleigh scattering cross-section [km^2] and N_m is the number density of air molecules [1/km^2]. Mie (aerosols) scattering occurs when the particle diameter is equal or larger than one-tenth the incident laser beam wavelength, Mie scattering is the main cause of attenuation at laser wavelength of interest for FSO communication at terrestrial altitude. Transmitted optical beams in free space are attenuated most by the fog and haze droplets mainly due to dominance of Mie scattering effect in the wavelength band of interest in FSO (0.5 μm – 2 μm). This makes fog and haze a keys contributor to optical power/irradiance attenuation. The attenuation levels are too high and obviously are not desirable.

The attenuation due to Mie scattering can reach values of hundreds of dB/km (with the highest contribution arising from fog). The Mie scattering coefficient expressed as follows, see "Eq. 6" [9].

$$\beta_a = \alpha_a N_a [1/km] \quad (6)$$

Where α_a is the Mie scattering cross-section [km^2] and N_a is the number density of air particles [1/km^3] [3].

C. Rain

Rain is formed by water vapor contained in the atmosphere. It consists of water droplets whose form and number are variable in time and space. Their form depends on their size: they are considered as spheres until a radius of 1 mm [11] and beyond that as oblate spheroids: flattened ellipsoids of revolution. Rainfall effects on FSO systems Scattering due to rainfall is called non-selective scattering, this is because the radius of raindrops (100 – 1000 μm) is significantly larger than the wavelength of typical FSO systems. The laser is able to pass through the raindrop particle, with less scattering effect occurring. The haze particles are very small and stay longer in the atmosphere, but the rain particles are very large and stay shorter in the atmosphere. This is the primary reason that attenuation via rain is less than haze. An interesting point to note is that RF wireless technologies that use frequencies above approximately 10 GHz are adversely impacted by rain and little impacted by fog. This is because of the closer match of RF wavelengths to the radius of raindrops, both being larger than the moisture droplets in fog.

D. Fog and fog formation

Fogs are composed of very fine water droplets of water, smoke, ice or combination of these suspended in the air near the Earth's surface. The presences of these droplets act to scatter the light and so reduce the visibility near the ground. A fog layer is reported whenever the horizontal visibility at the surface is less than 1 km [1]. Normally, after sunset a strong cooling takes place near the earth surface through the divergence effect of long wave radiation. As the cooling increases, the relative humidity (the ratio of absolute humidity to saturation) increases until fog droplets are activated. Typically, fog formation takes place as the difference (Δ) between temperature and dew point becomes (5 °F) 3 °C [6], or less and as a result water vapors in the air begin to condense into liquid water form while relative humidity reaches to 100%. Radiation fog is related to the ground cooling by radiation. It appears when the air is sufficiently cool and becomes saturated. This fog generally appears during the night and at the end of the day. Particle diameter is around 4 μm and the liquid water content varies between 0.01 and 0.1 g/m^3 [1].

E. Scintillation and atmospheric turbulence

The size of the receiver optics is also important; a larger area receive optic contributes to reducing errors due to scintillation. Scintillation [12] is atmospheric turbulence [15-17] due to solar loading and natural convection, causing temporally and spatially varying refractive index changes in the air. As a laser beam propagates through the atmosphere, there is a time-varying intensity at the receiver due to this phenomenon; this is referred to as 'scintillation' [2, 3]. This is quite similar to the apparent twinkling of the stars or distant city lights, which is due to the same effect. The result is that an FSO communications receiver can experience error bursts due to surges and fades in the receive signal strength. One way to combat this scintillation effect, and thus improve the error-rate performance, is to use a large aperture receiver. A collecting aperture that is much larger than the spatial scale of the scintillation provides an averaging effect of the localized surges and fades, thus improving the error rate. This large-aperture approach is more effective for scintillation reduction than multiple smaller apertures, which perform less averaging at each lens. Another way to mitigate [14] the effects of scintillation is to use multiple transmitters, each of which takes a slightly different path through the atmosphere, which also contributes an averaging effect. The net result is that a properly designed system can defeat scintillation impairments. Atmospheric scintillation can be defined as the changes occurring in the light intensities in time and space at the plane of a receiver detecting the optical signal. The received signal at the detector fluctuates because of changes in the refractive index which arise due to change in the temperature of the air along the transmit path. These index changes [3] make the atmosphere to function like a series of small lenses that deflect portions of the light beam into and out of the intended transmit path. The time scale of these fluctuations is in milliseconds, which is approximately equal to the time that it takes a volume of air the size of the beam to move across the path, and therefore is related to the speed of wind to move those lenses like air regions. The effect of scintillation on the optical signal will be highest when the temperature of the day is at the maximum level, this occurs usually during midday. FSO

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systems operate horizontally in the atmosphere near the surface (in case of terrestrial links), experiencing the maximum scintillation possible. The use of multiple-beam technology can substantially reduce effects of scintillation. Especially for longer distance FSO systems manufactures must address scintillation effects and reserve appropriate scintillation fade margins within the overall link budget.

V. CONCULSION

FSO is just starting to be applied to solve the Internet "last-mile" interconnectivity problem. Some believe that it may be the unlimited bandwidth solution for the metro urban core of downtown building-to-building communication, as well as the optimal technology for home-to-home and office-to-office connectivity. Free Space Optic offers solutions for current bottlenecks in communication technology; however it does not come for free. The cost we have to pay is huge attenuation of the signal, mainly caused by non-quantifiable factors, like weather conditions. Main limiting factors for FSO link design are rain and haze [10].

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Implementation of Real Time Operating System for AVR Microcontrollers

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Abstract- **The objective of this paper is to create the operating system for real-time Robotics based on AVR microcontroller that operates in the multitask environments. In addition to this, a single hardware performs the multiple tasks without recompiling and/or burning the programs into the controller's memory every time (invariably). The operating system in the AVR controller will read the program through secure digital (SD) card and execute it; if we insert the new card with the new program then same set of hardware performs the new task. The main advantage of this technique is that we don't have to connect the computer with the hardware, however the program can be uploading in the flash disk (SD card) as the .hex file and when we insert the card in the hardware, it performs the task accordingly.**

Index Terms- **RTOS, ATmega32, SD card, RISC.**

I. Introduction

A real-time operating system (RTOS) is an operating system (OS) that intended to serve real-time application requests. The main point of RTOS is, if programmed correctly; an RTOS can guarantee that a program will run with very consistent timing [1] and RTOS will always run the current program and execute it. Need of RTOS, to run the system in different environment with minimum speed. The purpose of this paper is to design a real time operating system which is based on AVR microcontroller.

The software design of this paper is broken up into two parts:-

A. Operating system
B. Card/boot loader program, which load the data into the SD/SC card.

The card loader program is accessed via the Atmel's SPI interface, which places the program into flash memory. When we interface the card with the controller, so the main OS program read the data of the card via SPI, and place it into the ROM memory at run time using boot loader program. After that our system will perform the task and if we remove the card from the hardware kit, then also the program will still run on the kit [2].

II. Problem Domain

In this paper, whenever we will perform the new task with the hardware so, we have to connect the hardware with the computer and recompiling or burning the controller and upload the new program in the controller.

III. Solution Domain

The advantage of this paper is that, we can upload the program in the flash disk (SD card) in the .hex file without connecting computer with the hardware. Then, we insert the card in the hardware and hardware will perform the respective task.

The AVR program coded and compiled in Code Vision AVR Studio 4, before installing the AVR studio 4, we first have to install the winavr because the winavr includes GCC compiler for the AVR target for C and C++ [3].

We will put our O.S. in the boot-loader section of flash, because the boot loader resides at the highest addresses of flash memory. The maximum boot-loader size is 2048 instructions, is too big to fit in this space, so I fixed some functions in high flash addresses next to the boot-loader, keeping the functions that program the flash actually in the boot-loader. We will test our program in the AVR kit. There are various kits available in the market like STK500 for example.

IV. About AVR ("Advanced Virtual RISC") Controller

In this particular paper, introducing AVR family of microcontrollers and Atmel AVR 8 and 32 bit microcontrollers deliver a unique combination of performance, power efficiency, and as well design flexibility. Optimized speed time to market and also they are based on the industry's most code-efficient architecture for C and assembly programming. On the other hand, no other microcontrollers deliver more computing performance with better power efficiency and industry-leading development tools and design support let you get to market faster [4].

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A. Overview of AVR Microcontroller

- AVR RISC Architecture.
- 32K bytes of in-system self-programmable flash program memory.
- We can access ROM at run time.
- It can deliver 16 million intrusions per second.
- 2K of SRAM.
- In-system programming by on-chip boot program.
- SPI - serial peripheral interface.
- Speed - 16 MHz
- 1024 bytes EEPROM [5].

B. Typical Hardware Support in AVR (ATmega32)

- Internal or External Oscillator/Clock [6].
- 10bit ADC.
- Real time clock.
- One or more USART.
- EEPROM.
- One or more timers
- External interrupts.

V. FLOWCHART

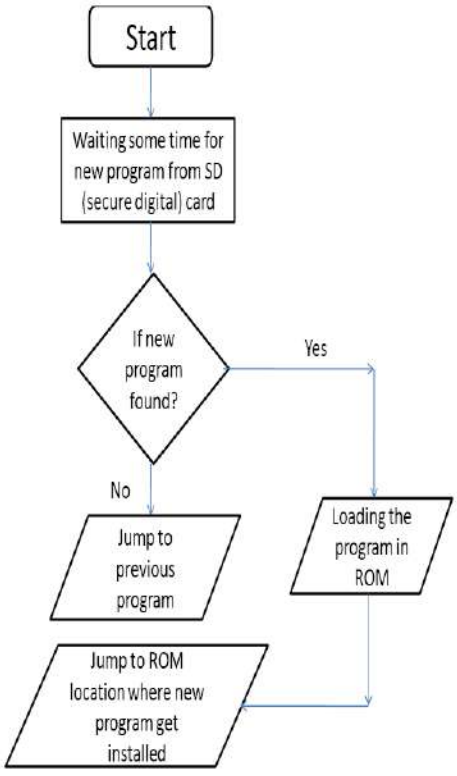

Fig. 1. Flowchart

VI. THEORY ORIENTED: - DESIGN IDEA OF PAPER (CREATING THE OPERATING SYSTEM FOR REAL-TIME ROBOTICS ON AVR BASED SYSTEM)

To create a real-time operating system for the Atmel mega32 microcontroller, the hardware waits for a card to be inserted and a reset button to be pressed; at that point a program is loaded from the SD card and gets executed [7].

The design of this particular hardware is divided into: the operating system itself and the card reader/program loader. Also the card reader is accessed via the Atmel's SPI interface by the program loader, which also places the program into flash memory and programs can be written similar to a standard Atmel Mega32 program, except that it must include the header file. The program loader resides in the Mega32's boot loader section of flash. Since, this gives it write access to other portions of flash memory so that it can write executables to program space.

A. Paper Specifications

To run this programs on an Atmel Mega32 development board; the SD card slot is designed in the board. We connect the SD card through PORTB with a jumper cable, which contains the Mega32's SPI interface. Also we wired the SD card connector's clock, Data In, and Chip Select pins to PORTB's pins 7, 5, and 0, respectively, and the Data Out to PORTB pin 6.

The three inputs to the card each were fed through separate step-down circuit to decrease the voltage from the power supply's 5V to the 3.3V required by the card. The output from the card was fed through a step-up circuit before going to B.6. To obtain the 3.3 volts needed for the HIGH voltage for the card, we used a simple voltage regulator [2]. Likewise, the card acts as a load on the 3.3V, drawing some current. The 3.3V was pulled down to 2.6V with the card's load, with the help of voltage dividers. Regulator is able to sustain a voltage of about 3.26V with the card's load, within the card's specifications. We have 3 unused pins on PORTB after connecting to the card reader, due to that we added a pushbutton with a pull-up resistor and connected it to pin 1. This button is used as a reset that causes the OS to load the program from an SD card.

B. How to make an OS in the AVR Controller?

Few steps to achieve the task:

- Interfacing of SD/MMC card with ATmega32.
- Reading the data of card and accessing its data.
- Storing the program at run time in ROM location with the help of boot loader program.
- Setting the pointer to that stored program location.
- With the help of pointer running that installed program.
- Returning from that program location.

C. How the RTOS will work?

Writing the code for O.S. and creating the AVR development board with card reader. Hardware waits for a secure digital card to be inserted and a reset button to be pressed; at this point a program is loaded from the card to flash memory and also gets executed. A new card with a new program can be inserted and run, at any time. Executing a new program doesn't require reprogramming the Atmel processor.

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All programs on the Atmel have to be contained in flash memory, but only the boot loader can write to flash memory. Thus, it was decided to put the O.S. in the boot loader section of flash. This decision also helped to avoid address conflicts with user programs because the boot loader resides at the highest addresses of flash memory. The maximum boot loader size is 2048 instructions. It is too big to fit in this space, that's why we fixed some functions in high flash addresses next to the boot loader, keeping the functions that program the flash memory actually in the boot loader.

The Atmel programs created have coded and compiled in AVR Studio 4. AVR studio 4 creates .hex files when it makes a project; we took these .hex files and used them to program the SD card and write a programmer to load the data into the card, separate from the O.S. program, which programs the contents of a .hex file to the SD card.

Whenever, using the hardware in the new task environment the Operating system in AVR controller boots, it begins waiting for a new program in the SD card and a reset signal. At this point, it start begins reading the contents of the card into small RAM buffers, which subsequently transferred to flash, because RAM is limited [3]. Now, the buffers used to read data from the card overlap with O.S. Data structures that are not used until after the program is loaded. Since executing and loading never overlap, so we can use the same memory for both.

D. Time required to run the programs of different sizes

First run time: Program load time + time to jump over the main routine.

Second run time: Time to check for new program + time to jump over the main routine.

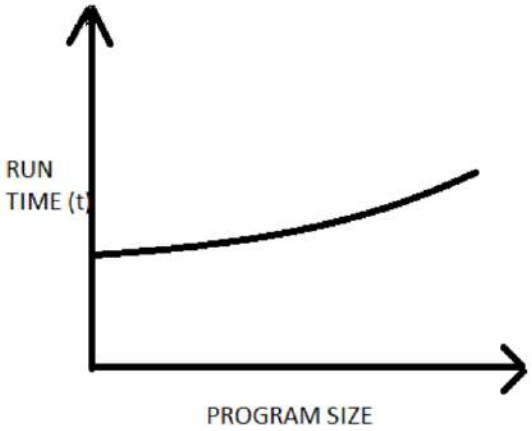

Fig. 2. Graph of first run time

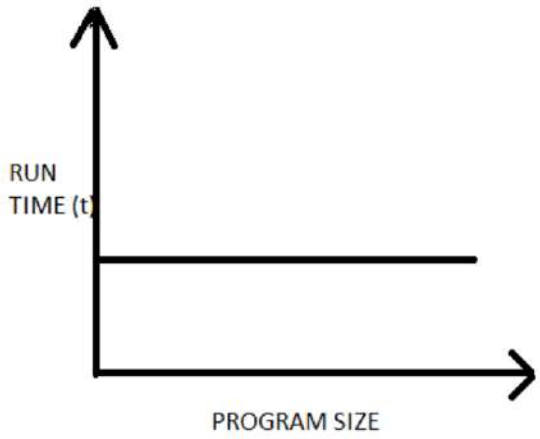

Fig. 3. Graph of second run time

VII. HARDWARE DESIGN

ATmega32 is used for testing the designed RTOS. The circuit is as "fig. 4", ATmega32 microcontroller is used in 16 MHz clock, Max232 i.e.) for serial peripheral interface with PC, capacitors and LEDs.

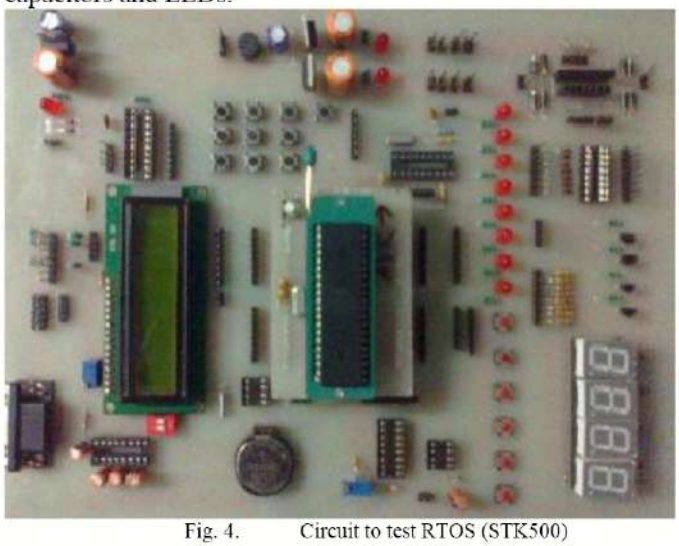

Fig. 4. Circuit to test RTOS (STK500)

CONCLUSION AND FUTURE IMPLEMENTATION

At the end, we successfully accomplished the objective, to create the operating system for real-time based on AVR microcontroller that loads program dynamically from SD card and performs the task accordingly. Writing the code for O.S. and creating the AVR development board with card reader is done successfully. However, also completed the second objective, a single hardware performs the multiple tasks without recompiling and/or burning the programs into the microcontroller.

In designing the operating system, we first considered various library functions that could add to increase functionality that is, LCD and keypad drivers and support for multiple programs on a single card with a menu system to choose between them [3]. These kind of features, although useful bells and whistles are cut from the design as, they are extraneous to the core vision that creates dynamically-loading

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OS, there is some unnecessary complexity been added, and consumed extra flash and RAM, which may be needed for some user programs.

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Influence of Noise on Image Quality

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***Abstract*— in this paper, various type of noise that affects the image quality is presented along with their probability density function. Source of noise and dominating noises are discussed with the help of a test pattern.**

***Index Terms*— Gaussian Noise, Rayleigh Noise, Exponential Noise, Impulse Noise, Speckle Noise and Periodic Noise, PDF.**

I. Introduction

An image gets corrupted with different types of noise during the processes of acquisition, transmission/ reception, and storage/ retrieval. It is very essential to suppress the noise in an image and to preserve the edges and fine details as far as possible [134]. During image acquisition (digitization), performance of imaging sensors is affected by a variety of factors, such as environment conditions and the quality of the sensing elements themselves. For instance, in acquiring images with the CCD camera, light levels and sensor temperature are major factors affecting the amount of noise in the resulting image. Images are corrupted during transmission, principally due to interference in the channel used for transmission e.g. an image transmitted using a wireless network might be corrupted as a result of lightning or other atmospheric disturbance. The most common noise that affect the quality of image are Gaussian noise, salt and pepper noise, speckle noise and periodic noise. In this paper, the detailed study of various type of noise that affects the image quality are presented.

II. Types of Noise

There are many types of noises that affect the quality of an image and detailed explanation of each type of noise is described in this section.

A). Gaussian Noise

This noise comes into notice due to poor quality image acquisition, images observed in a noisy environment or noise inherent in communication channels [135]. Noise is modeled as Additive White Gaussian Noise (AWGN), where all the image pixels deviate from their original values following the Gaussian curve. That is, for each image pixel with intensity value O_{ij} ($1 \le i \le M$, $1 \le j \le N$ for an $M \times N$ image), the corresponding pixel of the noisy image X_{ij} is given by,

$$X_{ij} = O_{ij} + G_{ij} \quad (1)$$

Where, each noise value G_{ij} is drawn from a zero-mean Gaussian distribution. Gaussian noise is used as an approximation in cases such as imaging sensors operating at low light levels. Its PDF is given as:

$$f(z) = \frac{1}{\sigma\sqrt{2\pi}} e^{-(z-\mu)^2/2\sigma^2} \quad (2)$$

Where z is the pixel intensity, μ is mean and σ is the standard deviation which decides shape of Gaussian function. The standard deviation squared value σ^2 is called the variance of z. A plot of Gaussian function is shown in fig.1. When z is described by Eqn. (2), approximately 70% of its values will be in range $[(\mu-\sigma),(\mu+\sigma)]$ and about 90% will be in the range $[(\mu-2\sigma), (\mu+2\sigma)]$.

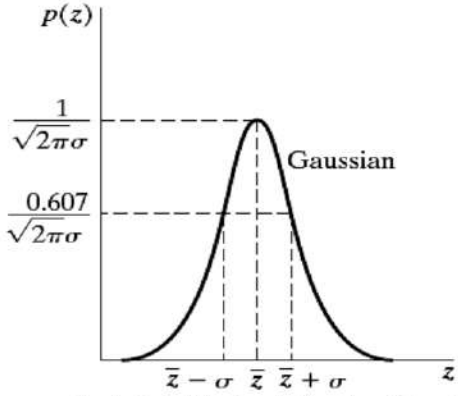

Fig. 1: Probability density function of Gaussian noise

B). Rayleigh Noise

The PDF of Rayleigh noise is given [135] by:

$$P(z) = \begin{cases} [2/b(z-a)] * \exp(z-a)^2/b & \text{for } z \ge a \\ 0 & \text{for } z < a \end{cases} \quad (3)$$

The mean and variance of this density are given by

$$\mu = a + \sqrt{\pi}\, b/4 \quad (4)$$

$$\text{and } \sigma^2 = b*(4-\pi)/4 \quad (5)$$

Fig.2 shows a plot of the Rayleigh density. Note that the displacement from the origin the fact that basic shape of this density is skewed to the right. The Rayleigh density can be useful for approximating skewed histograms.

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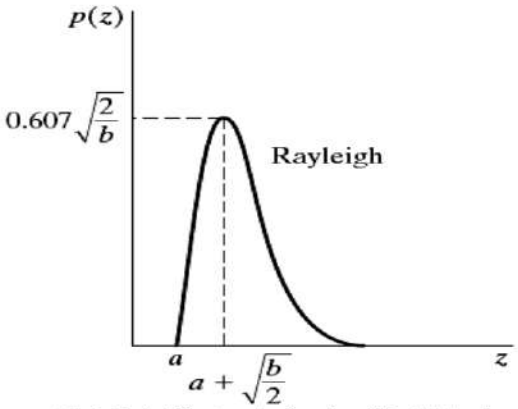

Fig.2: Probability density function of Rayleigh noise

C). Erlang (Gamma) Noise

The PDF of Erlang noise is given[135] by

$P(z) = \{a^b z^{b-1} / (b-1)!\ \text{Exp}(-az) \quad \text{for } z \geq 0\}$

$\{0 \quad \text{for } z < 0\}$ (6)

Where the parameters are such that a>0, b is a positive integer, and "!" indicates factorial. The mean and the variance of this density are given by

$\mu = b/a$ and (7)

$\sigma^2 = b/a^2$ (8)

The probability density function of Erlang noise is shown in fig.3.

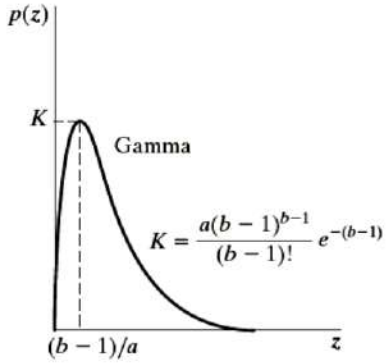

Fig.3: Probability density function of Erlang noise

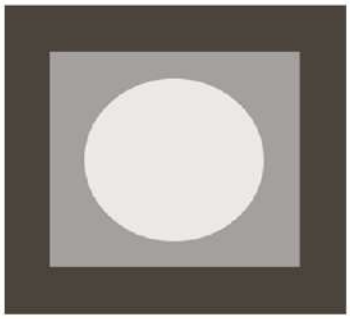

Fig.4: Test pattern used to illustrate the characteristics of the noise PDFs of Gaussian noise, Rayleigh noise, Erlang(Gamma noise) , exponential noise , uniform noise, impulse noise)

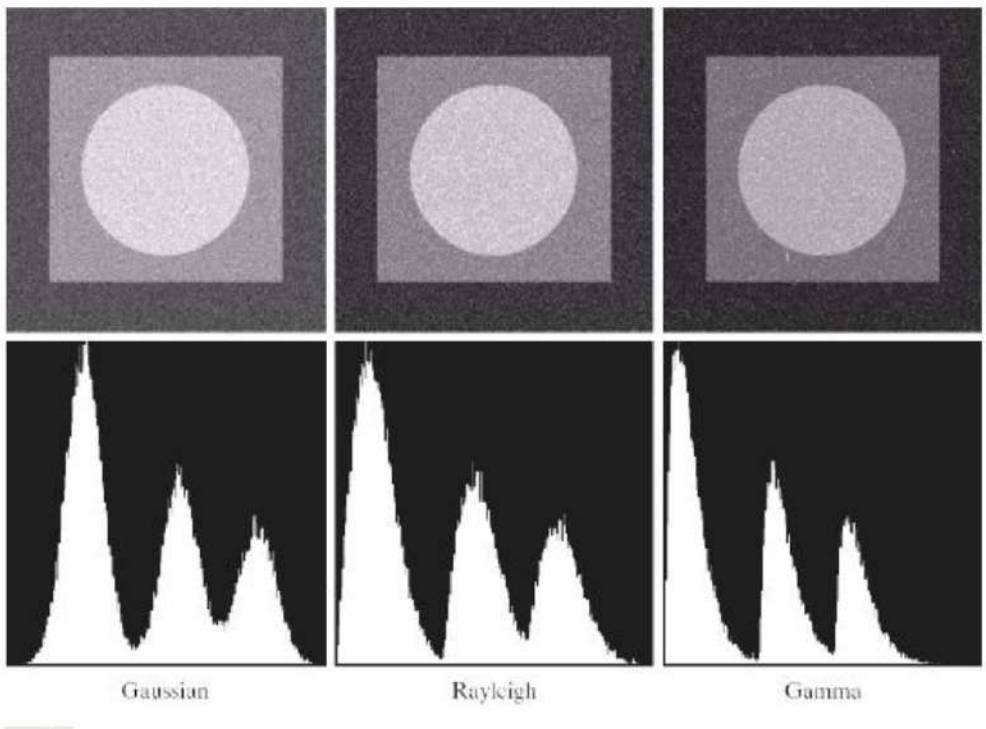

Fig. 5(a,b,c,d,e,f): Images and histograms resulting from Gaussian, Rayleigh and Gamma noise to the image in fig.4.

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D). Exponential Noise

The PDF of exponential noise is given [135] by

$$P(z)= \begin{cases} a*e^{-a\,z} & \text{for } z\geq 0 \\ 0 & \text{for } z<0 \end{cases} \quad (9)$$

Where a>0 .The mean and variance of this density function are

$$\mu=1/a \quad \text{and} \quad (10)$$

$$\sigma^2=1/a^2 \quad (11)$$

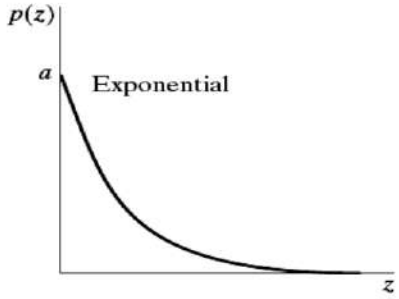

Fig.6: Probability density function of Exponential noise.

Note that this PDF is a special case of the Erlang PDF, with b=1. Fig.6 Shows a plot of this density function.

E). Uniform Noise

The PDF of uniform noise is given [1] by

$$P(z)= \begin{cases} 1/b-a & \text{if } a\leq z\leq b \\ 0 & \text{otherwise} \end{cases} \quad (12)$$

The mean and variance of this density function are given by:

$$\mu=a+b/2 \quad (13)$$

$$\sigma^2=(b-a)^2/12 \quad (14)$$

Fig.7 shows a plot of the uniform density.

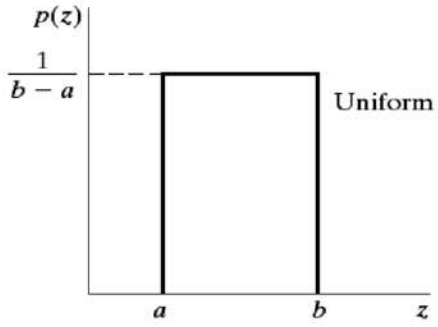

Fig.7: Probability density functions of uniform noise.

F). Impulse Noise

Impulse noise is characterized by replacing a portion of an image's pixel with noise values; this noise affects image pixel by pixel and not the whole area of an image. Such noise is introduced due to transmission errors. Impulse noise can be of two types:

- Random Values Impulse Noise (RVIN)
- Salt & pepper noise

The Salt and Pepper (SP) noise is also called as fixed valued impulse noise, it will take a gray level value either minimal (0) or maximal (255) (for 8-bit monochrome image) in the dynamic range (0-255). It is generated with the equal probability. In the case of salt and pepper noise, the image pixels are randomly corrupted by either 0 or 255. That pixel is replaced by either white value (255) or black value (0) that's why it is called as salt & pepper noise.

For each image pixel at location (i,j) with intensity value O(i,j), the corresponding pixel of the noisy image will be X(i,j), in which the probability density function of X(i,j) is

$$p(x) = \begin{cases} \frac{p}{2} & for\ x = 0 \\ 1-p & for\ x = o_{i,j} \\ \frac{p}{2} & for\ x = 255 \end{cases} \quad (15)$$

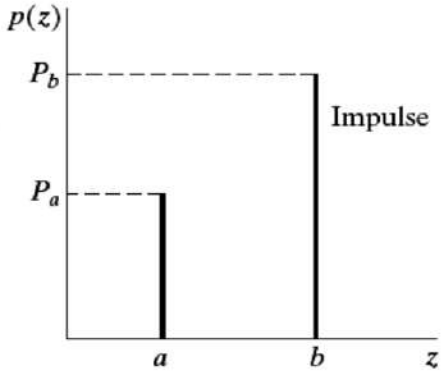

Fig.8: Probability density function of impulse noise

Random Valued Impulse noise (RVIN) is also called as variable type impulse noise which also replaces some pixels with random values like salt & pepper noise but in the range [0 255](in case of 8 bit gray scale image).

Distribution of Impulse noise: Impulse noise follows the impulse distribution like a unit impulse signal which can take either 0 or 1(random value in case of impulse signal). There is an abrupt transition in the pixel value in the neighborhood of any pixel of an image corrupted by impulse noise.

Effect on image: Image corrupted by salt & pepper noise will have black & white dots on image (for gray valued image) which distorts image.

G). Speckle Noise

Gaussian noise can be modeled by random values added to image but speckle noise can be modeled by random values multiplied by pixel values, it is also called multiplicative noise[135]. Speckle noise is a major problem in some radar applications. Although Gaussian noise and speckle noise appear superficially similar, they are formed by two totally different methods and thus require different approaches for their removal. Fig.11 shows the affect of speckle noise on an image.

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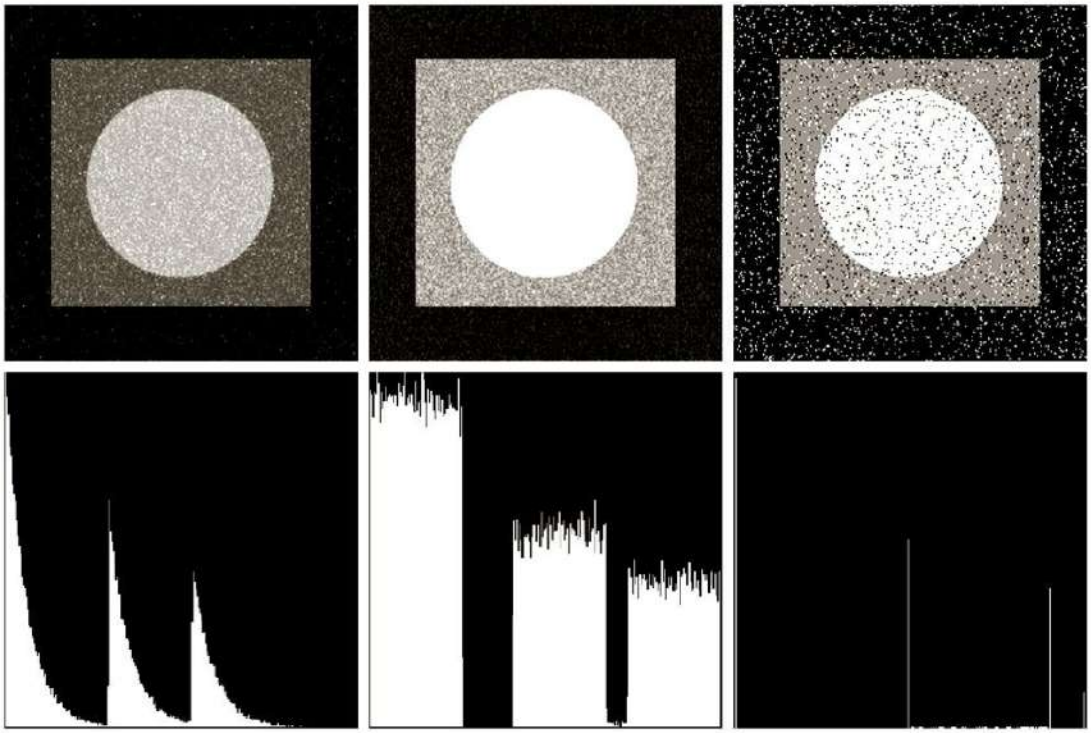

Fig.9: (a,b,c,d,e,f)(contd.) images and histograms resulting from addition of exponential, uniform and impulse noise to the image in fig.4.

Fig.10: Image of test Pattern

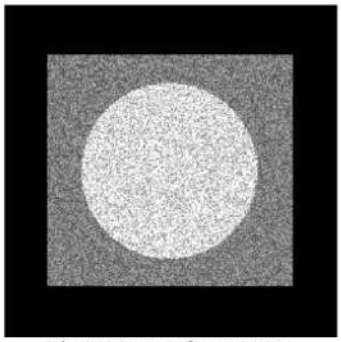

Fig.11: Image of test Pattern
after addition of speckle noise

H).Periodic Noise

Periodic noise in an image arises typically from electrical or electromechanical interference during image acquisition. This noise is periodic instead of random disturbance [135]. The effect is of bars over the image as shown in fig.12.
Salt and pepper noise, Gaussian noise and speckle noise can all be cleaned by using spatial filtering techniques. But periodic noise requires the use of frequency domain filtering due to its global affect instead of local degradation.

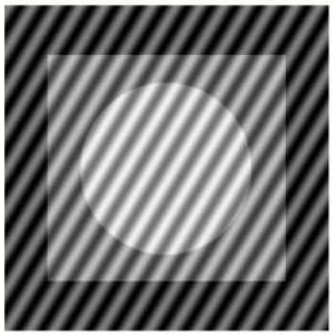

Fig.12: Image of test Pattern after addition of Periodic Noise

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III. CONCLUSION

The detailed theory of various types of noise and their affects on image quality is presented in this paper. It is observed from this study that Gaussian noise and Salt & pepper noise are two dominating noises. It is found that Gaussian noise arise in an image due to factors such as electronic circuit noise and sensor noise due to poor illumination and or high temperature. The Rayleigh density is helpful in characterizing noise phenomenon in range imaging. The exponential and gamma densities find application in laser imaging. The impulse noise is found in situations where quick transients such as faulty switching take place during imaging as mentioned in previous paragraph. The uniform density is perhaps the least descriptive of practical situations.

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Inter-Satellite Wireless Optical Communication Link

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***Abstract*—Free space optics (FSO) has the combined features of most dominated telecommunication technologies: wireless and fiber optics. Many aspects of FSO are related to fiber optics with an important difference of transmission medium which is air/free space rather than the glass of the fiber-optic cable. Inter-satellite optical wireless communication systems (IsOWC), one of the important applications of the FSO/WSO technology, will be deployed in space in the near future as such systems provide a high bandwidth, small size, light weight, low power and low cost alternative to present microwave satellite systems. IsOWC can be used to connect one satellite to another, whether the satellite is in the same orbit or in different orbits and data can be sent at speed of light without much delay and with minimum attenuation since the space is considered to be vacuum. In this paper a simple approach for high loss inter-satellite microwave photonic link with intensity modulation and coherent balanced detection is discussed .**

***Keywords*—FSO, IsOWC systems, inter-satellite link, microwave photonic.**

I. INTRODUCTION

The present satellite communications system uses microwave technology for space-to-ground and geosynchronous satellite to low earth orbiting vehicles. In the future system, the satellite to ground links would remain in the microwave regime but satellite-to-satellite communication will be governed by optical wireless links. The technology uses laser light of infrared wavelengths to transmit optical signals between two points via free space. This requires devices similar to those used for the transmission through fiber-optic cable, except that the signal is transmitted through free space and not via optical cable capable of transmitting data, voice or video. IsOWC can be used to connect one satellite to another, whether the satellite is in the same orbit or in different orbits and the data can be sent at speed of light with-out much delay and with minimum attenuation since the space is considered to be vacuum. Satellites revolve around earth at their own orbit and there are three commonly used orbits for satellites. Satellite orbits with orbital height of approximately 1000 km or less are known as Low Earth Orbit (LEO). LEOs tend to be in general circular in shape. LEO satellites take from 2 to 4 h to rotate around earth. This orbit is commonly used for multi-satellite constellations where several satellites are launched up to space to perform a single mission. Satellite orbits with orbital heights of typically in the range of 5000 km to about 25,000 km are known as Medium Earth Orbit (MEO)/Intermediate Circular Orbit (ICO).MEO and ICO are often used synonymously, but MEO classification is not restricted to circular orbits. In Geosynchronous Earth Orbit (GEO) the satellite is in equatorial circular orbit with an altitude of 35,786 km and orbital period of 24 h. Three satellites in GEO placed 120° apart over equator cover most of the world for communications purposes [2]. In an inter-satellite microwave photonic link, the amplified RF signals received from ground station directly modulated to the OC and then processed in optical domain such as amplified, transmitted, and received by another satellite. There are no processes of base-band data demodulation, modulation or analogue to digital and digital to analogue conversions which severely increase the system complexity when the data throughput is huge. For an external modulated microwave photonic link with multiple frequency-bands, it is essential to increase the RF input signals power to obtain a high signal to noise ratio, however, the modulation nonlinearities will cause severe distortions such as harmonic distortion (HD) and inter-modulation distortion (IMD) when RF input power is high, thus we consider the SNDR as a performance parameter of the link. The link SNDR can be improved by suppressing the distortions. A number of methods have been demonstrated to mitigate distortions such as low biasing the Mach–Zehnder modulator (MZM)[6], eliminating the second-order components near the OC [5,7], or generating two sets of distortion components.

II. MODEL DESCRIPTION

The IsOWC system consists of three main communication parts which are transmitter, propagation channel and receiver which shown in Fig. 1 where the transmitter is in the first satellite and the receiver is in the second satellite. Optical wireless communications uses light at near-infrared frequency to communicate. The IsOWC system is not much different from free space optics and fiber optic communication where the difference relies in the propagation medium. The free space between two connecting satellites is considered as OWC channel which is the propagating medium for the transmitted light. The OWC channel is modeled between an optical transmitter and optical receiver with 15 cm optical antenna at each end. The transmitter and receiver gains are 0 dB. The transmitter and receiver antennae are also assumed to be ideal where the optical efficiency is equal to 1 and there are no pointing errors. Additional losses from scintillation and mispointing are also assumed to be zero. The OWC channel is considered to be outer space where it is assumed to be a vacuum and free from atmospheric attenuation factors. The aperture Diameter of transmitting- and receiving-antenna is taken as 10 cm.

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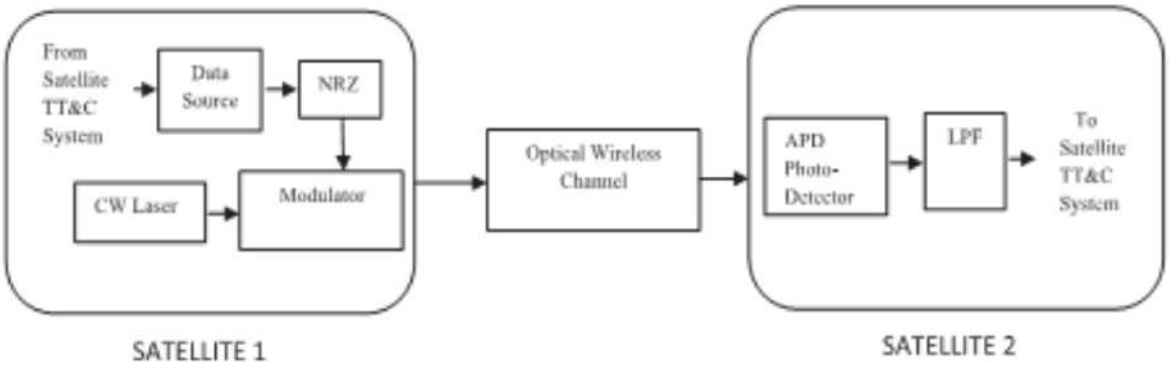

Fig. 1. Design of Inter satellite optical wireless communications systems [8]

The IsOWC transmitter receives data from the satellite's Telemetry, Tracking and Communication (TT&C) system of the satellite works along with its counterparts located in the satellite control earth station. The telemetry system collects data from sensors on board the satellite and sends these data via telemetry link to the satellite control center which monitors the health of the satellite. Tracking and ranging system located in the earth station provides the information related to the range and location of the satellite in its orbit. The command system is used for switching on/off of different subsystems in the satellite based on the telemetry and tracking data. Light source is the most important component in optical signal since communication is done by transmitting light. Light-emitting diode and laser diode are two types of optical light source commonly used in optical communication. The output light emitted by the laser diode is monochromatic, coherent and has high radiance which makes it suitable for long distance free space transmission [8]. The light generated by the laser can travel much further than the light emitted by LED. Hence, a CW laser diode of line width of 5 MHz is used in IsOWC system. The electrical signal from TT&C system and optical signal from the laser is modulated by an optical modulator before it is transmitted out to space. The output light pulses from the optical modulator are transmitted in the transmission medium to the receiving satellite. Different from free space optics that is subjected to many losses due to weather and atmospheric attenuation, the optical wireless communications channel is considered as vacuum and free from atmospheric losses. At an ideal case, the only cause of signal attenuation is the distance of the transmission. Optical antenna or optical lenses can be used at the transmitter and the receiver. Therefore, the free space loss is taken as 0 dB/ km of optical wireless channel various in our model. The optical antenna allows wider light beam divergence and detection. An optical antenna is actually a lens or a telescope that is placed before and after the transmission medium to increase the signal divergence as shown in Fig. 2. The receiving end of the IsOWC system consists of an Avalanche photodiode and a low pass filter. Amplification in APD photo detector or avalanche phenomenon occurs when charged electrons are introduced in such high electric field area and collide with neutral semiconductor atoms, thus generating other carriers. This process is then repeated to effectively amplify the limited number of carriers [9].

Fig. 2. Optical antenna [9]

III. LINK CONFIGURATION AND PRINCIPLE:

Fig. 3 depicts the inter-satellite microwave photonic link scheme with the method. The optical fiber utilized in the link is polarization maintaining to keep the laser beam polarization states and polarization direction unchanged. In the transmitter, the output laser beam from the source has a linear polarization state with a given azimuth angle and it divides into two parts. The divided laser beams enter the following arms as the OCs. In the upper arm, a push–pull DEMZM biased at null point is applied to process the DSB-SC electro-optic modulation with the RF input signals. In the bottom arm, the unmodulated OC traverses through an optical attenuator. A polarization combiner showed in Fig. 4 is utilized. This implement selects the appropriate polarization component of each signal at the input ports and adds the selected polarization components, the angle of each polarizer is given by device angle θ, and an angle of 90 degree is added to the device angle of the polarizer at input port2. The modulated optical signal and OC from two arms respectively combined together with orthogonal polarization directions as they pass through the polarization combiner. An EDFA and a HPA are used to boost the signal power going into the telescope. The laser beam propagates through optical wireless communication (OWC) channel and received by the telescope of another satellite. In the receiver, the received laser beam firstly put into an OPA. An optical filter is applied to remove most part

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of the amplifier spontaneous emission (ASE) noise and the background noise. The DSB-SC signal and OC are spilt into the upper and bottom arms respectively by the polarization splitter, which shown in Fig. 4 in the condition that polarization combiner and polarization splitter have same device angle θ. Two linear polarizers with identical transmission axis

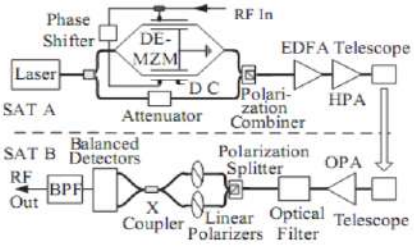

Fig. 3. Architecture of inter-satellite microwave photonic link. DC, direct current bias; EDFA, erbium-doped fiber amplifier; HPA, high power amplifier; OPA, optical pre-amplifier; BPF, band-pass filter. [3]

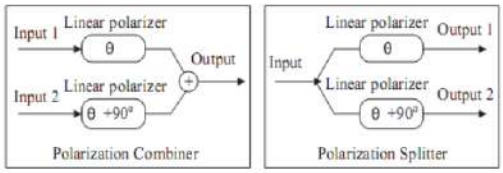

Fig. 4. Models of polarization combiner and polarization splitter. [4]

which halve the two directions of polarization splitter are placed following the splitter. The modulated optical signal and OC prior to the X coupler have same polarization direction and coherent detection can be realized without a LO in the receiver. The RF signals are obtained by using two balanced square law photo-diodes and a selective electrical BPF.

IV. LEO SATELLITES NETWORKS:

LEO satellite systems that are currently under various phases of development maintain either Earth-fixed cells (such as the Teledesic satellite network [1]) or satellite-fixed cells (Fig. 5). Earth fixed cells are cells wherein stationary cells on the earth are dynamically served by LEO satellites moving to within the range of the cell. On the other hand, satellite-fixed cells refer to dynamically moving satellite footprints and the affiliation of an individual user changes from cell to cell in time. A user might be handed off from one satellite to another multiple times during the lifetime of a connection. In satellite networks with Earth-fixed cells, users are periodically handed off from one satellite to another that takes its place to serve the users cell as long as users remain in their cell. These handoffs are of minor concern, since all the calls in the same cell are transferred from the outgoing satellite to the incoming satellite. Thus, if

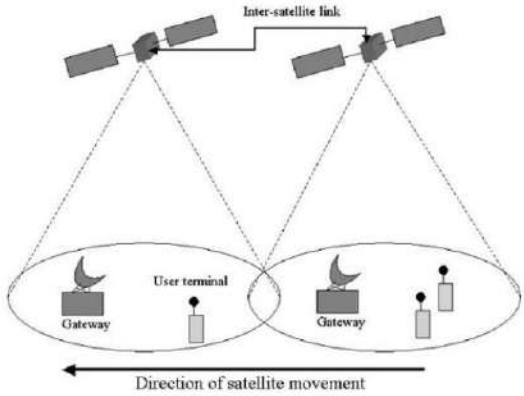

Fig 5. Wireless communications via LEO satellite networks. [1]

the outgoing satellite accommodated these calls, the incoming satellite can still accommodate them. If the users are mobile, then ongoing connections might have to be handed off to another satellite when the users of these connections change their Earth-fixed cells. Thus, apart from periodic handoffs among satellites, mobility affects satellite networks with Earth-fixed cells in a manner similar to the terrestrial cellular networks. In LEO satellite systems with satellite-fixed cells, due to the movement of the satellite footprint, the number of users in a cell and the traffic served by each satellite changes in time. The inherent mobility of the satellites may cause problems in maintaining the user connections. We consider connections that require certain quality of service (QoS) requirements as associated with real time voice and/or video or other sustained connections and we refer to such connections as calls. If the source traffic has a certain arrival profile, it is desirable that the received traffic at the destination follows this profile as closely as possible in order that the real-time video or audio can be played back with acceptable quality. An ongoing call may be dropped during handoff, due to the non availability
of a user-to-satellite uplink/downlink channel. If the connection has strict QoS requirements, such as a delay or a delay jitter bound, it may be blocked even if user-to-satellite channels are available, since there might be no route with adequate resources from the satellite entry to the satellite egress point on the LEO network. This is especially true for satellite networks with RF ISLs rather than optical ISLs, where the capacities of the links are comparable to the ground-satellite link capacity. Provision of guaranteed service relies on the reservation of a specific amount of bandwidth for each call on the links connecting the communicating end-users [10]. For example, in terrestrial broadband networks, a route for a particular connection between two end-users is determined based on available bandwidth on various network links at the time of call set-up. This particular route is used for the entire call duration. In LEO satellite networks the traffic

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on the ISLs also change with changes in the user-to-satellite traffic (which in turn changes both due to dynamic user traffic patterns and the mobility of the satellites). Hence, traditional terrestrial routing protocols cannot be applied to broadband LEO satellite networks. Although sufficient bandwidth may be available on a particular route at call set-up for a particular call, the same route may become congested in time due to the changes in access traffic loads which in turn are changing due to the mobility of the satellites.

CONCLUSION

It can be concluded that IsOWC can be used to connect one satellite to another, whether the satellite is in the same orbit or in different orbits and data can be sent at speed of light without much delay and with minimum attenuation since the space is considered to be vacuum. Satellite networks remain an important component of the network infrastructure for both developing and developed countries. Satellite networks are attractive to support data, audio and video streaming; bulk data transfer such as software update or dissemination of Web caches, and applications involving limited interactivity such as distance learning.

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Mathematical Morphology Based Novel Edge Detector

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***Abstract*— A new edge detector based on mathematical morphology to preserve thin edge features in low-contrast regions as well as other apparent edges is proposed. This method is based on multi-structure elements morphology of eight different directions. We got five different edge detection results, then opening, closing, top hat transform and bottom hat transform is used to get final results. The experimental results showed that the proposed algorithm is more efficient for edge detection than conventional mathematical morphological edge detection algorithms and differential edge detection operators.**

***Index Terms* –Dilation, Erosion, Opening, Closing, Edge, Morphology.**

I. INTRODUCTION

Edge detection is a fundamental and essential pre-processing step in applications such as image segmentation and computer vision, because edges represent important contour features in the corresponding image. Over the years, many approaches have been proposed to extract the contour features in an image. For example, the Sobel detector [1] used local gradient operators, which were capable of detecting edges having high spatial frequencies and certain orientations only. The Sobel detector produced poor results when the edges in an image were burred and noisy. The Prewitt operator [2] was proposed to extract contour features by fitting a least-squares-error (LSE) quadratic surface over a 3×3 image window and differentiate the fitted surface. The Canny edge detector [3] was a multiple-stage algorithm, which used Gaussian convolution technique first to smooth the image, and then measured the gradient properties in the image by a set of Robert's cross convolution masks. The Laplacian operator [3] used a second-order differential operator to find edge points based on the zero-crossing properties of the processed edge points. Most of the previously proposed edge detectors were based on utilizing a set of convolution masks to treat the image, and then applying a global threshold to transform the image into a binary edge image for further processing. When a global threshold was applied to extract the edge points in an image, a common disadvantage found in the above-mentioned approaches was that some thin edge details in the image were eliminated, for example, fine intensity differences in low-contrast regions (where the brightness was too dark or too bright). However, fine intensity differences in the image might represent important contour features. The further processing algorithms might perform poorly or misconduct the results improperly if these thin edge details were pruned. Mathematical morphology theory [4] has been utilized as the basic theory of many newly proposed edge detectors for distinguishing contour features in an image. Trujillo [5] used a 3×3 mask to produce a gradient image to extract the contour features of an image, which is somewhat similar to the morphological residue edge detector. However, Trujillo's edge detector may misclassify some undesired edge features. Chen et al. [6] proposed a pseudo top-hat mathematical morphological operator to extract thin edge features of an image with reasonable performance. Chanda et al. [7] proposed a modified morphology-based edge detector, but it can capture only contour features with some specific orientation, and the extracted edge features might be fractal or discontinuous. Many other researchers also found that the mathematical morphology theory was very useful in many image and video processing applications, such as image matching [8, 9] and video de-interlacing [10]. Hence, the morphological dilation residue edge detector was utilised to extract the contour features in this work. In this work, a novel mathematical-morphology-based edge detector is proposed to extract thin edge features in the low contrast regions of an image.

II. BASIC THEORY OF MATHEMATICAL MORPHOLOGY

When G. Matheron and J. Serra were engaged in the iron core nuclear analysis of quantitative rock, through in-depth research and the expansion, they built the mathematical morphology which is a rising subject based on strict mathematical theory. The basic ideas and methods are to obtain topological structure information, to gain the more essential shape through some operations of the interaction between object and structuring elements. Images can be observed and processed to achieve the purpose of improving image quality by the basic operations; moreover, each kind of geometric parameter and characteristics can be described and defined such as area, perimeter, connectivity, particles, skeleton, directivity, etc. Morphological image processing has been a major research field of image processing [4]. Mathematical morphology is used to study geometric

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structure of images. The basic idea above is to apply a structuring element to detect an image, to see whether the structuring element can be filled in the internal of the image well and to validate the validity of the method. The mathematical foundation of morphology and all languages used is set theory which is composed of a group of algebraic calculation. The four basic operations are dilation, erosion, opening and closing. These basic operations are used to process binary image.

(A) DILATION AND EROSION

Dilation and erosion are fundamental to morphological processing. In fact, many of the morphological algorithms are based on these two primitive operations.

(1) Dilation

With A and B as sets in Z^2(binary image), the dilation of A by B denoted A⊕B, is defined as

$$A \oplus B = \{z | (\hat{B})_Z \cap A \neq \emptyset\} \quad (1)$$

The equation (1) is based on obtaining the reflection of B about its origin and shifting the reflection by Z.the dilation of A by B is set of all displacements Z,such that B and A overlap by atleast on element. Based on this interpretation, equation (1) may be rewritten as

$$A \oplus B = \{z | [(\hat{B})_Z \cap A] \subseteq A\} \quad (2)$$

Set *B* is commonly referred to as the structuring element in dilation, as well as below morphological operations.

(2) Erosion

For sets A and B in Z^2 , the erosion of A by B,denoted AΘB,is defined as

$$A \Theta B = \{z \mid (B)_z \subset A\} \quad (3)$$

In conclusion, the equation (3) indicates that the erosion of A by B is the set of all points Z such that B,translated by Z,is contained in A.

Dilation and erosion are duals of each other with respect to set complementation and reflection.

$$(A \Theta B)^c = A^c \oplus \widehat{B} \quad (4)$$

(B) Opening and Closing

As can be seen from the equation (1) and (3), dilation expands an image and erosion shrinks it. Two other important morphological operations are opening and closing. Opening generally smoothes the contour of an object, breaks narrow isthmuses, and eliminates thin protrusion. Closing also tends to smooth sections of contours but, as opposed to opening, it generally fuses narrow breaks and long thin gulfs, eliminates small holes, and fills gaps in the contour. The opening of set *A* by structuring element B, denoted A∘B, is defined as

$$A \circ B = (A \Theta B) \oplus B \quad (5)$$

Thus, the opening *A* by *B* is the erosion of A by B , followed by dilation of the result by B .Similarly, the closing of set A by structuring element B denoted as A•B is

$$A \bullet B = (A \oplus B) \Theta B \quad (6)$$

In words says that the closing of A by B is simply the dilation of A by B followed by erosion of the result by B.

III. PROPOSED EDGE DETECTOR

In the section, a novel multi-structure elements morphology algorithm is proposed to detect the edge of image. the detailed procedure of working of proposed detector is explained below.

A. The Choosing of Structure Elements

The choosing of structure element is a key factor in morphological image processing. The size and shape of SE decide the final result of detected edges. The basic theory of multi-structure elements morphology is to construct different structure elements in the same square window. And these structures elements comprise almost all the line extending directions in the square window.

In the proposed algorithm, following structure elements are used to get the final edge map.

B1= [0,1,0;1,1,0;0,0,0]; B2 = [0,1,0;0,1,1;0,0,0];

B3= [0,0,0;0,1,1;0,1,0]; B4= [0,0,0;1,1,0;0,1,0];

B5 = [1, 0, 1; 0, 1, 0; 1, 0, 1];

Diagrammatically:

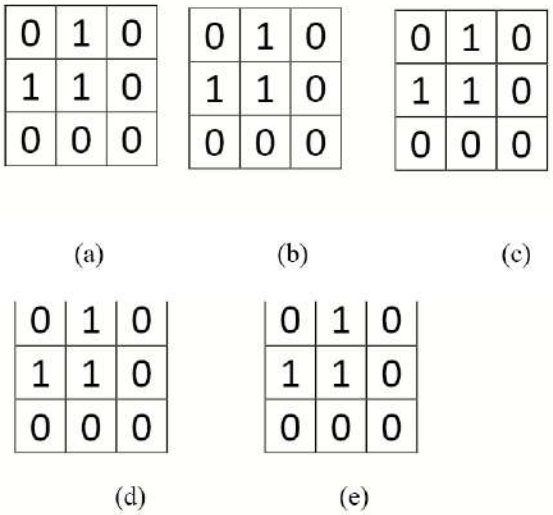

Fig.1. Structure Elements used in PA

B. Multi-structure elements morphological edge detection algorithm

In the following, we will propose multi-structure elements morphological edge detection algorithm.

Step-1: Input: Load/Acquire the image.
Let 'I' is acquired image.

Step-2: If 'I' is RGB, convert 'I' to gray scale image.

Step-3: Get three edge maps (i.e. E1, E2, and E3) by applying directional structure elements (B1, B2, B3, B4 and B5) on 'I'.

$E1 = \sum_{i=5}^{5}\{((M \bullet B_i) \oplus B_i) - (M \bullet B_i)\}$

$E2 = \sum_{i=5}^{5}\{(M \bullet B_i) - ((M \bullet B_i) \ominus B_i)\}$

$E3 = \sum_{i=5}^{5}\{((M \bullet B_i) \oplus B_i) - ((M \bullet B_i) \ominus B_i)\}$

Where $M = (I \bullet B_i) \circ B_i$

Step-4: $E_f = E1+E2+E3$

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Step-5: Get Top-Hat Transform of E_f with Z

$$E_{tf} = E_f - (E_f \circ Z)$$

Where Z is standard 'diamond' structure element of radius '1'.

Step-6: Bottom-Hat Transform of edge map E_f with Z is

$$E_{bf} = (E_f \bullet Z) - E_f$$

Step-7: $E_{hf} = E_f + E_{tf} - E_{bf}$

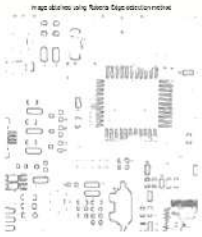
Step-8: Apply Thresholding technique to get binary image from E_{hf} image.

Step-9: Apply thinning algorithm on binary image (obtained in Step-(8)) to get single pixel wide edges.

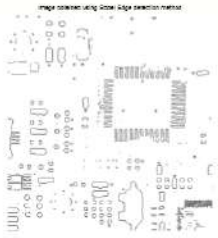
IV. EXPERIMENT RESULTS AND ANALYSIS

In this section, the proposed multi-structure elements morphological edge detection algorithm is compared with a variety of existing edge detection methods. Fig.2(a) is the original Cameraman gray-scale image with 256 gray-scale levels. Fig.2(b), Fig.2(c), Fig.2(d) and Fig.2(e) are the results of processed original Cameraman image after respectively applying Sobel edge detector, Laplacian of Gaussian (LOG) operator, Prewitt edge detector and Canny edge detector. Fig.2(f) and Fig.2(g) are the results of Canny and proposed algorithm. Proposed algorithm processed original Cameraman image by respectively applying single and symmetrical morphological edge detect operator with 3×3 SE as shown in Fig.1(a to e). Fig.2(g) is the result of processed original Cameraman image by the novel multi-structure elements morphological edge detection algorithm proposed in this paper.

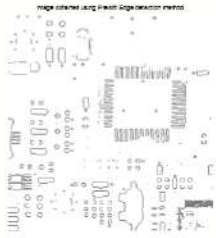
(a) Original Cameraman Image



(b) Image obtained using Roberts Edge detection method

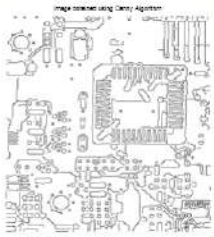


(c) Image obtained using Sobel Edge detection method

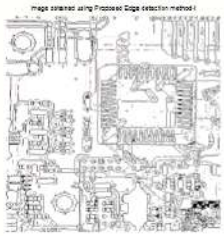


(d) Image obtained using Prewitt Edge detection method

(e) Image obtained using LOG operator



((f) Image obtained using Canny Algorithm



(g) Image obtained using Proposed Edge detection method

Fig.2. Edge detected from Cameraman Image by various edge detectors (a) Original Cameraman Image (b) Edge detected by Robert operator (c) Edge detected by Sobel operator (d) Edge detected by Prewitt detector

According to the experiment results shown in Fig.2(c), Fig.2(d) and Fig.2(e), differential operations such as Prewitt operator, Sobel operator and LOG operator can't detect the edge integrally and continually, and sometimes even anamorphicly like LOG operator. Though Canny operator detects the edge more continually as shown in Fig.2 (f), it can't differentiate the edge from noise. By Fig.2 (g) structure element morphological edge detection operator can detect the edge details better than differential operators, but they can't filter the noise or detect integral edge. As shown in Fig.2(g), the edge detected by the novel multi-structure elements morphological edge detection algorithm proposed in this paper is more pinpointed, integral and continual than the edge detected by other operators mentioned in this paper, and the edge information is more abundant, which can be learnt from the detected edges of buildings and fingers. Moreover, the novel proposed algorithm can filer the noise more successfully than other operators mentioned above.

V. CONCLUSIONS

In this paper, a novel multi-structure elements morphological edge detection algorithm is proposed to detect image edge. The mathematical morphological edge detection algorithm is derived from the basic morphological operations. The proposed algorithm is able to detect the features in low-contrast regions, and preserve them as well as other apparent edges. To demonstrate the performance of the proposed algorithm, comprehensive comparisons between well-known approaches and the proposed algorithm were carried out. Experimental results show that the proposed algorithm outperforms other edge detection methods in detecting detailed edge features and thin edge features in dark regions.

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Using the proposed algorithm, these thin edges can be preserved as well as other apparent edges even though the image is blurred or disturbed by noise.

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Microwave Application in Power Transfer For Wireless System

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***Abstract*—Energy saving has always been a critical issue in wireless communication system as researcher keeps on presenting various approach for this vital issue. The present paper is a review report using the concept of wireless charging of mobile phones using microwaves transmitting power that could reduce the transmission and distribution losses which is the major issue these days. A new approach has been proposed to make the recharging of mobile phones automatically as you talk in your phone with minimal additions that have to be made in mobile phones.**

***Keywords*—Antenna, Microwave Power Transmission (MPT), Rectenna, Receiver, Rectification, Transmitter, Wireless Power Transmission (WPT).**

I. INTRODUCTION

Wireless communication is extensively used for the exchange of information with it numerous advantages over the wired communication it has been adopted world wide. Wireless operations permit both services, long-range communications as well as short-range communication. Long-range, that are impossible or impractical to implement with the use of wires. The term is commonly used in the telecommunications industry to refer to telecommunications systems such as radio transmitters and receivers, remote controls etc. which use some form of energy to transfer information without the use of wires. Cellular service using global system of mobile service (GSM), Coded division for multiple access (/CDMA) standards, Wireless local area network (WLAN), Bluetooth etc are few of the wireless applications which are being used these days. The sign power gets transferred from one place to the other in this system so it is to be noted that the major issue in power transmission is the losses that occurs during the transmit session and distribution of electrical power.

The main reason for power loss is the resistances of wires used for grid. The efficiency of power transmission can be improved to certain level by using high strength composite over head conductors and underground cables that use high temperature super conductor. But he transmission is still inefficient.

The above said problem can be solves by choosing an alternative option for power transmission which could provide much higher efficiency and low transmission losses. Microwave power transmission may be the righteous alternative for power transmission. This paper represents the use of microwave for wireless charging of mobile. S. Sheik Mohammed [1] detected that this concept offers greater possibilities for transmitting power with negligible losses. Abdul kadir [2] used this approach for long range power transmission, power can be sent instantaneously from source to receivers without wires. M.Shah [3] concluded that the transmission of power without wires is not a theory or a mere possibility, it is now a reality. Zied Harouni [4] detected that no input low pass filter is needed, thus reducing the insertion losses and the dimensions of the circuit. The purpose of this work is to propose an efficient micro strip Rectenna operating on ISM band with high harmonic rejection.

The Rectenna[5] with integrated circular sector antenna can eliminate the need for an low pass filter (LPF) placed between the antenna and the diode as well as produce higher output power, with maximum conversion efficiency of 74% using a 1300 Ω load resistor at a power density of 0.3 mW/cm². A Rectenna may be used to convert the microwave energy back into electricity. Rectenna conversion efficiencies exceeding 95% have been realized[6]. Wireless power transmission is well proven. [7]-[9]Experiments in the tens of kilowatts have been performed.

A. Wireless power transfer system

The block diagram for power transfer using Microwave signal shown in the figure1, consists of two sections that are transmitting section and receiver section. Transmitting section, at the transmitting end there is one microwave power source which is actually producing microwaves. Which is attach to the Coax-Waveguide and Tuner is the one which match the impedance of the transmitting antenna and the microwave source. Directional couplers are used for the propagation of signal in a particular direction. It spread the Microwaves in space and sent it to the receiver side. Receiver side Impedance matching circuit receives the microwave signal through Rectenna circuit. This circuit is nothing but the combination of filter circuit and the schottky Diode. The basic work of this circuit is to convert microwave energy into the DC power.

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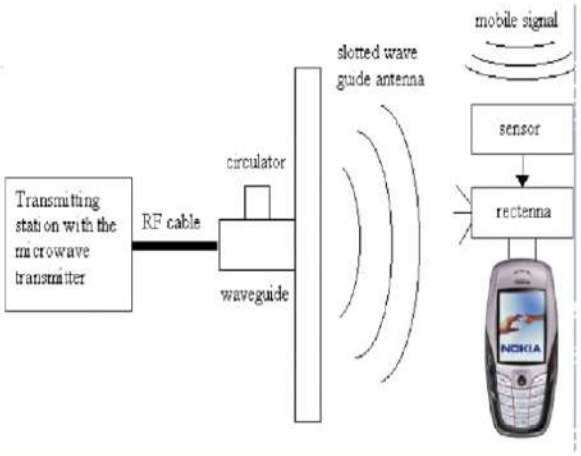

Figure 1. Block Diagram[12]

With the above setup the need of separate chargers is eliminated thus making the charging universal. The microwave signal is transmitted along with the message signal from the transmitter using special kind of antennas known as slotted waveguide antenna at a frequency of 2.45GHz.

B. Components of WPT system

The main components of wireless power transmission system are microwave generator, transmitting antenna and Rectenna that is receiving antenna. The components are described as follows.

a) Microwave Generator: The microwave transmitting devices are classified as Microwave Vacuum Tubes (magnetron, klystron, Travelling Wave Tube (TWT), and Microwave Power Module. Magnetrons are capable of delivering high levels of microwave power and are suitable for our application. When operated in pulsed mode they can generate several megawatts of power in microwave region. The microwave transmission often uses 2.45GHz or 5.8GHz of ISM band. Figure 2 shows the magnetron[11].

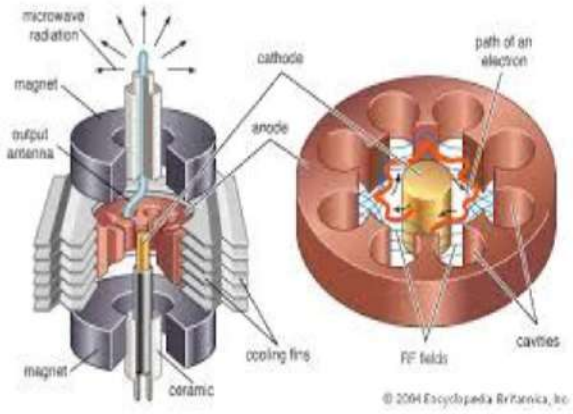

Fig.2. Magnetron[11]

b) Transmitting antenna: The slotted waveguide antenna as shown in figure 3 is ideal for power transmission because of its high aperture efficiency (> 95%) and high power handling capability. Designed frequency is 2.45 GHz. They are enough to transmit or to receive 2.45 GHz microwave power.

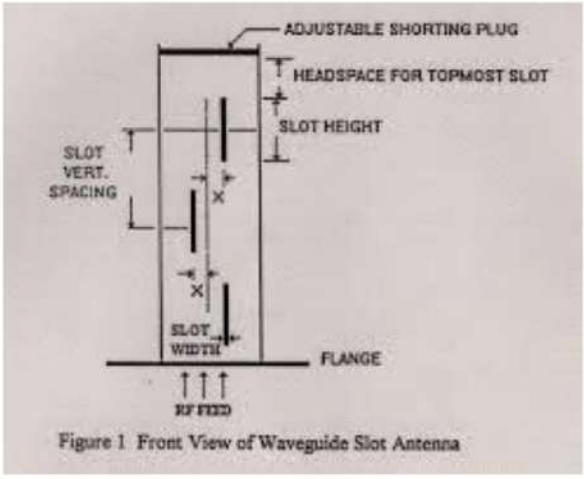

Fig.3. Slotted waveguide antenna[10]

c) Receiving antenna (Rectenna): The Rectenna is a passive element consists of antenna, rectifying circuit with a low pass filter between the antennas and rectifying diode. Figure 4 shows the Rectenna. The antenna used in Rectenna may be dipole, Yagi – Uda, micro strip or parabolic dish antenna. (Image).The Rectenna shown in Figure below consists of 6 rows of dipole antenna where 8 dipoles belong to each row. Each row is connected to rectifying circuit which consists of low pass filters and Rectifier.

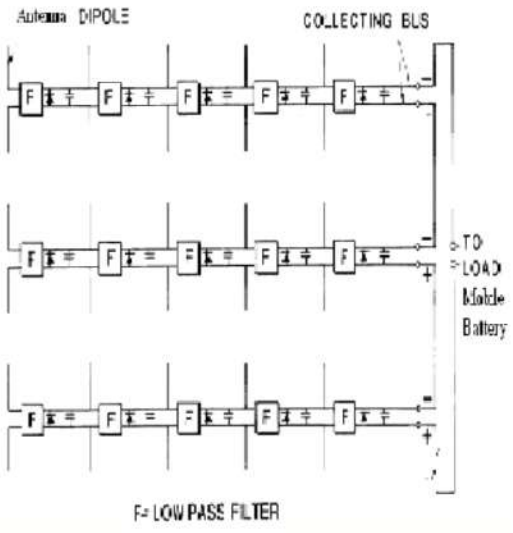

Fig.4. Rectenna[13]

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The power received by a receiver antenna which is separated from a radiating transmitter antenna by a distance d is given by frisks free space equation 1.

$$P_r(d) = P_t G_t G_r \lambda^2 / (4\pi)^2 d^2 L \quad (1)$$

Where $P_r(d)$ is received power, P_t is transmitted power, G_t is receiver antenna gain, d is T-R separation distance in metres,and L is system loss factor

The gain of an antenna is related to its effective aperture, A_e by

$$G = 4\pi A_e / \lambda^2 \quad (2)$$

The effective aperture A_e is related to the physical size of antenna and λ is related to carrier frequency by

$$\lambda = c/f = 2\pi c / \omega_c \quad (3)$$

Where f is the carrier frequency in Hertz, ω_c is the carrier frequency in radians per second and c is the speed of light given in metres/s.

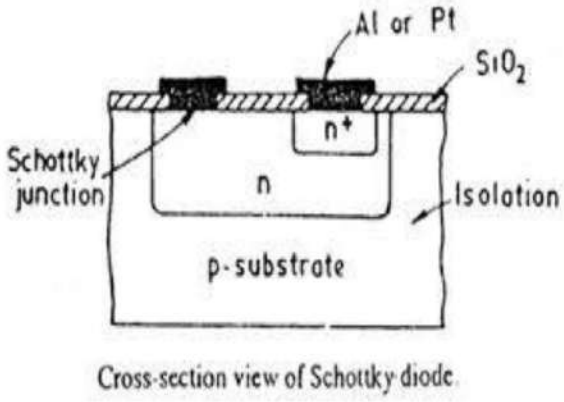
The efficiency of wireless power is the ratio between power that reaches the receiver and the power supplied to the transmitter and is expressed as:

$$\eta = Pr(d) / P_t \quad (4)$$

This kind of setup could power or recharge all the devices in one room. Some modifications would be necessary to send power over long distances, like the length of a building or a city.

II. THE PROCESS OF RECTIFICATION

This study consists of designing and simulating a single diode rectifier in hybrid technology with improved sensitivity at low levels. Microwave energy transmitted from space to earth has the potential to provide environmentally clean electric power on very high scale. The main aim to study is to make a low cost power rectifier for low and high power levels at 2.45 GHz frequency. The study is divided on two kind of technology the first is hybrid and second is monolithic .The first of the circuit is based on optimization of rectifier to have good matching of input impedance at the desired frequency 2.45ghz.The second is to increase the detection sensitivity at low levels of power. The schottky barrier diode is an ideal diode, such as for a 1 ampere limited current PN interface. Another advantage of the schottky barrier diode is a very low noise index that is very important for a communication receiver; its working scope may reach20GHz. Figure 5 shows the cross section view of schottky diode.



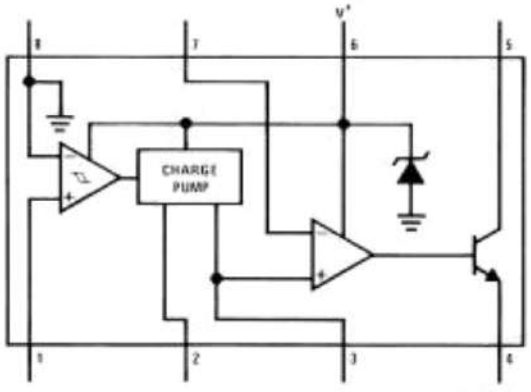
Cross-section view of Schottky diode

Fig.5. Schottky Diode[14]

Schottky diodes are made of single type of doping material. Hence based of majority carrier conduction mechanism enabling high frequency switching (microwaves are of high frequency). Though it consumes more power than other diodes, it suits our application and provides high frequency.

III. SENSOR CIRCUITRY

The Block Diagram of LM2907 is shown as in figure 6.The main task of sensor circuit is to check that whether the mobile phone is being charged with microwaves or not! The sensor circuit is a simple circuit which detects if mobile phone receives any message signal or call alert. This is required, as phone has to be charged as long as the user is talking. Thus a simple F to V converter will serve our purpose. In India the operating frequency of the mobile phone operators is generally 900MHz or 1800MHz for the GSM system for mobile communication. Thus the usage of simple yet powerful F to V converters would act as switches to trigger the Rectenna circuit to on. Thus on the reception of the signal the sensor circuitry directs the Rectenna circuit to ON and mobile phone begins to charge using microwave power.



Block diagram of LM2907[15]

Fig.6.

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CONCLUSION

The transmission of power without wires is not a theory or mere a possibility, it is now a reality! This paper successfully demonstrates that the novel use of Rectenna and sensor could provide a new dimension in revelation of mobile phones. The main advantage of this technique is that the users can carry their mobile phones anywhere even if the place is devoid of facilities for charging.

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Microwave Imaging for Breast Cancer Detection vs. Traditional Methods

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Abstract **– Breast Cancer is a malignant tumor that starts from cells of the breast. A malignant tumor is a group of cancer cells that may grow in to surrounding tissues or spread to distant areas of the body. The disease occurs almost entirely in women, but men can get it, too. Breast cancer is one of the most common types of cancer in women worldwide and this is a disease can be most efficiently treated if detected at an early stage. For early detection a regular checkup need to be done and mammography is one of the most important diagnosing tool. This paper studies various techniques used for the diagnosis of breast cancer. There are various different methods are employed for their merits and de-merits for the diagnosis of breast cancer cell. The present paper describes several new methods for extracting estimates of the operational delectability of breast cancers, especially the sizes at which breast cancers become operationally detectable by mammography, the sizes at which these tumors become operationally detectable in the absence of mammography, and how these aspects of delectability vary from woman to woman.**

Key words **- Breast Cancer, Mammogram, Mammography, Screening, Ultra wideband imaging.**

I. INTRODUCTION

Breast cancer is the second most dangerous disease in women worldwide, the risk increasing with the age[1]. Breast cancer affects not only women but also men and animals too. Only 1%of all the cases are found in men. There are two types of breast lesions-malignant and benign.10%-30%of the breast cancer lesions are missed because of the limitations of the human observations which is very useful in detecting early and accurate diagnosis is essential for patient's timely recovery [2]. Generally, biopsy was used for the diagnosis, nowadays mammography; breast Magnetic resonance imaging (MRI) ultrasonography, testing etc are done. These tests are not always capable to tell the difference between dense breast tissue, benign (non-cancerous) lumps and cancer [3]. Sometimes they may miss tiny calcium deposits that may be an early sign of an tumor. In some cases, screening tests can cause a "false positive". This could lead to more tests. A false positive is when a test finds something that looks like cancer, but actually it is not.[4]. Despite their limitations, these tests play a very important role in breast cancer detection and diagnosis as well. Early stages of breast cancer and early stages of this disease is asymptomatic. If we should face any of the symptoms given below, it is important that we must follow up with our physician. If there will be Change in the size or shape of the breast, nipple discharging take place, include bleeding, nipple pain or itching, change the color of the skin, thickening in the breast. it all depend upon the stages of cancer, if cancer is detected the surgeon first of all determine the staging of the cancer[5].

Cancers are staged on a Roman numeral scale, I-IV, where the higher stages represent a more advanced cancer [6].

Stage 0: Presence of abnormal cells in breast ducts.

Stage 1: There are cancer cells but not spread to lymph nodes.

Stage 2 : These cancers are invasive and measure about 2-5cm in size and have spread to nearby lymph nodes under arm.

Stage 3: These cancers are invasive and locally advanced and its size should be more then 5cm.

Stage 4: At this stage cancer has to spread to other parts of the body. Although there are various options of treatment of breast cancer patients, which may include surgery, radiation therapy or chemotherapy.

The present paper depicts the application of microwave imaging using ultra-wide band (UWB) method for the detection of breast cancer, the image may also be generated by applying the various image processing techniques like, Back projection, Beam forming, Sum &Delay, Omega-k .

II. PRE-PROCESSING

These steps are to identify the various methods employed for the detection of breast cancers diagnosis.

A. Ultrasound(sonogram)

Ultrasound machine as shown in Fig.1 uses sound waves to make images of the breast. It is often used as a follow-up test after an abnormal finding on a mammogram, breast MRI or clinical breast examination. Ultrasound is mostly used on pregnant women to monitor the progress of the growing baby

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[6]. When used on the breast, it can tell the difference between types of lumps, such as liquid-filled cysts or a solid mass. Doctors use this to find out the size, shape, texture and density of a breast lump. It also identifies the solid and liquid-filled cysts by rotating equipment on the breast.

Fig.1 Ultrasound machine [9]

B. Breast MRI

A breast MRI machine as shown in Fig.2 uses magnetic fields to create an image of the breast. It can sometimes find cancers in dense breasts that are not seen on mammograms. Breast MRI is often used with mammography for screening some women at a very high risk of breast cancer [6]. However, it can be costly and often finds something that looks abnormal, but turns out to be benign (false-positive).Some time it also detect cancer at beginning stage which is just starting of the disease.

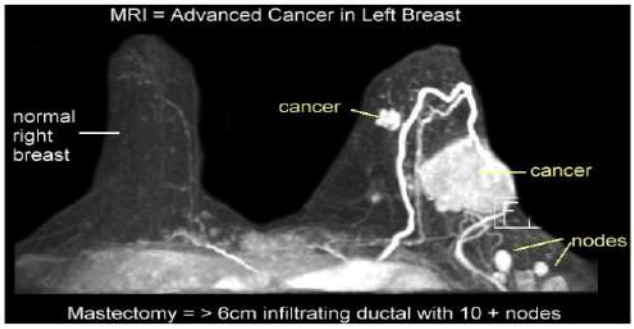

Fig.2 Breast MRI [10]

C. Scintigraphy

It is also called as scintimammography, machine as shown in Fig.3. This is one of best technique with certain disadvantages. This test uses a special camera to show where a tracer (a radioactive chemical) has collected inside a tumor [6]. It can sometimes find cancers in dense breasts that are not seen on mammograms A scanner is then used to see if the breast lump has picked up more of the radioactive material than the rest of the breast tissue. It also identifies the solid and liquid-filled cysts by stationary equipment on the breast.

Fig.3 Scintigraphy [14]

D. Stereotactic Imaging

This special type of mammography machine as shown in Fig.4 is used during a biopsy. After mammogram images locate the exact area of concern, a computer merges the pictures to make a 3D (3 Dimensional) image of the breast [6]. The image is used to guide a biopsy needle to the suspicious area of the breast. In this technique, the exact area of concern as well as position of the breast cancer spots can be identified or visualized.

Fig.4 Stereo static Imaging [12]

E. Lymphatic mapping

This test also uses a special camera as shown in Fig.5 and scanner to see where a tracer has collected. it is used to locate sentinel lymph nodes for cancer staging.

Fig.5 Lymphatic Mapping [11]

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F. *PET Scan*

PET machine as shown in Fig.6.Cancer cells grow faster in comparison with other cells, so they use energy faster, too. To measure how fast glucose (the body's fuel) is being used, a tracer is injected it to the body. The body is then scanned with a positron emission tomography (PET) machine which is also called as positron emission mammography (PEM). The PET machine is used up faster in certain places, it may show the presence of cancer.

Fig.6 PET Scan [8]

G. *Mammography*

Mammography machine as shown in Fig.7.Mammography is the process of using low-energy X-rays (usually around 30 kVp) to examine the human breast and is used as a diagnostic and a screening tool. The goal of mammography is the early detection of breast cancer, typically through detection of characteristic masses [15]. Mammography has a false-negative (missed cancer) rate of at least 10 percent. This is partly due to dense tissues obscuring the cancer and the fact that the appearance of cancer on mammograms has a large overlap with the appearance of normal tissues. A meta-analysis review of programs in countries with organized screening found 52% over-diagnosis. The use of mammography as a screening tool for the detection of early breast cancer in otherwise healthy women without symptoms is controversial. Doctors suggested that repeated mammography starting at age 50 saves about 1.8 lives over 15 years for every 1,000 women screened. This result has to be seen against the negatives of errors in diagnosis, overtreatment, and radiation exposure. Mammography may also produce false negatives. Estimates of the numbers of cancers missed by mammography are usually around 10%–30%. This means that of the 350 per 100,000 women who have breast cancer, about 35–105 will not be detected by mammography. Reasons for not seeing the cancer include observer error, but more frequently it is because the cancer is hidden by other dense tissue in the breast and even after retrospective review of the mammogram, cannot be seen. Furthermore, one form of breast cancer, lobular cancer, has a growth pattern that produces shadows on the mammogram which are indistinguishable from normal breast tissue.

Fig.7 Mammography [13]

III.MICROWAVE IMAGING SYSTEM

Microwave ultra wide band antenna is used for mammography. The real time data is obtained by applying Bscan. Bscan refers to the various horizontal positions of the horn antenna. Bscan using horn antenna as shown in Fig.8 has four horn antennas which are utilized for capturing the image from the model of cancerous breast by the signal transmission and receiving process.

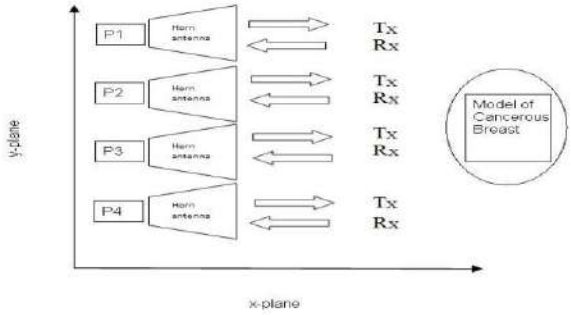

Fig.8 Bscan using horn antenna

Ultra-Wideband (UWB) technology is loosely defined as any wireless transmission scheme that occupies more than 25% of a centre frequency, or more than 1.5GHz.The high data rates afforded by UWB systems tend to favour applications such as video distribution or video teleconferencing for which Quality of Service (QoS) is very important.

Bscan data in matrix form as shown in Fig.9 represents the antenna positions of the subject in matrix form. Here P1, P2, P3, P4 represent the positions of the antenna.

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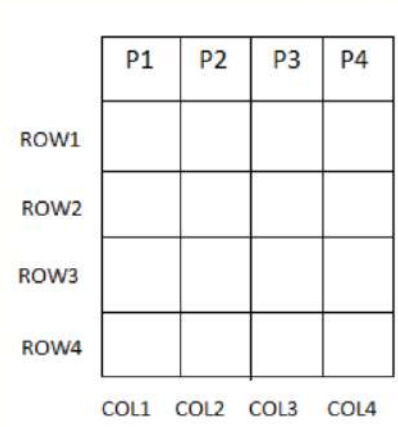

Fig.9 Bscan Data in Matrix Form

The advantages of UWB include its low cost, the use of non-ionization radiation and the ability to image the bulk electromagnetic properties of the tissue which cannot be easily done by other modalities.The data which is obtained in a matrix form further filtering is applied to remove the platters and unwanted signals. It is to be noted that digital signal processing technique along with microwave UWB radar is an upcoming applicable technology in the field of medical sciences. Ultra-wideband is a technology for transmitting information spread over a large bandwidth >500 MHz this should, in theory and under the right circumstances, be able to share spectrum with other users. Further the following imaging algorithms may be applied to generate the 2D-image of the breast:

1. Back Projection
2. Beam Forming
3.Sum & Delay
4.Omega-k

Once the 2D-image of the breast infected by the cancer is generated then a lot of information can be gathered by applying various methods and techniques can be used for analysis of the pattern of the malignant cell.

IV. CONCLUSION

All women above the age of 45-50 years must ensure schedule yearly check-ups. However for mass screening purpose the existing breast imaging methods such as x-ray Mammography and MRI are not suitable. Due to the use of ionizing radiations in x-ray mammography, it is not advisable for frequent check-ups. Besides, it requires significant breast compression, which is often painful.MRI is too expensive and time consuming. Ultrasound is consider to be too operator dependent and of low specificity is one of the most common method for early cancer detection. The various methods employed have given very good performance. In this paper we have studied various techniques but the early detection and self examine are better methods to detect the breast cancer diagnosis. Our future work is to design and develop an expert system for real time mammogram image analysis. The system so designed would give the exact shape and size of any tumor present in the breast.

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Noise and Its Influence on Edge Detection

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***Abstract*— This paper presents the overview of edge, edge detection and affect the noise on edge detection. Source of noise in image processing are also explained with the help of block diagram. An example of Lena image is presented to elaborate the need of suppression of noise prior to edge detection and extraction process.**

***Index Terms*—CCD, Edge, Gaussian, Image, Impulse, Noise.**

I. INTRODUCTION

Image processing is a rapidly growing area of computer science. Its growth has been fueled by technological advances in digital imaging, computer processors and mass storage devices. Image processing has got wide varieties of applications in computer vision, multimedia communication, television broadcasting, etc. that demands very good quality of images. The quality of an image degrades due to introduction of noise during acquisition, transmission/ reception and storage/ retrieval processes. It is very much essential to suppress the noise in an image and to preserve the edges and fine details as far as possible. In this paper, basic about edge, edge detection and affect of noise on edge detection are presented and discussed.

II. WHAT IS EDGE AND EDGE DETECTION?

A very important goal of computer image analysis and processing is to generate some particular images that are more suitable for people or machines to observe and identify. Image edges are the most basic features of an image. The so-called image edge refers to the most prominent part of partial intensity changes in images. The edges that exist on between the main objectives and goals, objectives and background, regional and regional (including different colors), are the important basis of image analysis and processing such as the image segmentation, texture and shape characteristics[5]. The results of detection directly affect the completed quality of the follow-up image processing [6].

In simple words, edge detection is a process which attempts to capture the significant properties of objects in the image. These properties include discontinuities in the photometrical, geometrical and physical characteristics of objects. Such information give rise to variations in the grey level image; the most commonly used variations are discontinuities (step edges), local extrema (lines edges), and 2D features formed where at least two edges meet (junctions) [1].

The basic idea of image detection is to outstand partial edge of the image making use of edge enhancement operator. Then we define the 'edge intensity' of pixels and extract the set of edge points through setting threshold. But the borderline detected may produce interruption as a result of existing noise and image dark. Thus edge detection contains the following two parts:

(a) Using edge operators the edge points set are extracted.

(b) Some edge points in the edge points set are removed and a number of edge points are filled in the edge points set. Then obtained edge points are connected to be a line.

There are many methods of edge detection, traditional method adopt edge detection operator to solve two dimensional real function, then selecting proper threshold to extract edge, the commonly used operators are Roberts, Prewitt, Sobel, Differential, Log, Canny operators and Binary morphology etc. when image is in the condition without noise interruption, these operator could provide perfect edge[2]. But, actually noise existed and these operators are inefficient to detect the edges from noisy images.

III. INFLUENCE OF NOISE ON EDGE DETECTION

An image gets corrupted with different types of noise during the processes of acquisition, transmission/ reception, and storage/ retrieval. Fig.1 shows the many potential sources of noise.

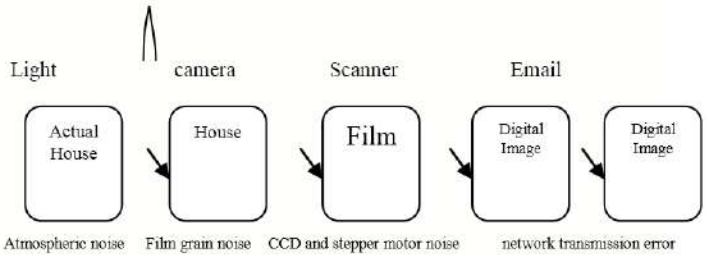

Fig.1: Noise may be introduced at each step in the acquisition process.

The air between the photographer and the house may contain dust particles which interfere with the light reaching the camera lens. The silver-halide crystals on the film vary in size and are discontinuous, resulting in film grain noise in the printing process. Most scanners use a CCD array to scan a row of the print, which may introduce photo-electronic noise. The scanner's CCD array is controlled by a fine stepper motor.

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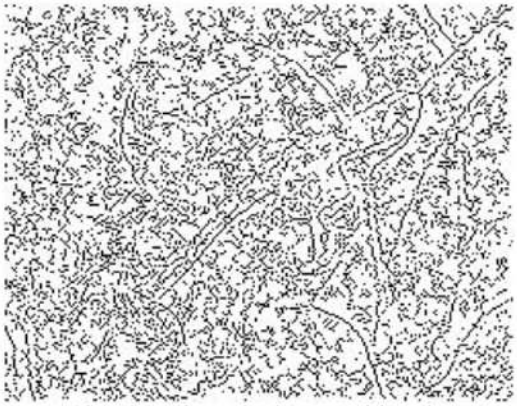
This motor has some degree of vibration and error in its movement, which may cause pixels to be mis-aligned. The scanner also quantizes the CCD signal, introducing quantization noise. Transmitting the image over the Internet is nearly always a bit preserving operation thanks to error checking in network protocols. However, an image transmitted to Earth from a remote space probe launched in the 1970's is almost guaranteed to contain errors.Noise may be classified as substitutive noise (impulsive noise: e.g., salt & pepper noise, random-valued impulse noise, etc.) and additive noise (e.g., additive white Gaussian noise). The impulse noise of low and moderate noise densities can be removed easily by simple denoising schemes available in the literature. In many occasions, noise in digital images is found to be additive in nature with uniform power in the whole bandwidth and with Gaussian probability distribution. Such a noise is referred to as Additive White Gaussian Noise (AWGN). It is difficult to suppress AWGN since it corrupts almost all pixels in an image.

Classical edge detectors are usually failed to handle images with strong noise, as shown in fig.2. Noise is unpredictable contamination on the original image. It is usually introduced by the transmission or compression of the image.

(a) Lena image

(b) Edges from Lena image

(c) Lena image with noise



(d) Edges from the image with noise

Fig. 2: Impact of noise on edge detection

Noise is of various kinds that effect the image but the most widely studied two kinds are Gaussian noise and impulse "Salt and pepper" noise. Gaussian noise is usually characterized by adding to each pixel a random value from a zero-mean Gaussian distribution, thus intensity of image varies according to the variance of distribution. Impulse noise is characterized by replacing a portion of an image's pixel with noise values, this noise affects image pixel by pixel not the whole area of image.

IV. Conclusion

This paper gives the brief review of edge, edge detection and influence of noise on edge detection. Various stages of image processing where noise can introduce in image is discussed with the help of block diagram. It is shown with help of edge image obtained from non-noisy and noisy Lena image that why image should be denoise prior extraction of edge pixels. So it can be concluded from this study that for use of an image for any image processing applications, noise should be suppress first.

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Real Life Applicable Fall Detection System: A Review

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Abstract— **Real-time health monitoring is an active area of research. In this domain, observing the physical condition of elderly people or patients in personal environments such as home, office, and restroom has special significance because they might be unassisted in these locations. The elderly people have limited physical abilities and are more vulnerable to serious physical damages even with small accidents, e.g. fall. The falls are unpredictable and unavoidable. In case of a fall, early detection and prompt notification to emergency services is essential for quick recovery. Fall detection approaches are divided into three main categories: wearable device based, ambience device based and vision based. In this review paper these approaches are summarised and compared with each other and a conclusion is derived with some discussions on possible future work.**

Keywords: **Fall detection, Healthcare, Visual surveillance, Vision-based systems**

I. INTRODUCTION

India is the second most populous country in the world. According to the census conducted recently in India, the life span of normal human being is increased to 70 at an average. People at or over the age of 60 are about to 6.6% of the total population in India [1]. The elders at this age suffer a lot both mentally and physically. Falls are an important cause of morbidity and mortality in the elderly. But by treating the elderly properly at right time, we can bring back them to their normal lifestyle. To attain this, at hand is a need for a fall detector which should monitor the normal activities of a person and to inform the care-taker when fall or any other harm happens to them. The demand for surveillance systems, especially for fall detection, has increased within the healthcare industry with the rapid growth of the population of the elderly in the world. It has become very important to develop intelligent surveillance systems, especially vision-based systems, which can automatically monitor and detect falls. It has been proved that the medical consequences of a fall are highly contingent upon the response and rescue time. Thus, a highly-accurate automatic fall detection system is likely to be a significant part of the living environment for the elderly to expedite and improve the medical care provided whilst allowing people to retain autonomy for longer. The quality of an individual's life is significantly affected by the levels of functional ability. Plenty of research has been done in this area to develop systems and algorithms for enhancing the functional ability of the elderly and patients. The maturity of cameras, sensors and computer technologies make such systems feasible. Such systems cannot only increase the independent living ability of the elderly, by raising the confidence levels in a supportive care environment within the public sector, but also save on manual labour in terms of the presence of nurses or support staff at all times.

The rest of the paper is organised as follows. In Section 2, different types of fall are introduced, followed by the classification of fall detection methods. In this paper three different categories of fall detection approaches are reviewed in Sections 3–5. Finally, we conclude and discuss future directions of research in Section 6.

II. CLASSIFICATION OF FALLS AND FALL DETECTION TECHNIQUES

In this section, different kinds of falls are first identified. Specifying different types of falls help towards an understanding of the existing approaches. It also guides and contributes towards the design of new algorithms. Different scenarios should be considered when identifying different kinds of falls: falls from walking or standing, falls from standing on supports, e.g., ladders etc., falls from sleeping or lying in the bed and falls from sitting on a chair. There are some common characteristics among these falls as well as significant different characteristics. It is also interesting to note that some characteristics of fall also exist in normal actions, e.g., a crouch also demonstrates a rapid downward motion. Noury et al. [4] and Yu [3] reviewed principles and methods used in existing fall detection approaches. Existing fall detection approaches[2] can be explained and categorised into three different classes to build a hierarchy of fall detection methods. Different methods under these categories are discussed further in the following sections. Fall detection methods can be divided roughly into three categories: wearable device based, ambience sensor based and camera (vision) based. Fig.1 depicts the classification of fall detection techniques.

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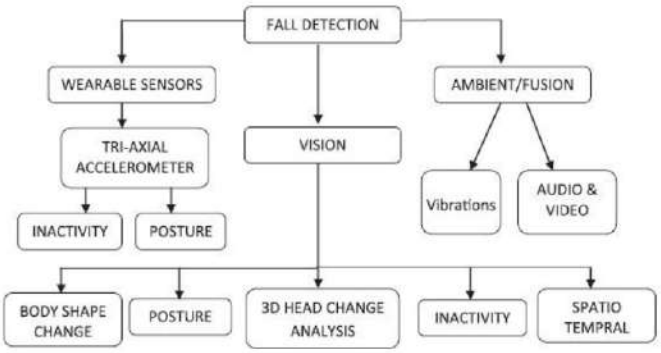

Fig. 1. Classification of fall detection methods[2]

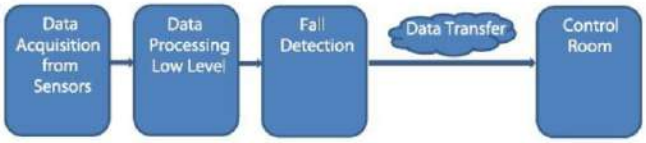

Fig. 2 Framework for existing wearable sensor and ambience based approaches.[9]

Fig. 3. Framework for existing vision based approaches[25]

Wearable devices can be further divided into posture based and motion based devices. Ambience devices can be further classified into presence and posture based sensors. And the camera (vision) based systems can be further categorised into three classes as shape change, inactivity and 3D head motion. Most of the existing approaches share the same general framework. Data acquisition varies from one sensor to multiple sensors and from one fixed camera to multiple cameras and moving cameras. Figs. 2 and 3 illustrate the general framework for a fall detection system based on Wearable and Ambient and Vision based approaches, respectively.

3.WEARABLE DEVICE BASED APPROACHES

Wearable device based approaches rely on garments with embedded sensors to detect the motion and location of the body of the subject. In the following we summarise the different methods.

3.1. ACCELEROMETERY

Technological developments have yielded devices that can measure activity using accelerometers. Accelerometry is composed of measure of acceleration of the body or parts of the body. It is one of the most extensively-used methods implemented for measuring physical activities to monitor activity patterns. Mathie et al. [5] used an integrated approach of waist-mounted accelerometry. A fall is detected when the negative acceleration is suddenly increased due to the change in orientation from upright to lying position. A barometric pressure sensor was introduced by Bianchi et al. in [6], as a surrogate measure for altitude to improve upon existing accelerometer-based fall event detection techniques. The acceleration and air pressure data are recorded using a wearable device attached to the subject's waist and analysed offline. A heuristically trained decision tree classifier is used to label suspected falls. Estudillo-Valderrama et al. [7] analysed results related to a fall detection system through data acquisition from multiple biomedical sensors, then processed the data with a personal server. The hardware and software design issues are clearly discussed when processing of bio-signals is involved during analysis. A wearable airbag was incorporated by Tamura et al. in [8] for fall detection by triggering airbag inflation when acceleration and angular velocity thresholds are exceeded. The system design consists of an accelerometer and a gyro sensor. Such a fall detection system can be very useful, especially at construction sites etc., for reducing fall related injuries. Chen et al. [9] created a wireless, low-power sensor network by utilising small, non-invasive, low power motes (sensor nodes).

3.2. FUSION OF ACCELEROMETRY AND POSTURE SENSORS

Physiological responses such as varying heart rate or blood pressure may result from physical activity and changes in body position. That makes the assessment of motion and posture a key factor in an ambulatory monitoring environment. Acceleration vectors were represented in a 3D space in [10] when Luo et al. implemented a group of sensors on a belt that filter noisy components with a Gaussian filter and generate a three dimensional body motion model that can be related to various body postures and the accelerometer's outputs. A two-axis accelerometer with a posture sensor was used in [11] for fall detection. The authors developed a wrist-worn prototype that integrates a health monitoring device with tele-reporting functionality for emergency telemedicine that contains a fall detector

3.3. TRI-AXIAL ACCELEROMETRY

Tri-axial accelerometers are designed for simultaneous detection of acceleration in three axial directions. Lai et al. in [12] combined several tri-axial acceleration sensor devices for joint sensing of injured body parts, when an accidental fall occurs. The model transmits the information fed by the sensors which are distributed over various body parts. The system can determine the possible occurrence of a fall when the acceleration significantlyexceeds the usual acceleration range. The impact acceleration and normal acceleration can be compared to determine the level of injury. Inertial sensors and the data logging unit are combined by Wu et al. in [13] to develop a portable pre-impact fall detection system. The inertial sensor unit consists of accelerometers and tri-axial angular rate sensors. The inertial frame vertical velocity is the key variable that detects the fall prior impact and is applied

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using a threshold detection algorithm. Adaptive thresholding has been quite successful for the reduction of false positives.

3.4. POSTURE BASED

Multichannel accelerometry can be used to distinguish between posture and basic motion patterns. Body orientation as posture is measured to detect falls. Kaluza et al. [14] presented a posture-based fall detection algorithm. Falls along with abnormal behaviours are detected based on the ideology of reconstruction of an object's posture. Kangas et al. carried out study with the aim of developing a new fall detector prototype in [15] based on fall associated impact and end posture. A waist-worn tri-axial accelerometer, transceiver and microcontroller unit is used for data acquisition, transmission and processing. Sensitivity and specificity are also defined with respect to different fall detection algorithms.

3.5. DISCUSSION ON WEARABLE DEVICES

Wearable devices have their advantages as well as disadvantages. The biggest advantage remains the cost efficiency of wearable devices. Installation and setup of the design is also not very complicated. Therefore, the devices are relatively easy to operate. The disadvantages include intrusion and fixed relative relations with the object, which could cause the device to be easily disconnected. Such disadvantages make wearable devices an unfavourable choice for the elderly.

4. AMBIENT DEVICE BASED APPROACHES

Ambience based devices attempt to fuse audio and visual data and event sensing through vibrational data.

4.1. AUDIO & VIDEO

Image sensing and vision-based reasoning were presented in [16] by Tabar et al. for verification and further analysis of sensortransmitted events. A bridge like operation via a wireless badge node is created between the user and the network. The badge node detects falls through event sensing functions. Along with fall detection it also creates a voice communication medium between the user and the Monitoring Control when the system detects a problem and alerts the control. Zhuang et al. [17] proposed a different approach to the method in [18] using the audio signal from a single far-field microphone. A Gaussian mixture model (GMM) super vector is created to model each fall as a noise segment. The pairwise difference between audio segments is measured using the Euclidean distance.

4.2. EVENT SENSING USING VIBRATIONAL DATA

The detection of events and changes using vibrational date can be useful in many ways such as monitoring, tracking and localisation etc. A completely passive and unobtrusive system was introduced by Alwan et al. in [19] that developed the working principle and the design of a floor vibration-based fall detector. Detection of human falls is estimated by monitoring the floor vibration patterns. A slip-fall detection system, using the sliding linear investigative platform, was proposed in [20] by Robinson et al. Classification of acceleration thresholds has been used to identify true
slip-falls. Data such as tri-axial head accelerations and the centre of pressure in terms of psychophysical response are measured.

4.3. DISCUSSION ON AMBIENT DEVICES

Most ambient device based approaches use pressure sensors for object detection and tracking. The pressure sensor is based on the principle of sensing high pressure of the object due to theobject's weight for detection and tracking. It is very cost effectiveand less intrusive for the implementation of surveillance systems. However, it has a big disadvantage of sensing pressure of everything in and around the object and generating false alarms in the case of fall detection, which leads to a low detection accuracy.

5. CAMERA (VISION) BASED APPROACHES

Cameras are increasingly included, these days, in in-home assistive/care systems as they convey multiple advantages over other sensor based systems. Cameras can be used to detect multiple events simultaneously with less intrusion.

5.1. SPATIOTEMPORAL

Shape modelling using spatiotemporal features provides crucial information of human activities which is used to detect different events In [21], a mobile human airbag release system was designed for fall protection for the elderly. The system consists of 3D MEMS accelerometers, gyroscopes, a Micro Controller Unit and a blue-tooth module. The object's motion information is recorded by the accelerometers. A high speed camera is used for the analysis of falls. Gyro thresholding is applied to detect a lateral fall.

An asynchronous temporal contrast vision sensor was developed for fall detection in [22]. The method extracts changing pixels from the background and reports temporal contrast (compared to a threshold), which is equivalent to the change in image reflectance in the presence of constant lighting and finally an instantaneous motion vector computation reports fall events. The motion detector protects the patient's privacy because no data are communicated until an emergency is detected.

5.2. INACTIVITY/CHANGE OF SHAPE

In this section, we describe algorithms based on shape change analysis as well as inactivity detection. Rougier et al. in [23] proposed a classification method for fall detection by analysing human shape deformation. Segmentation is performed to extract the silhouette and additional edge points inside the silhouette are extracted using a Canny edge detector for matching two consecutive human shapes using the shape context. The mean matching cost and Procrustes analysis are applied for shape analysis.

Wu et al. [24] uniquely identified velocity profile features between normal and abnormal activities, such as falls, for automatic detection. The fall activities contain forward and backward falls from standing and tripping, etc. Horizontal and

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vertical velocities are measured at different locations of the trunk Cucchiara et al. [25] instead applied a multi-camera system for image stream processing. The processing includes recognition of hazardous events and behaviours, such as falls, through tracking and detection. The cameras are partially overlapped and exchange visual data during the camera handover.

5.3 3D HEAD POSITION ANALYSIS

Head position analysis is based on head tracking that determines the occurrence of large movement within the video sequence. Different state models are used to track the head based on the magnitude of the movement information. Rougier and Meunier in [26] obtained image streams from a monocular camera. This methodology of fall detection is based on 3D head trajectories and the idea that the object's head remains visible in the image sequence and undergoes a large movement when a fall occurs.

5.5. DISCUSSION ON VISION BASED APPROACHES

Vision based systems tend to deal with intrusion better than other approaches. Recent research in computer vision on surveillance indeed provides a practical and complex framework. Most of the emphasis in the context of surveillance in computer vision is dedicated to methods with the ability of real time execution using standard computing platforms and low cost cameras. The methods with capability of dealing with robustness still leave a wide open area for further research and development. Video analysis of human behaviour containing semantic description of the activities belongs to higher level abstraction and lower level represents the segmentation of motion along with feature extraction in computer vision. Though some of the implementations discussed earlier have shown a diverse pattern when it comes to dealing with image sequences, still there is plenty of room for further development in this area. Fall detection has still not been implemented using the total optical flow of the image sequence or specifically analysing the optical flow of the object after the object has been tracked and located. Further higher level abstraction can be applied on calculated optical flow to achieve higher levels of accuracy and robustness.

6. CONCLUSION AND FUTURE WORK

In This paper different techniques for the detection of a fall event have been reviewed. Table 1 lists various characteristics of those approaches and Table 2 lists some commercially available fall detector devices A comprehensive and robust fall detection system should possess both high sensitivity and good specificity. The existing approaches have not comprehensively satisfied the accuracy as well as robustness of a fall detection system. However, the existing approaches do provide a framework to further develop techniques as well as modify the existing algorithms to achieve better performance.

Sensor based approaches lack consistency when it comes to providing highly accurate automatic fall detection systems. Further research and development should continue in terms of making the design more automatic and without much intervention.

Vision based approaches in comparison to others are certainly the area to look forward to. Most of the existing vision based approaches lack flexibility. There is a need for a reliable and robust generic fall detection algorithm.

Continuous surveillance through vision/camera and sensor based systems also introduces some ethical issues concerning the respect of confidentiality and privacy and also the risk of dependency of the subject on the technology.

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Approach	Category	Cost	Intrusion	Accuracy	Setup	Robust
Wearable devices	Tri-axial	Cheap	Yes	Scenario dependent	Easy	No
	Posture	Cheap	Yes	Scenario dependent	Easy	No
	Inactivity	Cheap	Yes	Scenario dependent	Easy	No
Ambient	Audio	Cheap to medium	Yes	Scenario dependent	Easy/medium	No
	Video	Cheap to medium	Yes	Scenario dependent	Easy/medium	No
Vision based	Body shape change	Medium	Low/dependent	Higher/non specific	Medium	Yes
	Posture	Medium	Low/dependent	Higher/non specific	Medium	Yes
	Inactivity	Medium	Low/dependent	Higher/non specific	Medium	Yes
	Spatiotemporal	Medium	Low/dependent	Higher/non specific	Medium	Yes
	3D head change	Medium	Low/dependent	Higher/non specific	Medium	Yes

Table 1: Brief comparison of different categories of fall detection approaches

	AlertOne **Alert One Services Inc.** Williamsport, Pennsylvania, USA	**Belt/Wrist Device**
	eyesonelders **Pioneer Medical Systems** Woburn, Massachussets, USA	**Belt Device**
	**Tunstall Group Ltd** Whitley Bridge, Yorkshire, UK	**Belt Device**
	Vivago **IST International Security Technology** Helsinki, Finland	**Wrist Device**
	AphyCare **Aphycare Technologies** Lannion, France	**Wrist Device**
	DMS Data Health System Nîmes, France	**Wrist Device**
	TADIRAN TADIRAN **Tadiran Spectralink Ltd** Holon, ISRAEL	**Wrist Device**

Table 2 Some commercially available fall detectors.

A comprehensive data set containing different scenarios of falls with different camera angles and with both static and moving cameras should be publicly available for the scientific community for the development and research purposes.

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Review of Dispersion Compensation Fiber

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***Abstract*: Dispersion on fiber-optic system and its effect on optical transmission system are study in this paper. In optical wavelength division multiplexed (WDM) systems in order to reduce dispersion various dispersion compensating techniques are used. The most commonly used dispersion compensation fiber (DCF) technology are discuss. Three schemes (pre-compensation, post compensation, symmetrical-compensation of dispersion compensation) of dispersion compensation with DCF are proposed. In this study, we analyze the symmetrical compensation is better than post and pre compensation . Symmetrical compensation has minimum BER as compared post compensation and pre compensation. It can reduce the fiber nonlinearity and increase the transmission distance.**

***Keywords*:Dispersion, wavelength division multiplexing (WDM),Dispersion compensation fiber(DCF),OCDMA**

1. INTRODUCTION

In recent years, with the rapid growth internet business needs, people urgently need more capacity and network systems. So the demand for transmission capacity and bandwidth are becoming more and more challenging to the carriers and service suppliers. Under the situation, with its huge bandwidth and excellent transmission performance, optical fiber is becoming the most favorable delivering media and laying more and more important role in information industry. The optimal design and application of optical fiber are very important to the transmission quality of optical fiber transmission system. Therefore, it is very necessary to investigate the transmission characteristics of optical fiber. And the main goal of communication systems is to increase the transmission distance. Loss and dispersion are the major factor that affect fiber-optical communication being the high-capacity develops. [1]

WDM optical network has bring the performance improvement in data transmission because of high speed, high bandwidth and high capacity. So a lot of research is going on in this field. In WDM networks optical fibers are used to transmit information between the transmitter and the receiver. WDM systems have the capability to transmit multiple signals simultaneously. In WDM Network, different signals from different users are multiplexed. But the light signals degrade in intensity when they travel inside the fiber. Fibers suffer from dispersion other Nonlinearities due to fiber material nonlinearities and distance the signal travels inside the fiber. In WDM network, dispersion, Group velocity dispersion (GVD) and nonlinear effects, like self phase modulation, cross phase modulation and four-wave mixing is observed at different data rates. So this dispersion and fiber nonlinearities at different data rate must to be minimised by different dispersion compensation techniques like dispersion compensation fiber, fiber Bragg grating, optical phase conjugation and electrical compensation methods.[2] In this paper we purpose three DCF compensation scheme pre,post & symmetrical compensation scheme.

II. EFFECT OF DISPERSION ON OPTICAL FIBER TRANSMISSION

Dispersion is related to the broadening of input signal at the output side. and errors are produced at the output side. Loss and dispersion are the major factor that affect fiber-optical communication being the high-capacity develops. Dispersion is defined as because of the different frequency or mode of light pulse in fiber transmits at different rates, so that these frequency components or models receive the fiber terminals at different time. It can cause in tolerable amounts of distortions that ultimately lead to errors. In single-mode fiber performance is primarily limited by chromatic dispersion (also called group velocity dispersion), which occurs because the index of the glass varies slightly depending on the wavelength of the light, velocities for the two polarizations. This phenomenon is called birefringence [3].

III. NEED FOR DISPERSION COMPENSATION

In optical Fiber Communication and light from real optical transmitters necessarily has nonzero spectral width (due to modulation). Polarization mode dispersion , another source of limitation, occurs because although the single-mode fiber can sustain only one transverse mode, it can carry this mode with two different polarizations, and slight imperfections or distortions in a fiber can alter the propagation, when light signal is propagated through the fiber, due to the dispersion system performance is degraded. In dispersion, different modes travel with different group velocity due to the material and waveguide property of the fiber. So ultimately all the modes reached at the different times results in pulse broadening means inter symbol interference occur. The classification of different types of dispersion is shown in figure below.

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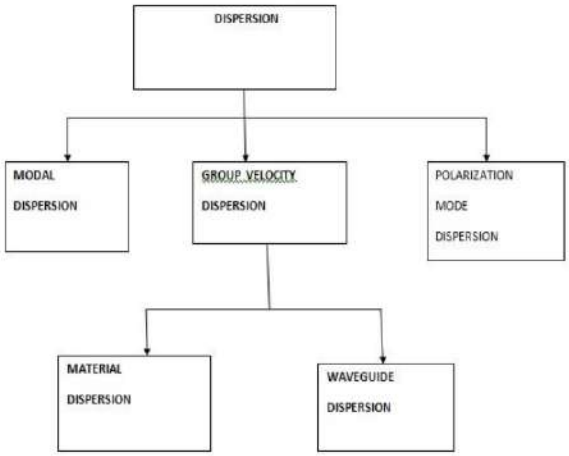

Fig1: Classification of dispersion

Material dispersion is caused by due to the material property of the fiber. Material dispersion is due to the change in refractive index of material with wavelength. Waveguide dispersion is due to the physical structure of fiber means because of the refractive index profile of the core and cladding of the fiber. Modal dispersion is generally observed in multimode fiber due to the multiple mode travel with different group velocity. Polarization mode dispersion is caused by different polarization state of pulse travel with different velocity results in pulse broadening. To avoid the broadening of the pulse dispersion should be compensated in optical network. There are different techniques possible for dispersion compensation like use of dispersion compensating fiber, use of fiber Bragg grating, use of optical phase conjugation and use of electronic equalizers. Among these, dispersion compensating fiber is efficient way of reducing dispersion in optical fiber communication system. [2-3]

IV. DISPERSIONCOMPENSATION SCHEME

Based on optical transmission equation, considering the various types of nonlinear effects and the impact of EDFA, system simulation models are established. According to relative position of DCF and single-mode fiber, post-compensation, pre-compensation, Symmetrical compensation is proposed. DCF Pre-compensation scheme achieve dispersion compensation by place the DCF before a certain conventional single-mode fiber, or after the optical transmitter. Post compensation scheme achieve dispersion compensation by place the DCF after a certain conventional single-mode fiber, or before the optical transmitter. Different location on the system will generate different nonlinear effects. The fig of three dispersion compensation system is shown in Figure 2. The WDM system consists of eight channels, each channel with 40Gb/s. Eight different center frequency wavelength of the light carrier were produced. The center frequency range of Laser is 192.6-194.01 THZ. Transmission code is the DPSK modulation code. 8-channel WDM bandwidth is 80GHZ.Optical fiber transmission link composed of a 160Km. The kind of optical fiber is G.655. Dispersion compensation is achieved with DCF. EDFA is used to compensate the power loss generating by SMF and the DCF signal. Receiver module includes demultiplexer and receiver Filters. [4].In single mode fiber Chromatic dispersion and polar dispersion take place.DCF has become a most useful method of dispersion compensation fiber. This compensation method can be done by using the positive dispersive elements.By inserting a DCF, the average dispersion is close to zero.

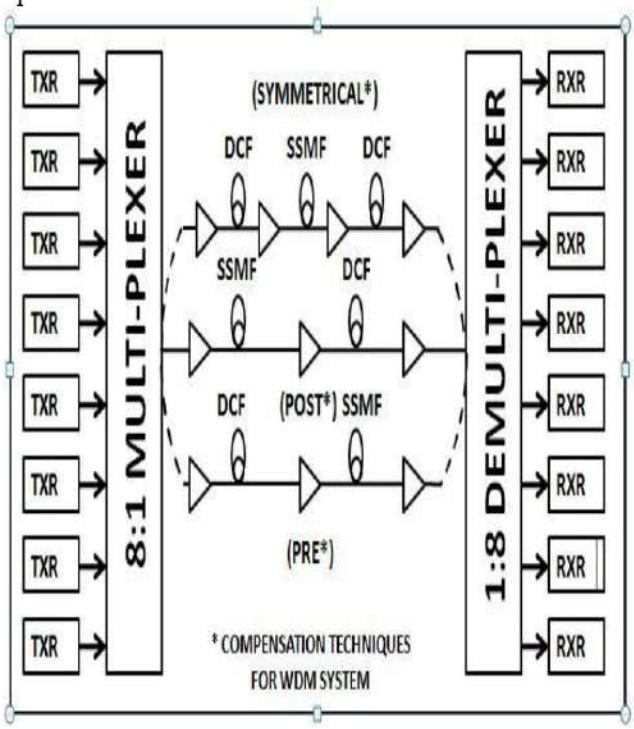

Figure 2:Block diagram of eight channel WDM system using dispersion compensating fiber technique Pre, Post or Symmetrical compensation.[5]

The eight channel WDM systems i.e. Conventional WDM system and Dense WDM system are designed using pre, post and symmetrical dispersion techniques. The data source used is binary pseudorandom data at 40 Gb/s. Gaussian pulse generator is used to converts this binary data into RZ Super Gaussion electrical pulses. By using Mach Zehender modulator the RZ Super Gaussian electrical pulse modulates the optical laser signal [6]. In this eight channel WDM system there are eight laser sources generating optical signals of different wavelengths. There wavelengths are selected depending on the channel spacing between the adjacent channels during transmission thurogh single mode fiber.[7]

OCDMA

OCDMA is a highly flexible technique to achieve high-speed connectivity with large bandwidth. Data access security and ability to support asynchronous, bursty data transmission are two of the main driving forces behind a lot of interest in the

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OCDMA techniques. O-CDMA is one of the multiple access technique to allow several users to transmit simultaneously over the same optical fiber. Optical CDMA has the advantage of using optical processing to perform certain network applications, like addressing and routing without resorting to complicated multiplexers or demultiplexers. The asynchronous data transmission can simplify network management and control. Therefore OCDMA is an attractive candidate for LAN application and recent advances in wavelength division multiplexing (WDM) and time division multiplexing (TDM) technologies [8].

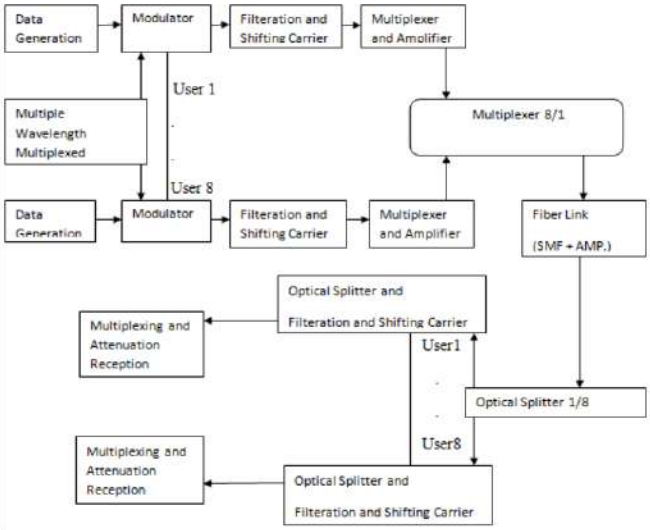
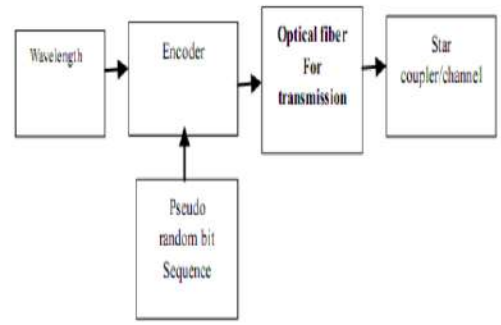


Fig:3Block Diagram of OCDMA

An OCDMA system for each user can be described by a data source, containing the data that will be sent, followed by an encoder and then a laser that maps the signal from electrical form to an optical pulse sequence. At the receiver end, an optical correlator is used to extract the encoded data. A large number of subscribers transmit data simultaneously. Each user has its own codeword, which is approximately orthogonal to all other code words. The encoded data is send to the N*1 star coupler from where the optical channel carries the signal through the optical fiber and couples to a 1*N coupler and broadcast to all nodes. All users' encoded data are then added together chip by chip and the result is called the superposition and after thatthe data are sent over the channel [9].



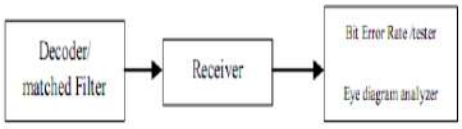


Fig 4 Block Diagram of OCDMA

Features of OCDMA

- OCDMA has the feature of having applications in optical communication as well as radio communication.
- The optical systems use unipolar codes, thus can be used in asynchronous environments. On the other hand the radio communications systems use bipolar codes and thus cannot be used in asynchronous environments.
- In OCDMA each user is allotted its own code sequence.
- OCDMA is a spread- spectrum technique employed in mobile telecommunication that allows a number of users to share the same broadband of transmission.
- OCDMA has Lower latency.
- The asynchronous data transmission can simplify network management and control
- Flexible network design

CONCLUSION

We studied dispersion compensation fiber and its effect on fiber optic transmission system. three compensation scheme are pre ,post ,symmetrical are studied in this paper. And need for dispersion compensation with the help of modal ,group velocity dispersion, polarization mode dispersion, material dispersion and waveguide dispersion and discuss the WDM Network allows several channels to be routed through the same fiber cable on different Wavelength. Dispersion is the major limiting factor in High speed optical WDM Network. Dispersion causes pulse broadening and pulse distortion WDM Network has been done with Non-Return to Zero modulation formats. The system has been analysed using pre, post and symmetrical dispersion compensation schemes. Optical Fiber cable offers very high bandwidth. For making

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the efficient utilization of available bandwidth many signals should be transmitted through same cable.

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Review of Orthogonal Frequency Division Multiplexing

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Abstract: **Research on digital communication systems has been greatly developed in the past few years and offers a high quality of transmission in both wired and wireless communication environments. Coupled with advances in new modulation techniques, Orthogonal Frequency Division Multiplexing (OFDM) is a well- known digital multicarrier communication technique and one of the best methods of digital data transmission over a limited bandwidth. Orthogonal Frequency Division Multiplexing (OFDM) is a combination of modulation and multiplexing. OFDM is a multi-carrier modulation technique with densely spaced sub-carriers that has gained a lot of popularity among the broadband community in the last few years. In this paper we will discuss the basics of OFDM techniques, its advantages and demerits, and some applications of OFDM.**

Keywords: **OFDM(orthogonal frequency division multiplexing), Cyclic prefix, orthoganality**

INTRODUCTION

The growth in use of the information networks lead to the need for new communication technique with higher data rate. There is several modulation techniques are available but among the variety of modulation technique, OFDM modulation technique is the best for both wired and wireless environments. It is a powerful modulation technique used for high data rate, and is able to eliminate ISI. It is computationally efficient due to the use of FFT techniques to implement modulation and demodulation functions. In an OFDM scheme, a large number of orthogonal, overlapping, narrow band sub- channels or subcarriers, transmitted in parallel, divide the available transmission bandwidth. It is the modulation technique used in many new broadband communication schemes including digital television, digital audio broadcasting, ADSL and wireless LANs. It also allows digital data to be efficiently and reliably transmitted over a radio channel, even in multipath environments. In OFDM, subcarriers overlap but it does not create any problem. Since they are orthogonal that is the peak of one subcarrier occurs when other subcarriers are at zero [2]. It has been popularly standardized in many wireless applications such as Digital Video Broadcasting (DVB), Digital Audio Broadcasting (DAB), High Performance Wireless Local Area Network (HIPERLAN), IEEE 802.11 (Wi Fi), and IEEE 802.16 (WiMAX). It has also been employed for wired applications as in the Asynchronous Digital Subscriber Line (ADSL) and power-line communications. One of the main reasons to use OFDM is to increase the robustness against frequency selective fading or narrowband interference. In a single carrier system, a single fade or interferer can cause the entire link to fail, but in a multicarrier system, only a small percentage of the subcarriers will be affected. Error correction coding can then be used to correct for the few erroneous subcarriers.[5]

NEED OF OFDM

In contrast to conventional Frequency Division Multiplexing, the spectral overlapping among subcarriers are allowed in OFDM as shown in fig 1.1, since orthogonality will ensure the subcarrier separation at the receiver, providing better spectral efficiency and the use of steep band pass filter was eliminated[7]. OFDM transmission system offers possibilities for alleviating many of the problems encountered with single carrier systems. It has the advantage of spreading out a frequency selective fade over many symbols. This effectively randomizes burst errors caused by fading or impulse interference so that instead of several adjacent symbols being completely destroyed; many symbols are only slightly distorted. This allows successful reconstruction of majority of them even without forward error correction. Because of dividing an entire signal bandwidth into many narrow sub bands, the frequency response over individual sub bands is relatively flat due to sub band are smaller than coherence bandwidth of the channel. Thus, equalization is potentially simpler than in a single carrier system and even equalization may be avoided altogether if Differential encoding is implemented [2].

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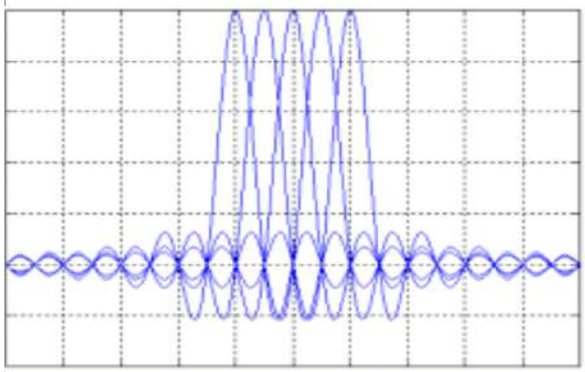

Fig 1.1:- Frequency spectrum of OFDM subcarrier signals [5]

Principle of OFDM

Orthogonal Frequency Division Multiplexing (OFDM) is a multicarrier transmission technique, which divides the bandwidth into many carriers; each one is modulated by a low rate data stream. OFDM uses the spectrum much more efficiently by spacing the channels much closer together. This is achieved by making all the carriers orthogonal to one another, preventing interference between the closely spaced carriers [3]. OFDM data are generated by taking symbols in the spectral space using M-PSK, QAM, etc, and convert the spectra to time domain by taking the Inverse Discrete Fourier Transform (IDFT). Since Inverse Fast Fourier Transform (IFFT) is more cost effective to implement, it is usually used instead [2].

- Some processing is done on the source data, such as coding for correcting errors, interleaving and mapping of bits onto symbols. An example of mapping used is QAM.
- The symbols are modulated onto orthogonal sub-carriers. This is done by using IFFT.
- Orthogonality is maintained during channel transmission. This can be achieved by adding a cyclic prefix to the OFDM frame to be sent. The cyclic prefix consists of the L last samples of the frame, which are copied and placed in the beginning of the frame. It must be longer than the channel impulse response.
- Synchronization: cyclic prefix can be used to detect the start of each frame. This is done by using the fact that the L first and last samples are the same and therefore correlated.
- Demodulation of the received signal by using FFT.
- Channel equalization: the channel can be estimated either by using a training sequence or sending known so-called pilot symbols at predefined sub-carriers.
- Decoding and de-interleaving.

SYSTEM MODELING OFDM TRANRECEIVER

As stated above OFDM is a multi-carrier modulation technology where every sub-carrier is orthogonal to each other. The "orthogonal" part of the OFDM name indicates that there is a precise mathematical relationship between the frequencies of the carriers in the system[11]. It is possible to arrange the carriers in an OFDM Signal so that the sidebands of the individual carriers overlap and the signals can still be received without adjacent carrier's interference. In order to do this the carriers must be mathematically orthogonal. If the integral of the product of two signals is zero over a time period, then these signals are orthogonal to each other. Since the carriers are all sine/cosine wave satisfy this criterion. If a sine wave of frequency m is multiplied by a sinusoid (sine or cosine) of a frequency n, then the product is given by

$$f(t) = \sin mwt * \sin nwt$$

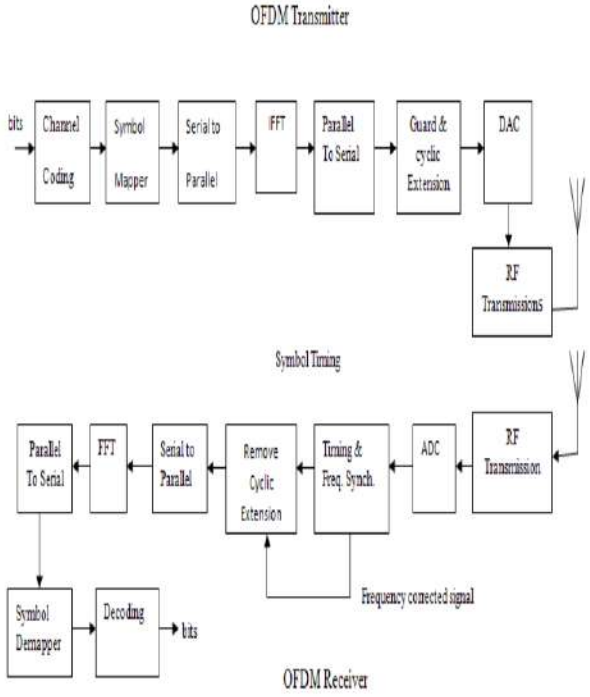

Fig 1.2:- OFDM System Block Diagram [3]

Where both m and n are integers. By simple trigonometric relationship, this is equal to a sum of two sinusoids of frequencies (m-n) and (m+n) since these two components are each a sinusoid, the integral is equal to zero over one period. The integral under this product is given by

$$f(t) = \int_0^{2\pi} \frac{1}{2}\cos(m-n) - \frac{1}{2}\sin(m+n)wt$$

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So when a sinusoid of frequency *n* multiplied by a sinusoid of frequency *m*, the area under the product is zero. In general for all integers' *n* and *m*, sin nx, cosnx, sin mx, cos mx are all orthogonal to each other. These frequencies are called harmonics. As the sub carriers are orthogonal, the spectrum of each carrier has a null at the center frequency of each of the other carriers in the system. This results in no interference between the carriers, allowing them to be spaced as close as theoretically possible. The orthogonality allows simultaneous transmission on a lot of sub-carriers in a tight. Frequency space without interference from each other. So in the receiver side easily we can extract the individual sub-carriers. But in traditional FDM systems overlapping of carriers are not possible, rather a guard band is provided between each carrier to avoid inter-carrier interference [3].

CYCLIC PREFIX IN OFDM

A cyclic prefix (CP) or guard interval is critical for OFDM to avoid interblock interference (IBI) caused by the delay spread of wireless channels. They are usually inserted between adjacent OFDM blocks[2]. Since orthogonality is important property for an OFDM system, so synchronization in frequency and time must be extremely good. Once orthogonality is lost we experience inter-carrier interference (ICI). This will introduce interference from one subcarrier to another. There is another reason for inter-carrier interference (ICI) in OFDM system. If we add the guard time with no transmission then it creates problems for IFFT and FFT, which results in inter-carrier interference (ICI). A delayed version of one subcarrier can interfere with another subcarrier in the next symbol period. This can be avoided by extending the symbol into the guard period that precedes it. And this is known as a cyclic prefix. It ensures that delayed symbols will have integer number of cycles within the FFT integration interval[10]. This removes ICI so long as the delay spread is less than the guard period. We should note that FFT integration period excludes the guard period. In an OFDM transmission, we know that the transmission of cyclic prefix does not carry 'extra' information in Additive White Gaussian Noise channel. The signal energy is spread over time Td+Tcp whereas the bit energy is spread over the time T_d i.e.

$$E_s = (T_d + T_{cp}) = E_b T_d$$

After simplifying we get the following equation,

$$E_s = \frac{E_b T_d}{(T_d + T_{cp})}$$

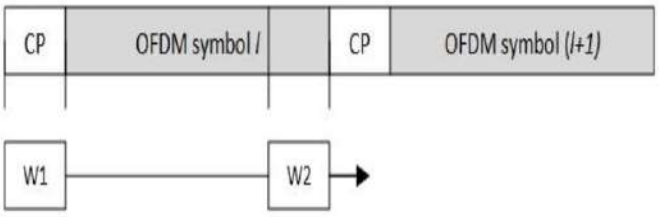

Fig 1.3:- Shows the function of cyclic prefix(CP)[6]

ORTHOGONALITY

The main aspect in OFDM is maintaining orthogonality of the carriers. If the integral of the product of two signals is zero over a time period, then these two signals are said to be orthogonal to each other[9]. Two sinusoids with frequencies that are integer multiples of a common frequency can satisfy this criterion.
Therefore, orthogonality is defined by:

$$\int_0^T cos(2\pi n f_0 t)\ \cos(2\pi m f_0 t)dt = 0 \quad (n \neq m)$$

Where n and *m* are two unequal integers; f_0 is the fundamental frequency; *T* is the period over which the integration is taken. For OFDM, *T* is one symbol period and f_0 set to $1/T$ for optimal effectiveness[8]

ADVANTAGES OF OFDM

- Makes efficient use of the spectrum by allowing overlap
- By dividing the channel into narrowband flat fading sub channels, OFDM is more resistant to frequency selective fading than single carrier systems[5] are.
- Eliminates ISI and IFI through use of a cyclic prefix.
- Using adequate channel coding and interleaving one can recover symbols lost due to the frequency selectivity of the channel.
- Channel equalization becomes simpler than by using adaptive equalization techniques with single carrier systems.
- It is possible to use maximum likelihood decoding with reasonable complexity, as discussed in OFDM is computationally efficient by using FFT techniques to implement the modulation and demodulation functions.
- In conjunction with differential modulation there is no need to implement a channel estimator.
- Is less sensitive to sample timing offsets than single carrier systems are.

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- Provides good protection against co channel interference and impulsive parasitic noise.
- High spectral efficiency,
- Resiliency to RF interference[3].
- Lower multi-path distortion.
- Flexibility: each transceiver has access to all subcarriers within a cell layer.

DISADVANTAGES OF OFDM

- High synchronism accuracy.
- Multipath propagation must be avoided in other orthogonallity not be affected
- Large peak-to-mean power ratio due to the superposition of all subcarrier signals, this can become a distortion problem
- .More complex than single-carrier Modulation.[7]
- Requires a more linear power amplifier.
- The OFDM signal has a noise like amplitude with a very large dynamic range, therefore it requires RF power amplifiers with a high peak to average power ratio.
- It is more sensitive to carrier frequency offset and drift than single carrier systems are due to leakage of the DFT[3].
- Peak to average power ratio (PAPR) is high.
- High power transmitter amplifiers need linearization.
- Low noise receiver amplifiers need large dynamic range.
- Capacity and power loss due to guard interval.
- Bandwidth and power loss due to the guard interval can be significant.

LIMITATIONS OF OFDM

- The OFDM signal has a noise like amplitude with a very large dynamic range, therefore it requires RF power amplifiers with a high peak to average power ratio.[12]
- It is more sensitive to carrier frequency offset and drift than single carrier systems are due to leakage of the DFT.

OFDM APPLICATIONS

During the past decade, OFDM has been adopted in many wireless communication standards, including European digital audio broadcasting, terrestrial digital video broadcasting, and satellite–terrestrial interactive multiservice infrastructure in China. In addition, OFDM has been considered or approved by many IEEE standard working groups, such as IEEE 802.11a/g/n, IEEE 802.15.3a, and IEEE 802.16d/e.

The applications include wireless personal area networks, wireless local area networks, and wireless metropolitan networks. Currently, OFDMA is being investigated as one of the most promising radio transmission techniques for LTE of the 3rd Generation Partnership Project (3GPP), International Mobile Telecommunications—Advanced Systems. Before introducing the major features of several OFDM applications, we briefly describe the design guideline of OFDM for wireless communications[11].

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Some of applications is given below.

- DAB: DAB - OFDM forms the basis for the Digital Audio Broadcasting (DAB) standard in the European market. Digital Audio Broadcasting (DAB) using OFDM has been standardized in Europe and is the next step in evolution beyond FM radio broadcasting providing interference free transmission.
- HDTV
- Wireless LAN Networks
- 5.3.1 HIPERLAN/2.
- Wireless ATM transmission system

CONCLUSION

In this paper we summarized the review of OFDM in wireless communication system. Then we compared the use of OFDM with basic communication system. OFDM solves the problem of ISI through use of a cyclic prefix due to high data rates. It also provides other advantages like high spectral efficiency, Low implementation complexity etc. Some of the major applications of OFDM include digital audio broadcasting digital video broadcasting, local area networks, WiMax etc. Despite of all these advantages and applications the carrier frequency offset (CFO) and high peak to average power ratio (PAPR) are major disadvantage of OFDM. This disadvantage needs to be addressed properly to allow further widespread use of OFDM.

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ROC and PR Curve

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Abstract— **In this paper, Detailed theory of ROC curve and PR curve is discussed. It is also elaborated that how theses curves can be used to evaluate the performance of edge detection algorithms. The purpose of this article is to serve as an introduction to ROC and PR graphs and as a guide for using them in research.**

Keywords— **PR, ROC, AUC, Evaluation, Area, Curve**

I. Introduction

In machine learning, current research has shifted away from simply presenting accuracy results when performing an empirical validation of new algorithms. This is especially true when evaluating algorithms that output probabilities of class values. Provost et al. (1998) have argued that simply using accuracy results can be misleading. They recommended when evaluating binary decision problems to use Receiver Operator Characteristic (ROC) curves, which show how the number of correctly classified positive examples varies with the number of incorrectly classified negative examples. However, ROC curves can present an overly optimistic view of an algorithm's performance if there is a large skew in the class distribution. Drummond and Holte (2000; 2004) have recommended using cost curves to address this issue. Cost curves are an excellent alternative to ROC curves, but discussing them is beyond the scope of this paper.

Precision-Recall (PR) curves, often used in Information Retrieval (Manning & Schutze, 1999; Raghavan et al., 1989), have been cited as an alternative to ROC curves for tasks with a large skew in the class distribution (Bockhorst & Craven, 2005; Bunescu et al., 2004; Davis et al., 2005; Goadrich et al., 2004; Kok & Domingos, 2005; Singla & Domingos, 2005). An important difference between ROC space and PR space is the visual representation of the curves. Looking at PR curves can expose differences between algorithms that are not apparent in ROC space. In this paper, the detailed analysis of ROC and PR curves are presented.

II. ROC (Receiver Operating Characteristic) Curve

The receiver operating characteristic (ROC) curve [1], which is defined as a plot of test sensitivity (TPR) as the y-coordinate and its 1-specificity or false positive rate (FPR) as the x- coordinate, is an effective method of evaluating the quality or performance of edge detection algorithm. Sensitivity and specificity, which are defined as the number of true positive decisions/the number of actually positive cases and the number of true negative decisions/the number of actually negative cases respectively, constitute the basic measures of performance of edge detector.

An ROC curve demonstrates several things [2]:

1. It shows the tradeoff between sensitivity and specificity (i.e. any increase in sensitivity will be accompanied by a decrease in specificity).
2. The closer the curve follows the left-hand border and then the top border of the ROC space, the more accurate edge detection method.
3. The closer the curve comes to the 45-degree diagonal of the ROC space, the less accurate the edge detection method.
4. The area under the curve is a measure of text accuracy.

Area under ROC Curve (AUC)

One of the most popular measures is the area under the ROC curve (AUC)[3]. AUC is a combined measure of sensitivity and specificity. AUC is a measure of the overall performance of an edge detector and is interpreted as the average value of sensitivity for all possible values of specificity. It can take any value between 0 and 1, since both the x and y axes have values ranging from 0 to 1. The closer AUC is to 1, the better will be the overall detection performance of the edge detection algorithm, and a detector with an AUC value of 1 is the one that is perfectly accurate.

Since AUC is a measure of the overall performance of edge detection algorithm, the overall detection performance of different edge detectors can be compared by comparing their AUCs. The bigger its AUC is, the better the overall performance of the edge detector. When comparing the AUCs of two detectors, equal AUC values mean that the two detectors yield the same overall detection performance, but does not necessarily mean that the two ROC curves of the two detectors are identical. Fig.1 depicts three different ROC curves. Considering the area under the curve, test A is better than both test B and C, and the curve is closer to the perfect discrimination. Test B has a good validity and test C has a moderate one.

Fig.2 illustrates two ROC curves with equal AUCs. The curves are obviously not identical. Although the AUCs and, therefore, the overall performances of the two edge detectors are the same, test B is better than test A in the high FPR range

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(or high sensitivity range), whereas test A is better than test B in the low FPR range (or low sensitivity range).

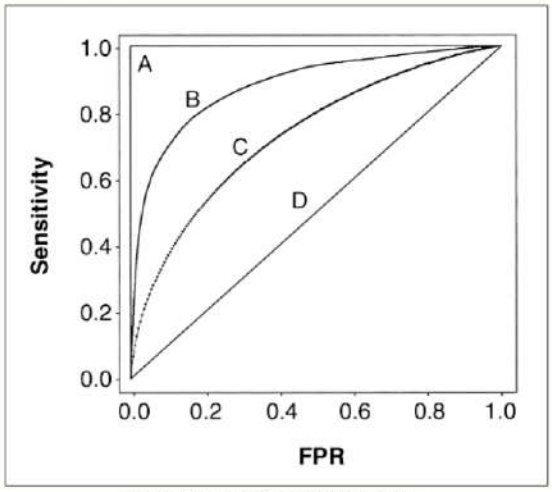

Fig.1: Three different ROC curves

Fig.2 has hypothetical ROC curves of two medical tests. Test A and test B applied on the same subjects to assess the same disease. Test A and B have nearly equal area but they cross each other. In the high false positive rate range (or high sensitivity range) test B is better than test A, whereas in the low false positive rate range (or low sensitivity range) test A is better than test B.

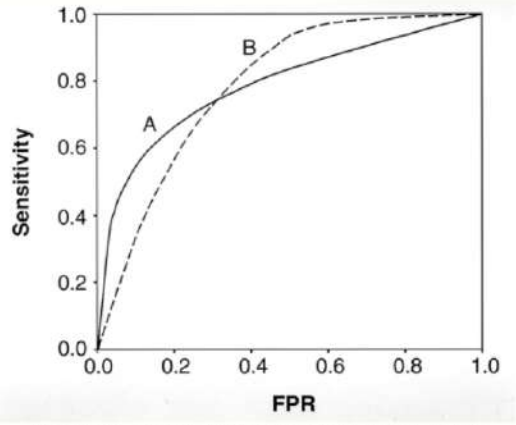

Fig.2: Hypothetical ROC curves of two medical tests

III. Precision-Recall (PR) curve

Precision-Recall (PR) curve presents an alternate approach to the visual comparison of classifiers (Davis and Goadrich 2006). PR curve can reveal the difference between algorithms which is not apparent from an ROC curve. In a PR curve, x-axis represents recall and y-axis represents precision. Recall is yet another term for PD(or TPR). Fig.3 shows an example; looking at the ROC curves for project PC5, it is difficult to tell the difference among the three classifiers: Naive Bayes (nb), Random Forest (RF) and IBk. However their PR curves allow us to understand the difference in their performance: Random Forest algorithm performs better than Naïve Bayes and Naïve Bayes has an advantage over IBk. In ROC curves, the best performance indicates high TPR and low FPR in the upper left-hand corner. PR curves favour classifiers which offer high TPR and high Precision, i.e. the ideal performance is in the upper right-hand corner. In fig.3(a) the performance of the three classifiers appears to approach close to the optimal left-hand upper corner. However the PR curve of fig.3(b) indicates that there is still plenty of room for the improvement of classification performance. This dissertation does not contend that PR curves are better than ROC curves. It only recommends that when ROC curves fail to reveal the differences in the performance of different classification algorithms, PR curves may provide adequate distinction

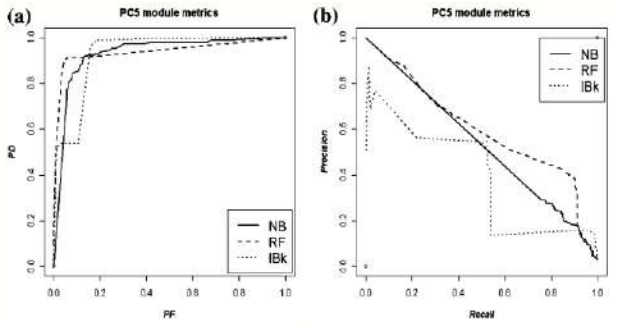

Fig.3: (a) ROC curve and (b) PR curve of models built from PC5 module metrics

IV. Conclusion and Discussion

ROC Curve and PR curves are a very useful tool for visualizing and evaluating classifiers. They are able to provide a richer measure of classification performance than scalar measures such as accuracy, error rate or error cost. Because they decouple classifier performance from class skew and error costs, they have advantages over other evaluation measures such as lift curves. However, as with any evaluation metric, using them wisely requires knowing their characteristics and limitations. It is hoped that this article advances the general knowledge about ROC and PR graphs and helps to promote better evaluation practices in the pattern recognition community.

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Routing Attacks In Manet

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Abstract- **A MOBILE AD HOC NETWORK (MANET) is a type of decentralized network and is high vulnerable network which requires secure communication. MANET incorporates mobile nodes that forward information or packets from node to node without a wired connection. Due to dynamic topology and absence of central administration there is an increasing threat of attacks in mobile adhoc networks (MANETs). It is easy for hackers to enter the network, exploit the vulnerabilities of the routing protocols.A significant security issue in manet is to protect the network layer from malicious nodes that misbhaves often to obtain the data that is not broadcasted for them i.e gray hole attacks aka selective forwarding attack that leads to denial of service attack(DoS). In this paper a survey and study about rushing attack is provided. This attack results in denial-of-services and is effectively damaging as it can also be performed by weak attacker.**

***Keywords*-- Black Holes, Gray holes attack, Mobile Ad-hoc Networks.**

I. INTRODUCTION

Mobile means moving and ad-hoc means temporary without any infrastructure[1]. So, mobile ad-hoc network is a collection of wireless mobile nodes which have the ability to communicate with each other without having fixed network infrastructure or any central base station[2]. The nodes themselves are responsible for creation, operation and maintenance of the network. Each node in the MANET is equipped with a wireless transmitter and receiver, with the aid of which it communicates with the other nodes in its wireless vicinity.

II. CHARACTERISTICS OF MANETS [1] [2] [3]:

(a)Cooperation: If source node and destination nodes are out of range of each other then the communication between them takes place with the cooperation of other nodes. This is known as mutihop communication.

(b)Limited Bandwidth: The bandwidth available for mobile ad-hoc networks is generally very low.

(c)Resource Constraints: MANETs have low power capacity, computational capacity, memory etc. In order to achieve reliable communication between nodes, these resource constraints make the task more enduring.

(d)Dynamic Topology: In MANET, nodes are mobile nodes as a result the network topology may change rapidly and unpredictably and connectivity among the terminals may vary with time. The nodes dynamically establish routing among themselves as they move about, forming their own network on the fly.

(e)Energy Constraint Operation: The nodes in MANET are portable devices and are dependent on batteries.

(f)Lack Of Fixed Infrastructure: In MANETs there is no fixed or central infrastructure as a result it is not possible to establish centralized authority to control the network. Due to the absence of centralized authority network management and security are scarcely applicable to MANETs.

(g)Autonomous Terminal: In MANET, each mobile terminal is an autonomous node, which may function as both a host and a router. Besides the basic processing ability as a host, the mobile nodes can also perform switching functions as a router. So, endpoints and switches are indistinguishable in MANET

(h)Distributed Operation: As there is no background network for the central control of the network operations, the control and management of the network is distributed among the terminals. The nodes involved in a MANET collaborate among themselves and each node acts as a relay as needed, to implement security and routing.

(i)Fluctuating Link Capacity: In MANETs, one end-to-end path can be shared by several sessions. The channel over which the terminals communicate is subject to noise, fading, and interference, and has less bandwidth.

III. ROUTING ATTACKS IN MANETS

Due to dynamic topology, distributed infrastructure less nature of MANETs and lack of centralized authority, ad- hoc networks are vulnerable to various types of attacks. MANETs are susceptible to both passive and active malicious attackers.

A. PASSIVE ATTACKS: A passive attacker listens to the channel and may access the packet con-taining secret information, but does not a_ect system resources and the normal functioning of the network [4]. Passive attacks are

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hard to detect because they do not involve alteration of the data. Figure1[5] shows a schematic description of passive attacker C, eavesdropping on communication channel between A and B [5]:

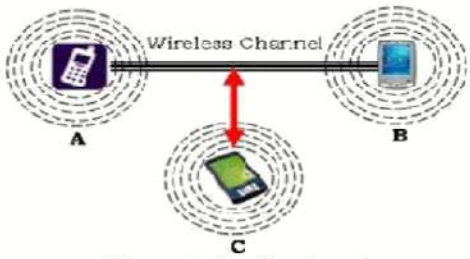

Figure 1: Passive Attacks

B. ACTIVE ATTACKS: The action of active attacker includes injecting packets to invalid desti-nations in the network, deleting packets, modifying contents of the packet etc. [4].

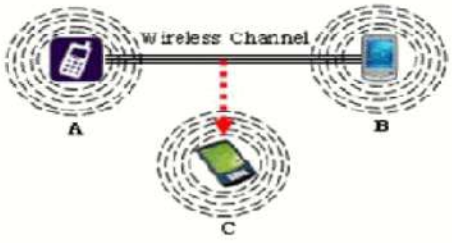

Figure 2: Active Attacks

As shown in Figure 2 [4], an active attacker C can listen, inject and modify messages into the communication channel between A and B[5]: Active attacks can be either internal or external. External attacks are carried out by mobile nodes that do not fit into the network. These attacks are launched by adversaries who are not initially authorized to participate in the network operations and access the resources without authorization. These internal attacks are more serious and hard to detect because the attackers know the valuable and secret information.

IV. VARIOUS TYPES OF ATTACKS IN MANET ARE:

(a)Flooding Attack: The attacker node floods the network with bogus route creation packets to fake (non-existing) nodes or simply sends excessive route advertisements to the network. The purpose is to overwhelm the routing-protocol implementations, by creating enough routes to prevent new routes from being created. Proactive routing protocols, as they create and maintain routes to all possible destinations are more vulnerable to this attack. [4]

(b)Sleep Deprivation Attack: In this attack, the attacker keeps the resources of the specific nodes engaged in routing decisions by continually requesting for either existing or non-exist-ing destinations. The nodes remain busy in processing and forwarding these packets thereby consuming batteries and bandwidth and obstructing the normal operation of the network[.4] .

(c)Impersonation Attack: In this attack, the attacker node impersonates a legitimate node, joins the network undetectably and starts sending false routing information.[4]

(d)Black Hole Attack: A black hole is a malicious node that falsely replies for any RREQ (Route Request) without having active route to the specified destination and drops all the receiving packets. If these malicious nodes work together as a group then the damage will be very serious and such type of attack is called cooperative black hole attack [6]. Figure3 shows black hole node in the network.

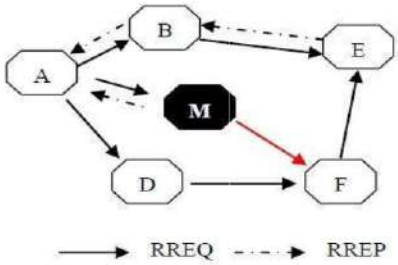

Figure 3 :Black Hole Attack

(e)Node Isolation Attack: In this attack, the attacker node isolates a given node from communicating with other nodes in the network by preventing link information of specific node from being spread to the whole network.

Thus, other nodes will not be able to get link information to establish link to the target node and hence will not be able to send data [4].

(f)Routing Table Poisoning Attack: In this, the attacker node generates and sends fictitious traffic in order to create false entries in the routing tables of participating nodes[10].

The attacker may also inject a RREQ packet with highest sequence number that causes all legitimate RREQ packets with lower sequence numbers to be deleted. This type of attack can result in selection of non optimal routes, creation of routing loops, bottlenecks etc [4].

(g)Wormhole Attack: Wormhole attack involves cooperation between two attacker nodes. For example, consider the following network as shown in figure 4.

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The source S chooses to route the data packets by S, M1, M2, D instead of S, A, B, C, because it is the shorter route but in reality, attackers use a longer route S, M1, A, B, C, M2, D since that the link between M1 and M2 is unreal [4].

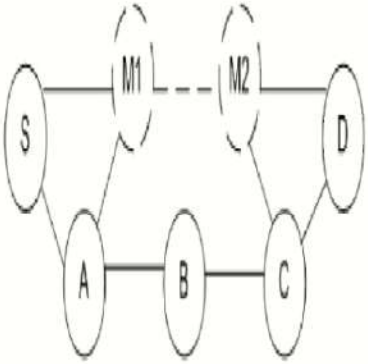

Figure 4: Wormhole Attack

(h)Location Disclosure Attack: In this type of attack, the attacker is able to discover the location of anode and structure of a network by using traffic analysis techniques [4]

(i)*Gray Hole Attack:* The gray hole attack has two phases: In the first phase, a malicious node advertises itself as having a valid route to a destination node, with the intention of intercepting packets, even though the route is fake. In the second phase, the node drops the intercepted packets with a certain probability. Figure 5 shows gray hole node in the network. A gray hole may exhibit its malicious behavior in different ways.
It may drop packets coming from certain specific node in the network while forwarding all the packets for other nodes. Another type of gray hole node may behave maliciously for some time duration by dropping packets but may switch to normal behavior later. A gray hole may also exhibit a behavior which is a combination of the above two, thereby making its detection even more difficult [7].

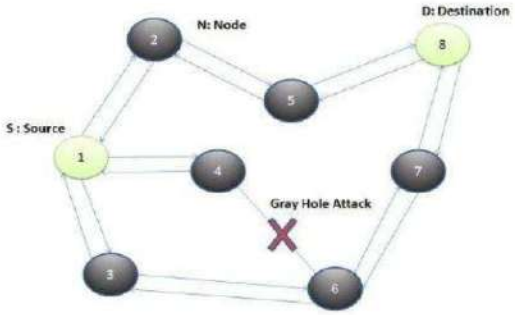

Figure 5: Gray Hole Attack

(j)Message Tampering Attack: In this type of attack, the attacker node alters the contents of the routing messages either by deleting some bytes or adding few bytes to it and forwards them with falsified information. This is an intentional malicious activity by the intermediate malicious nodes [1].

(k)Jamming Attack: In this attack, the attacker primarily keeps examining the wireless medium to find out the frequency at which the receiver node is receiving signals from the dispatcher. It, then, transmits signals on that particular frequency so that free reception at the receiver is hindered without error [5].

(l)Sinkhole Attack: In this attack, the adversary's goal is to attract all the virtual traffic from a specific area through a compromised node, creating a symbolic sinkhole with the opponent at the center as nodes on or near the path those packets follow have many opportunities to interfere with data [5].

(m)Byzantine Attack: In this attack, a set of cooperative intermediate nodes works in com-bined and collectively performs attacks such as creating routing loops, routing packets on worst paths, and selectively dropping packets [5].

(n)Neighbour Attack: The goal of neighbor attackers is to disrupt multicast routes by making two nodes that are in fact out of communication range believe that they can communicate directly with each other [5].

(o)Stealth Attacks: Stealth attacks are classified into two classes. The first class of attacks attempts to perform tra_c analysis on filtered traffic to and from victim nodes. The second class partitions the network and reduces good put by disconnecting victim nodes in several ways. The methods are referred to as stealth attacks since they minimize the cost of launching the attacks [5].

(p)Repudiation Attack: Repudiation attack is the main application layer level attack. Re-pudiation refers to the rejection or attempted denial by a node involved in a communication of having contributed in a part or the entire communication. Non-repudiation is one of the key requirements for a security protocol in any communication network and assures that a node cannot later deny the data was sent by it [5].

(q)Denial Of Service Attack: In this attack, an adversary always attempts to avoid legitimate and authorized users of network services from accessing those services, where legitimate tra_c cannot reach the target nodes [5].

A. DENIAL OF SERVICE ATTACK AT NETWORK LAYER :

(a)The attacker performs denial of ser-vice attack at the network layer by saturating the medium with a storm of broadcast messages (message bombing), reducing nodes goodput and impeding nodes from com-municating[10]. The attacker even sends invalid messages to keep nodes busy,

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wasting their CPU cycles and draining their battery power.

(b)Message Bombing: The attacker performs denial of service attack at the net-work layer by saturating the medium with a storm of broadcast messages (message bombing), reducing nodes goodput and impeding nodes from communicating. The attacker even sends invalid messages to keep nodes busy, wasting their CPU cycles and draining their battery power [8].

B. DENIAL OF SERVICE ATTACK AT TRANSPORT LAYER:

(a)Shrew Attack: This DoS attack is performed by sending short bursts repeated with a slow timescale frequency [8].

(b)Jellyfish Attack: A jellyFIsh attacker first needs to intrude in multicast forwarding group. It then interrupts data packets unreasonably for some time before forwarding them. This results in high end to end delay, thus degrading the performance [5].

(r)Device Tampering Attack: Manet nodes are generally compact, soft and hand- held in nature. They can be broken, lost or stolen easily and misused by the opponent [5].

(s)Eclipse Attack: This attack consists of gradual poisonin of good, uncompromised nodes' routing tables with links to a conspiracy of compromised nodes [5].

V. CONCLUSION:

In this paper, an effort has been made to concentrate on the various routing attacks mobile ad-hoc networks are susceptible to. Routing has greater impact on the performance of MANETs and routing is controlled by routing protocols. Therefore, effective routing protocols need to be developed. Routing protocols in MANETs are broadly divided into three categories as reactive, proactive and hybrid routing protocols and these protocols differ on the basis of certain parameters like routing philosophy, routing overhead, latency scalability, routing table updates, storage requirement etc.Security is one of the major challenging issues in MANETs as they are susceptible to various routing attacks due to dynamic topology and absence of central base station..

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Site Selection for Installation of Cellular Towers Using Fuzzy Logic Technique

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***Abstract*--- When installing a new tower the first step is to conduct a site survey to select the location for the installation of cellular towers. Site selection for infrastructures such as towers is extremely complex so there is a strategic need to take into account several criteria, which are often conflicting, incommensurate (measured on different scales) and subject to uncertainty. This paper describes an effort to design and implement a fuzzy logic based approach to select a suitable site for the installation of cellular towers. In this system seven input parameters which are distance from other tower, ground space for equipment, site location, subscriber density, distance from main transmission line, power supply, safe distance and one output parameter which is used.**

***Keywords*-** Fuzzy Logic, Cellular Towers, Site selection

I. INTRODUCTION

A cell site is a cellular telephone site where antennas and electronic communications equipment are placed, usually on a radio mast, tower or other high place, to create a cell or adjacent cells in a cellular network.Some cities require that cell sites be inconspicuous, for example blended with the surrounding area. Preserved treescapes can often hide cell towers inside an artificial tree or preserved tree. These installations are generally referred to as concealed cell sites or stealth cell sites.

The working range of a cell site - the range within which mobile devices can connect to it reliably - is not a fixed figure. It will depend on a number of factors, including[1]

- Height of antenna over surrounding terrain (Line-of-sight propagation).
- The frequency of signal in use.
- Timing limitations in some technologies.
- The transmitter's rated power.
- The directional characteristics of the site antenna array.
- Reflection and absorption of radio energy by buildings or vegetation.
- It may also be limited by local geographical or regulatory factors and weather conditions.

It should be ensured that there is enough overlap for "handover" to/from other sites and the overlap area should not be too large, to minimize interference problems with other sites.

Another most important area of concern is the electromagnetic radiation emitted by this fixed infrastructure,it is emitted continuously and is more powerful at close quarters.

In order to protect the population living around base stations and users of mobile handsets, governments and regulatory bodies adopt safety standards, which translate to limits on exposure levels below a certain value. There are many proposed national and international standards, but that of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) is the most respected one, and has been adopted so far by more than 80 countries. For radio stations, ICNIRP proposes two safety levels: one for occupational exposure, another one for the general population. Currently there are efforts underway to harmonize the different standards in existence.

Radio base licensing procedures have been established in the majority of urban spaces regulated either at municipal/county, provincial/state or national level. Mobile telephone service providers are, in many regions, required to obtain construction licenses, provide certification of antenna emission levels and assure compliance to ICNIRP standards and/or to other environmental legislation.

Many governmental bodies also require that competing telecommunication companies try to achieve sharing of towers so as to decrease environmental and cosmetic impact. This issue is an influential factor of rejection of installation of new antennas and towers in communities.

The safety standards in the U.S. are set by the Federal Communications Commission (FCC). The FCC has based its standards primarily on those standards established by the Institute of Electrical and Electronics Engineers (IEEE), specifically Subcommittee 4 of the "International Committee on Electromagnetic Safety".

On 1 September 2012, India set electromagnetic frequency exposure limit for all mobile phone base stations to

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one tenth of the existing ICNIRP exposure level. Telecom Enforcement Resource & Monitoring (TERM) cells will audit the self-certification provided by the mobile network operators.

In the USA, a small number of personal injury lawsuits have been filed by individuals against cellphone manufacturers, such as Motorola, NEC, Siemens and Nokia, on the basis of allegations of causation of brain cancer and death.

A case was also filed against the mobile towers in residential areas, schools and hospitals in India in 2012. In March 2013, based on the WHO notification dated May 31, 2011wherein the mobile tower radiations have been classified as possibly carcinogenic and the research conducted by the scientists of IIT Kharagpur, India a writ has been filed by Advocate Vikas Nagwan for the suspected death of one Late. Hemant Sharma for removal of the mobile towers from residential areas.[3]

There are certain rules and regulations set up by telecom regulatory authority of India for erection of towers[2]:

1) Before installation of tower, the licensee company obtains siting clearance from DoT to ensure that no interference with other wireless users, no aviation hazards and no obstruction to any other existing microwave links.

2) Telecom service providers have to obtain the necessary permission from the concerned local authorities/ municipal corporation before installation of tower.

3) Ensure that no nearby buildings right in front of the antenna with height comparable to the lowest antenna on tower at a distance threshold as specified .

Through this paper using fuzzy logic system we are making decision support system to choose suitable location for cell site.

II. INTRODUCTION TO FUZZY LOGIC

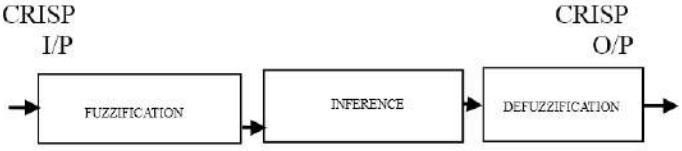
FUZZY logic was proposed in 1965. In this context, fuzzy logic is a problem-solving control system methodology that lends itself to implementation in systems ranging from simple, small, embedded micro-controllers to large, networked, multichannel PC or workstation-based data acquisition and control systems. It can be implemented in hardware, software, or a combination of both. Fuzzy logic provides a simple way to arrive at a definite conclusion based upon vague, ambiguous, imprecise, noisy, or missing input information. FUZZY logic's approach to control problems mimics how a person would make decisions, only much faster.

Fuzzy logic incorporates a simple, rule-based IF X AND Y THEN Z approach to a solving control problem rather than attempting to model a system mathematically. The FUZZY logic model is empirically-based, relying on an operator's experience rather than their technical understanding of the system.Fuzzy logic requires some numerical parameters in order to operate such as what is considered significant error and significant rate-of-change-of-error, but exact values of these numbers are usually not critical unless very responsive performance is required in which case empirical tuning would determine them[4].

III. FUZZY INFERENCE SYSTEM:

Fuzzy inference system is a popular computing framework based upon fuzzy set theory,fuzzy if-then rules and fuzzy reasoning.it has found successful applications in wide variety of fields such as automatic control,data classification and decision analysis,expert systems,time series prediction,robotics and pattern recognition.the basic structure of fuzzy inference system consists of three conceptual components:a rule base which contains selection of fuzzy rules,a data base which defines membership functions used in fuzzy rules and a reasoning mechanism which performs inference procedure upon the rules and given facts to derive a reasonable output or conclusion.

A basic fuzzy inference system can use either fuzzy inputs or crisp inputs but the outputs it produces are almost always fuzzy sets,sometimes it is necessary to have crisp output especially in the situation where fuzzy inference system is used as a controller.Thus we need a method of fuzzification to extract a crisp value that best represents a fuzzy set.with crisp inputs and outputs,a fuzzy inference system implements a non linear mapping from its input space to output space.this mapping is accomplished by fuzzy if then rules,each of which describes the local behaviour of mapping [4].



IV. FUZZIFICATION:

Fuzzification is a means of mapping measured input values fuzzy membership functions. A membership function is a curve that defines how each point in the input space is mapped to a membership value between 0 and 1. There are different shapes of membership functions; triangular, trapezoidal, piecewise, Gaussian, bell-shaped, etc.[6][5]

V. DEFUZZIFICATION:

Defuzzification is a conversion of internal fuzzy output variables into crisp values that can actually be used. It is done after the evaluation of inputs and applies them to the rule base. The centroid calculation method is commonly used for defuzzification **The defuzzification of the data into a crisp output is accomplished by combining the results of the inference process and then computing the "fuzzy centroid" of the area**. The weighted strengths of each output member function are multiplied by their respective output membership function center points and summed. Finally, this area is divided by the sum of the weighted member function strengths

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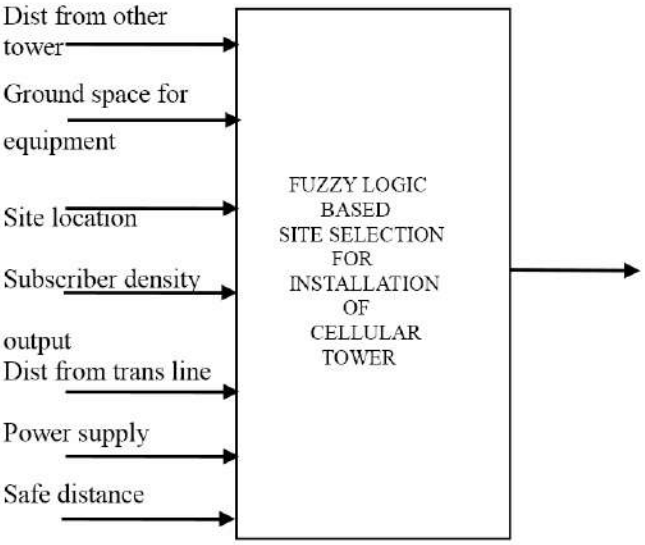
and the result is taken as the crisp output. One feature to note is that since the zero center is at zero, any zero strength will automatically compute to zero. If the center of the zero function happened to be offset from zero (which is likely in a real system where heating and cooling effects are not perfectly equal), then this factor would have an influence [5][6].

VI. SIMULATION ARCHITECTURE

The simulation model is built with the Fuzzy Logic Toolbox of Math Works. Fuzzification comprises the process of transforming crisp value into grade of membership for linguistic terms of fuzzy sets. The membership function is used to associate a grade to each linguistic term. The first step in using fuzzy logic within this model is to identify the parameters that will be fuzzified and to determine their respective range of values. The final result of this interaction is the value for each performance parameter.



A. INPUT AND OUTPUT PARAMETERS:

The input and output parameters are created in FIS editor as shown in the figure 1. We have considered seven input parameters and one output applied to the FIS[7].

Input parameters are:

1. distance from other tower
2. Ground space for equipment
3. Site location
4. Subscriber density
5. Distance from main transmission line
6. Availability of power
7. Safe distance

There is one output parameter as shown in figure 1.

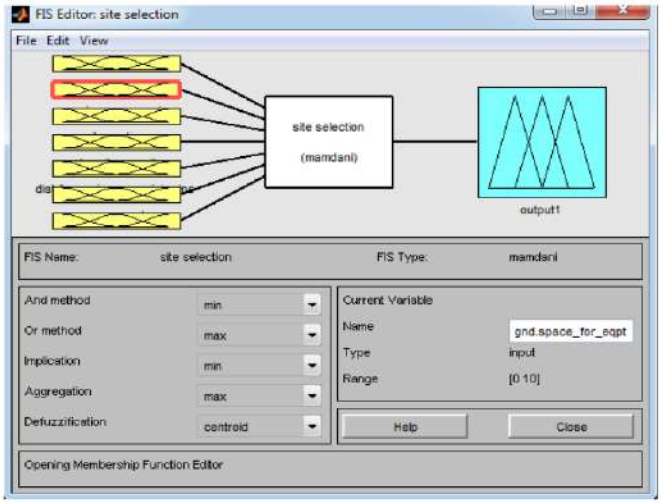


Fig. :1 Input and output parameters

B. MEMBERSHIP FUNCTIONS:

The membership function is used to associate a grade to each linguistic term. The membership function editor is used to define the properties of the membership function for the systems variables. The membership function is a graphical representation of the magnitude of participation of each input. It associates a weighting with each of the inputs that are processed, define functional overlap between inputs, and ultimately determines an output response. The rules use the input membership values as weighting factors to determine their influence on the fuzzy output sets of the final output conclusion. Once the functions are inferred, scaled, and combined, they are defuzzified into a crisp output which drives the system. There are different membership functions associated with each input and output response. Some features to note are:

SHAPE- triangular is common, but bell, trapezoidal, haversine and, exponential have been used. More complex functions are possible but require greater computing overhead to implement. HEIGHT or magnitude (usually normalized to 1) WIDTH (of the base of function), SHOULDERING (locks height at maximum if an outer function. Shouldered functions evaluate as 1.0 past their center) CENTER points (center of the member function shape) OVERLAP (N&Z, Z&P, typically about 50% of width but can be less).

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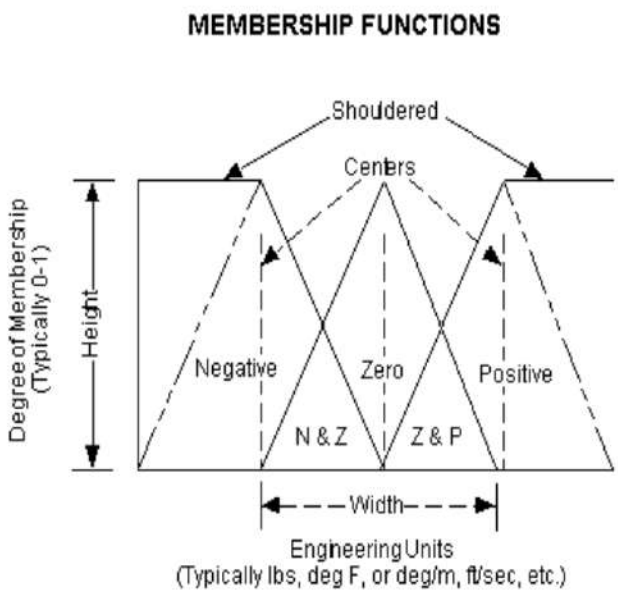

Fig 2- The features of a membership function

Figure 2 illustrates the features of the triangular membership function which is used in this example because of its mathematical simplicity. Other shapes can be used but the triangular shape lends itself to this illustration.

The degree of membership (DOM) is determined by plugging the selected input parameter (error or error-dot) into the horizontal axis and projecting vertically to the upper boundary of the membership function(s) [5].

Membership functions for given input parameters:

Input parameters	Mf1	Mf2	Mf3
distance from other tower	Less than 1.5kms	More than 1.5 kms	
Ground space for equipment	Less than 2000 square foots	More than 2000 square foots	
site location	residential	commercial	
subscriber density	low	med	High
Distance from main transmission line	low	med	High
power supply	low	med	High
safe distance	low	med	High

Membership functions for given output parameter:

Output parameter	Mf1	Mf2
Output1	no	yes

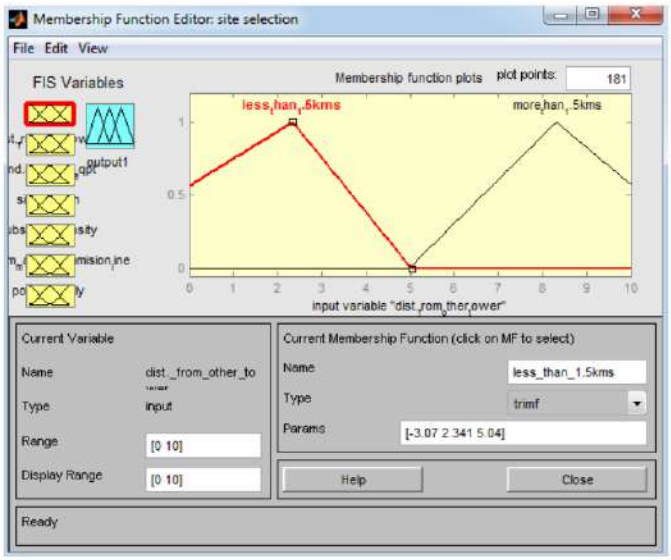

Fig. 3: Membership function plot for input parameter i.e. distance from other tower

C. RULE BASE:

A fuzzy rule base is a collection of knowledge in the If-Then format from experts. It describes the relationship between fuzzy input parameters and output. It is used to display how an output is dependent on any one or two of the inputs. The rule editor enables the user to define and edit the rules that describe the behavior of the system. As per the input and output parameters fuzzified, rule base is generated by applying reasoning to evaluate the performance of a teacher. There are 195 number of rules generated. Fig 4shows rule viewer and figures 5 and 6 shows surface viewer for our system[6].

Assessment:

1. If ground space for equipment is low but all other parameters are high then output is no because a tower cannot be set without sufficient space.
2. If all parameters are high then output is yes.
3. If all parameters are high but distance from main transmission line and safe distance is low then output is no because of interference.
4. If site location is residential and power supply is low then output will be no because there will be disturbance in

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residential areas as generators will be used for power generation.

Fig. 4: Rule viewer

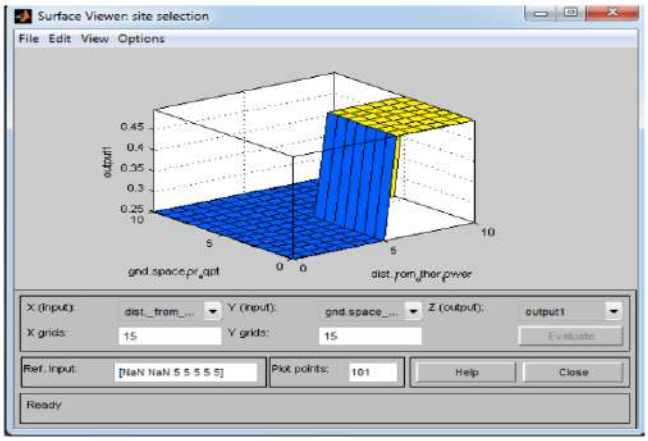

Fig. 5: Surface viewer (distance from other tower vs. ground space for equipment.)

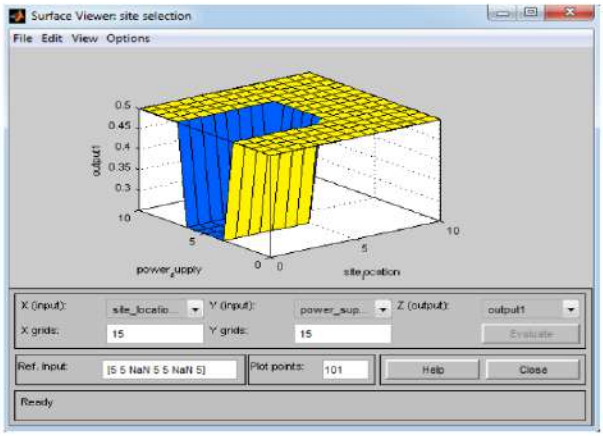

Fig. 6: Surface viewer (power supply vs. site location)

CONCLUSION:

The process of setting of cellular towers is very important procedure as according to TRAI(telecom regulatory authority of India) there are certain rules and regulations which are to be followed by telecom companies before setting of towers. Thus with the help of this model we have designed a decision support system for selecting an accurate location for building an infrastructure to set antennas for cellular communication.The membership functions and fuzzy rule bases were developed based on logical reasoning.The results obtained reflect that the proposed system can be used to select the suitable location for setting tower. This research can be extended by considering remaining categories for site selection after reaching in to more surveys for further improvements.

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Various Standards of GSM

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Abstract—**Mobile communication in today's life is the most developing technology with advanced techniques in all fields. This paper deals with the advancement techniques, generation wise depicting the standards of wireless cellular technologies which are first , second , third and fourth generation. First generation was basically analog cellular systems with circuit switched network architecture. This was basically voice telephony with low capacity, limited local and regional coverage. The increased demand for high frequency second generation arrived to meet the capacity demands of expansion of voice, telephony, text messaging and limited data services. The third generation allowed mobile telephone customers to use audio, graphics and video application. Fourth generation is short for fourth generation cell phone devices.**

Index Terms—Cellular network, first generation, ,fourth generation, second generation, third generation

I. INTRODUCTION

From past few years wireless industry done a wide growth both in terms of technology and subscribers. The first generation mobile systems were the semi-analog systems, which came in the early 1980s and known as NMT (Nordic mobile telephone).Second generation arrived to meet the capacity demands of expansion of voice and telephony. Second generation was basically digital communication which replaced the analog technology. As an example of 2G system Himanshu Teyagi says[1] study of GSM, develop in 1980s.Data communication in addition to the voice communication has been the main focus in the 3g technology and a converged network for both voice and data communication. Third generation can provide higher data rates both in mobile and in fix environment. It gives up to 2mbps in stationary and about 384kbps in mobile environment. Paramand Sharma [2] says that 4g encouraged the video streaming, IP telephony and provide cost effective services to mobile users.3g can implement various network technologies such that GSM,CDMA,WCDMA,CDMA200 AND TDMA. Fourth generation integrates the existing heterogeneous wireless technology avoiding the need of uniform stand for different wireless systems like WIMAX K.Kumaravala [3]says about wimax that it is a wireless communication standard designed to provide 30to40 megabit per second data rates. Sanket Yew ale [4] says, general packet radio system (GPRS) is a packet oriented service on the 2g and 3g cellular communication system. GPRS usage is typical charged based on volume of data transferred, contrasting with circuit switched data, which is usually billed per minute of connection timer Srividya [5] says that 4g increase the data rates by providing 100mbps to 1gbps respectively. This paper is organized as follows. Section II provides a brief review of development of mobile communication from first generation of cellular network how mobile industry has grown till fourth generation. Describing of first, second, third and fourth generation. Section III shows the comparison between the four generations. Section IV gives the conclusion of the paper and about the future prospects of the paper.

II. EVOLUTION OF MOBILE CELLULAR NETWORKS

Mobile network is a radio network distributed over land areas called cells, each served by at least one fixed-location transceiver, known as a cell site or base station. In a cellular network [6], each cell uses a different set of frequencies from neighboring cells, to avoid interference and provide guaranteed bandwidth within each cell. This enables the cells(e.g., mobile phones, pagers ,etc)to communicate with each other and with fixed transreciever and phones anywhere in India, even if some of the transreciever are moving more than one cell during transmission.Fig1 shows the cellular communication system .

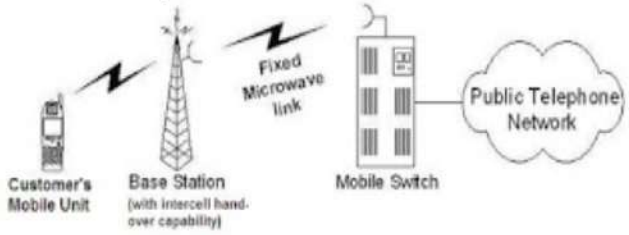

Figure1: General cellular system [12]

II. FIRST GENERATION

The 1G first generation mobile wireless communication system was analog system, which was based on a technology known as Advance Mobile Phone Service(AMPS).1G consists of distributed transceivers that helped in communicating with mobile phone. 1G phone, the mobile market showed annual growth rate of 30 to 50 per cent, rising to nearly 20 million subscribers in 1990.1g technology replaced 0g technology which featured mobile radio telephones and such technologies as mobile telephone systems. Advanced mobile telephone system, improved mobile telephone service and push to talk.1g, a voice call gets

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modulated to a higher frequency of about 150 MHz and transmitted between radio towers. This is done by using frequency division multiple access (FDMA) [7], but it fails in some fields in terms of overall connection quality. It has low capacity, poor voice links and no security at voice calls. In fig2 graph of time and frequency is shown.

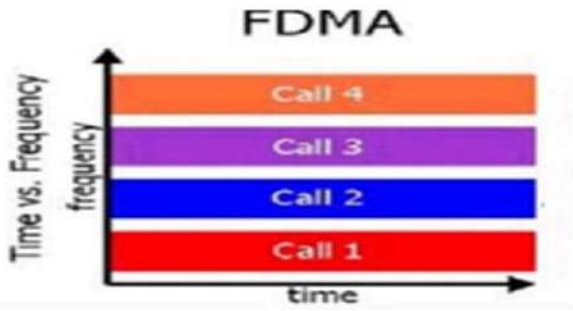

Figure 2: Graph of Time and Frequency [13]

IV. SECOND GENERATION:

2G was followed by 2.5G which is an intermittent between 2G and 3G. It is based on both circuit switched and packet switched technologies providing high data rate with low power consumption. 2G also introduced the additional data transfer through mobile rather than only voice data as in 1G.2g phones using global system for mobile communications (GSM) were first used in the early 1990s in Europe. GSM provides voice and limited data services, and uses digital modulation for improved audio quality. The development of 2G cellular systems was driven by the need to improve transmission quality, system capacity, and coverage further advances in semiconductor technology and microwave devices brought digital transmission to mobile communication. Multiple IG and 2G standards are used in worldwide mobile communication. Different standards serve different applications (paging, cordless telephony, wireless local loop, private mobile radio, cellular telephony, and mobile satellite communication) with different levels of capability and service area. Mobile switching centers (MSCs) are intelligent servers and the whole net- work is data-driven, using subscription and authentication. Information held in the home location register (HLR) and authentication centre (AuC). The standard services of 2g include circuit-switched voice, fax, and data, as well as voicemail and voicemail notification. Ad- additional services include wireless application proto- col (WAP), high-speed circuit-switched data (HSCSD), mobile location services (MLS), and cell broadcast.

V. GLOBAL SYSTEM OF MOBILE COMMUNICATION (GSM):

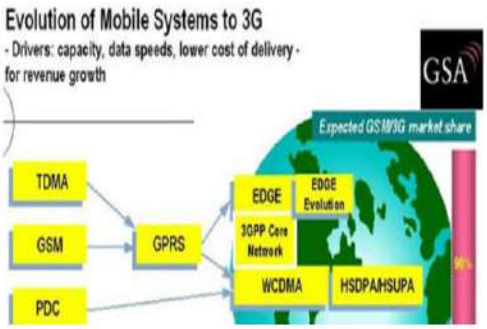

Figure3: Evolution of 3g mobile system.[14]

GSM is the most successful family of cellular standards. It includes GSM900, GSM-railway (GSM-R), GSM1800, GSM1900, and GSM400. GSM supports around 250 million of the world's 450 mil- lion cellular subscribers, with international roaming in approximately 140 countries and 400 networks. The main elements of this system are BSS(base station subsystem),in which there are the BTS(base Tran receiver station),BSC(base station controllers) and the NSS(network switching subsystem),VLR(visitor location register)and EIR(equipment identity register).GSM network also has a extension to be fixed telephone networks.

V I GSM AND EDGE (Enhanced data rates for global evaluation):

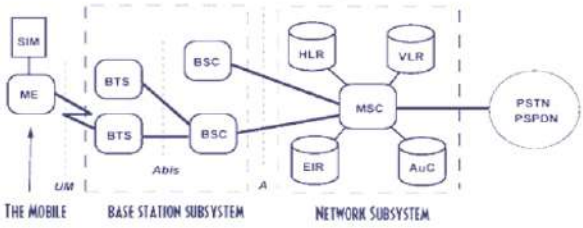

Figure4, GSM Architecture [14]

With both voice and data traffic moving on system the need to increase the data rate. This was done by using sophisticated coding methods over the internet and increasing the data rate up to 384kbps EDGE/EGPRS is implemented as a bolt on enhanced for 2.5g GSM/GPRS networks. Edge is a superset to GPRS and function many network with GPRS deployed on it. Edge can carry a bandwidth up to 236kbit/s. It means it can handle 4times as much traffic as standard gars.

VII. GSM AND GPRS (General packet radio services):

GPRS is important be- cause it helps operators, vendors, content providers, and users prepare for 3G, as many concepts of GPRS live on in 3G, and we will need these enhancements to 2G net- works for ten years or more. Wireless network technologies are somewhere between 2G and 2.5G. The

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second generation of mobile communications technology was all about digital PCS. The problem, however, was that much of the digital network was implemented for, or overlaid onto, propriety networking equipment. Taken together, 2G and 2.5G technologies are far from seamless. These range from spread- spectrum code-division multiple access (CDMA) in North America to narrow-spectrum time-division multiple access (TDMA) and GSM in Europe and Asia. In addition to these incompatibilities, both systems offer digital voice at a relatively low speed with very little bandwidth left over for data. As if we talk about GSM and GPRS, as the requirement for sending data on the air interface increased a new elements SGSN (serving GPRS) and GGSN (gateway GPRS) were added to existing GSM system. These elements made it possible to send packet data on the air-interface. It also contains IP routers, firewall servers and DNS (domain name servers). This enables wireless access to the internet and the bit rate reaching 150kbps in optimum conditions. In fig 4 GSM and GPRS mobiles are shown.

Figure4: GSM and GPRS mobiles [12]

VII. THIRD GENERATION:

3G can provider higher data rates both in mobile and in fixed environments. It gives up to 2Mbps in stationary and about 384 Kbps in mobile environments. 3G has encouraged the video streaming and IP telephony to develop further and provide cost effective services to mobile users.3g can implement various network technologies such as UMTS, GSM, CDMA, WCDMA, CDMA200, TDMA and EDGE. The International Telecommunication Union (ITU) defined the demands for 3G mobile networks with the IMT-2000 standard. An organization called 3rd Generation Partnership Project (3GPP) has continued that work by defining a mobile system that fulfills the IMT-2000 standard. In Europe it was called UMTS (Universal Terrestrial Mobile System), which is ETSI-driven. IMT2000 is the ITU-T name for the third generation system, while cdma2000 is the name of the American 3G variant. WCDMA is the air-interface technology for the UMTS. 3G networks enable network operators to offer users a wider range of more advanced services while achieving greater network capacity through improved spectral efficiency. Services include wide-area wireless voice telephony, video calls, and broadband wireless data, all in a mobile environment. The first commercial 3G network was launched by NTT Do Como in Japan branded FOMA, based on W-CDMA technology on October 1, 2001 [8]. 3G networks do not use the same radio frequencies as 2G, so mobile operators must build entirely new networks and license entirely new frequencies; an exception is the United States where carriers operate 3G service in the same frequencies as other services. The license fees in some European countries were particularly high, bolstered by government auctions of a limited number of licenses and sealed bid auctions, and initial excitement over 3G's potential. In January 2009, China launched 3G but interestingly three major companies in China got license to operate the 3G network on different standards, China Mobile for TD-SCDMA, China Unicom for WCDMA and China Telecom for CDMA2000 [2].In fig 5 DA centre is shown.

Figure5: DA centre is shown.[14]

VIII.FOURTH GENERATION:

4G also called Next Generation Network (NGN) offers one platform for different wireless networks. These networks are connected through one IP core. 4G integrates the existing heterogeneous wireless technologies avoiding the need of new uniform standard for different wireless systems like World Wide Interoperability for Microwave Access (Wimax), Universal Mobile Telecommunications System (UMTS), wireless local area network (WLAN) and General Packet Radio Service (GPRS). In 4G the latency will be decreased considerably, because of all IP environments. 4G can be considered as a global network where users can find voice, data and video streaming at anytime and anywhere around the globe. 4G will make sure - "The user has freedom and flexibility to select any desired service with reasonable QoS and affordable price, anytime, anywhere." 4G mobile communication services started in 2010 and make a mass market in the 2014 to 15. The main aim of 4G technology is to provide high speed, high quality, high capacity and low cost services for example voice, multimedia and internet over

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IP. 4G is totally IP based technology with the capability of 100Mbps and 1Gbps speed for both indoor and outdoor. Other 4G applications include high-performance streaming of multimedia content based on agent technology and scalable media coding methods. 4G will solve problems like limited band- width in 3G when people are moving and uncertainty about the availability of bandwidth for streaming to all users at all times. In fig 6 4g uses are shown.

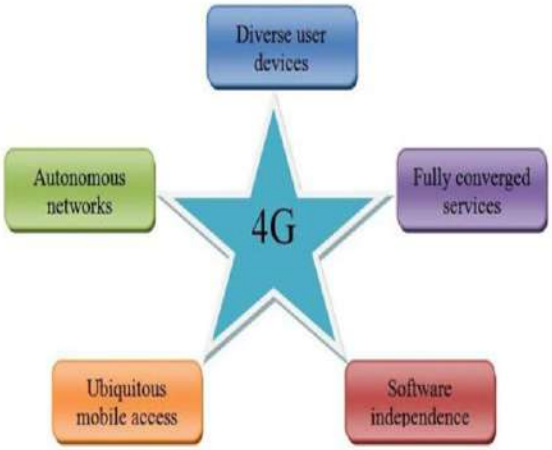

Figure6: Application of 4G.[15]

VII. COMPARISION:

Sr no	1ST G	2ND G	3rd G	4th G
1	It is existed in 1980-90.	It evolved in 1991.	It existed in 1997.	It evolved in 2000.
2	It uses analog signaling technology .	It uses digital signaling technology.	It uses broadband technology.	It uses combination of broad band and undefined IP technology
3	It supports data bandwidth in Kbps.	It supports data bandwidth in Kbps.	It supports data bandwidth in Mbps.	It supports data bandwidth in Mbps.
4	It uses FDMA Multiplexing technique.	It uses TDMA/ CDMA multiplexing	It uses TDMA/CDMA multiplexing technique.	It uses CDMA multiplexing technique.
5	Peak speed up to 1.9Kbps.	Peak speed up to 14.4Kbps.	Peak speed up to 5Mbps.	Peak speed upto 150Mbps.
6	AMPS, TACS technologies are part of 1g.	TDMA/ CDMA are part of 2g.	Technologies under it are CDMA200, UMTS, EDGE, IXRIT, and EVDO.	WIMAX Technology is part of 4g.
7	It supports circuit switching	It supports circuit and packet switching.	It supports circuit and packet switching .	It supports packet and message switching.

CONCLUSION

In this paper we have propose comparion of all wireless standards like 1g,2g 3g and 4g,which is the main contribution of the paper.Cellular technology has become very essential part of our everyday life.Their current development is the outcome of various generations mentioned above.In this paper we our viewing various performance,advantages and disadvantages of one generation over other.

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Vertical Handover Technique for Heterogeneous Wireless Networks

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***Abstract*— In the nowadays heterogeneous wireless environment, a plethora of access networks have to be interconnected in an optimal manner to meet the always best connected paradigm. In this paper we investigate the potentiality and the benefits of a soft Vertical Handover (VHO) mechanism, compared with the traditional hard approach. More specifically, we present an analytical scheme for seamless service continuity in a heterogeneous network environment, modeled by means of a multi-dimension Markov chain. . Mobile devices enabled with multiple wireless technologies make possible to maintain seamless connectivity in highly dynamic scenarios such as vehicular networks (VNs), switching from one wireless network to another by using vertical handover techniques (VHO). In addition we suggest the most appropriate VHO techniques to efficiently communicate in VN environments considering the particular characteristics of this type of networks.**

***Keywords*— Heterogeneous wireless networks , Vertical Handover, Mobility, Vehicular Networks**

I. INTRODUCTION

In developed countries the user demand for mobile services is increasing due to the need to access information anywhere, anytime. The ever-growing communications infrastructure allows connectivity through diverse wired and wireless technologies in different environments.

The adoption of wireless technologies is increasing at a very fast rate. This trend is basically due to factors such as: (i) the miniaturization of devices such as laptops, Personal Digital Assistants (PDA), and netbooks, (ii) the multiple networking interfaces available in most devices, (iii) the availability of several wireless technologies such as Wireless Fidelity (Wi-Fi), Worldwide interoperability for Microwave Access (WiMAX), and Universal Mobile Telecommunications System (UMTS), and (iv) the emerging mobile applications, such as those based on the Web 2.0 paradigm, car navigation, and location based services.

The integration of different wireless network technologies is needed to provide a ''seamless'' interoperability, integration and convergence among these heterogeneous technologies and, therefore,

the use of vertical handover (VHO) techniques are required.

Nowadays, the automobile industry is taking advantage of the wireless technologies to improve security and comfort offering to users diverse services such as alert messages, toll payments, infotainment, etc. In order to avoid any underperformance and to guarantee the Quality of Service (QoS) of the services, the On-Board Unit (OBU) in the car must be able to perform VHO in a seamless manner.

Heterogeneous Wireless Networks (HWNs) represent the new scenario of Next Generation Network (NGN) architecture, where different technologies, such as GSM (Global System for Mobile Communications), GPRS (General Packet Radio Service), UMTS (Universal Mobile Telecommunications System), WLAN (Wireless Local Area Network), WiMAX (Worldwide Interoperability for Microwave Access), and LTE (Long Term Evolution), co-exist and offer an overlapped wireless coverage [1].

Currently, wireless mobile networks and devices are becoming increasingly popular to provide user seamless Internet access, anytime and anywhere. This has led to the concept of nomadic computing, which involves portable devices (such as smartphones, laptop and handheld computers) providing Internet access to users connecting from their home or office networks. Furthermore, multimedia services requirements encompass not only large bandwidth communications, but also on-the-move facilities. NGN communication systems aim at providing seamless mobility support to access heterogeneous wired and wireless networks [2,3].

Typically handover procedures fall into two main categories, (i) the Network Controlled Handover (NCHO) and (ii) the Mobile Controlled Handover (MCHO), depending on whether a handover is initiated and controlled by the network or by the MT, respectively [4,5]. In horizontal handover management, MCHO is the most common case, especially for WLAN environments, while NCHO is generally the preferred choice for cellular networks where resource optimization and load management are centralized. To the best of our knowledge no scheme currently exists that is able to use both approaches.

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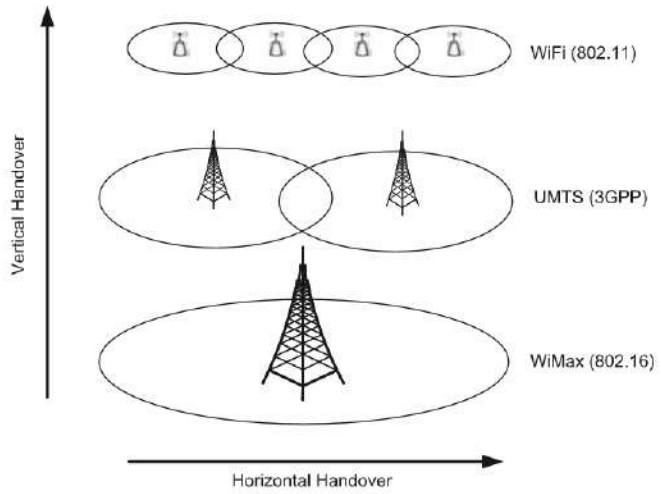

Fig. 1. Illustration of the horizontal and vertical handover processes.

II. Vehicular Network Overview

VNs offer many application branches which can be classified as: (i) safety such as emergency warning systems for vehicles, transit or emergency vehicle priority signaling, and (ii) non-safety applications. As examples of the latter we have cooperative adaptive cruise control, electronic parking and toll payments, infotainment services, and content delivery, among others. Within VNs a vehicle is considered as a node of the network, being equipped with multiple interfaces that provide access to different technologies such as Global Positioning System (GPS), Wi-Fi, WiMAX and UMTS. Vehicles are able to communicate among them and with their base stations (access points or point of attachments) under the Ad-hoc or the infrastructure mode [6], respectively. Notice that we focus our study on access-point-based networks (VNs) and not on the ad hoc mode (VANETs). Further information about VANETs could be found in [7].

The main specific characteristics of VNs can be summarized in: (i) topology restrictions, (ii) mobility patterns, (iii) power consumption, (iv) scalability, (v) node reliability and (vi) speed [6]. VNs are geographically constrained to the roadmap layout; consequently, the topology is heavily dependent on the roadmap or the vehicular scenario. Nevertheless, this restriction allows to improve network performance or VHO decisions allowing to predict mobility. Concerning power consumption, wireless devices are traditionally limited by the battery autonomy. However, in vehicular network (VN) environments, the devices are continuously powered by the vehicle's energy system; therefore, there are no energy constrains limiting their performance. It is important to mention that VNs can reach a high number of nodes, which requires them to be very scalable. Finally, node reliability must be taken into account since a node may quickly join or leave the network coverage area depending on the speed and the destination of the vehicle.

Several worldwide projects are being developed and promoted in order to provide solutions to reinforce safety and to extend the use of non-safety applications on cars and highways through the use of wireless technologies. Industry, researchers and governments are working towards a standardization for those solutions: Europe through projects and consortiums such as Car2Car Communication Consortium, Network on Wheels, and Safespot; USA through the Vehicle Safety Consortium (VSC), Vehicular Infrastructure Integration (VII) and Intelligent Vehicle Highway Systems (IVHS); finally, Japanese projects Advanced Safety Vehicle (ASV) and Advanced Highway Systems (AHS) focus their efforts on setting common issues such as frequency allocation, protocol definition and infrastructure deployment [8].

Wireless Access in Vehicular Environments (WAVE) [9] is a standard developed for VNs, to satisfy the communication needs of a large class of applications using the Dedicated Short Range Communication (DSRC) spectrum [10]. The WAVE protocol architecture encompasses the IEEE P802.11p standard [11] for the PHY/MAC layers and the IEEE P1609 [9] family of protocols for the application layers. These protocols must be efficient and reliable in order to provide safety and comfort services to passengers via context sensitive applications [12,13], as well as low latencies to deliver contents within acceptable time bounds.

The International Organization for Standardization (ISO) is also working towards a seamless connectivity solution for a wide variety of wireless access technologies. This proposal, called Continuous Air Interface for Long and Medium Range (CALM M5), has been specifically designed to reduce the end-to-end latency communication in mobile environments such as VNs [14], and also works on top of IEEE 802.11 p.

Referring to VN environments, we consider that VHO strategies must be designed and applied depending on the underlying network technologies geographically available and the expected lifetime of each possible connection. Therefore, at least two scenarios might be evaluated: (i) Urban scenarios and (ii) Highway scenarios. Concerning urban scenarios, multiple short and wide range wireless technologies such as BT, Wi-Fi, General Packet Radio System (GPRS), UMTS and WiMAX may be considered in the design of the VHO strategy. In highway scenarios the predominant wireless technologies are those that cover a wide range, and so VHO strategies should focus mostly on technologies such as UMTS, WiMAX and WiBro.

III. Vertical Handover Overview

An accurate VHO process should take into account and care about the service continuity, network discovery, network selection, security, device's power-management and QoS issues [9,33,36], focusing mostly on the latter. Several proposals [25,26,58] split the VHO process into three parts: (i) Handover information gathering, (ii) Handover decision, and (iii) Handover execution. Fig. 2 shows the interactions among the three phases required to implement handover in heterogeneous networks.

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3.1. Handover information gathering

The handover information gathering phase collects not only network information, but also information about the rest of the components of the system such as network properties, mobile devices, access points, and user preferences. For that reason this phase receives different names: handover information gathering [24], system discovery , system detection [15], handover initiation [16] or simply network discovery [17]. In this phase, the information is collected to be used and processed for making decisions in the handover decision phase. The information typically collected is the following:

Availability of neighboring network links by offering information such as throughput, cost, packet loss ratio, handoff rate, Received Signal Strength (RSS), Noise Signal Ratio (NSR), Carrier to Interference Ratio (CIR), Signal to Interference Ratio (SIR), Bit Error Ratio (BER), distance, location, and QoS parameters.

The Mobile device's state by gathering information about battery status, resources, speed, and service class.

User preferences information such as budget and services required.

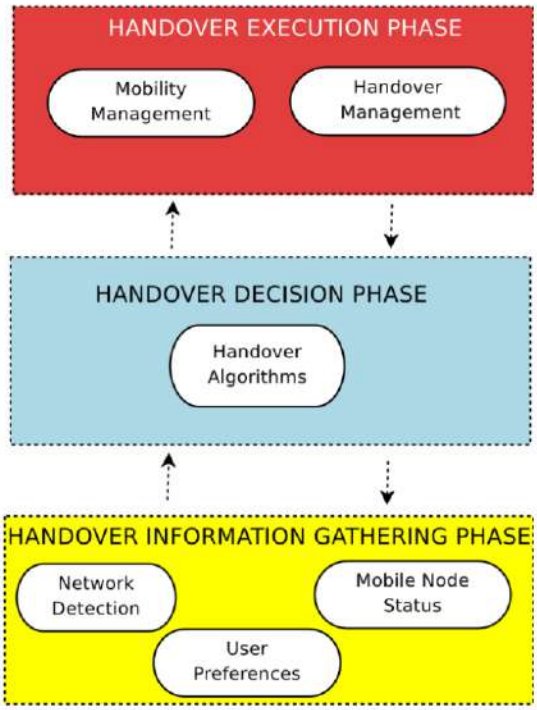

Fig. 2. Handover management procedure.

3.2. Handover decision

The handover decision phase is one of the most critical processes during the handover. This phase is also know assystem selection [19], network selection [18] or handover preparation [16]. Based on the gathered information, this phase is in charge of deciding When and Where to trigger the handover. The When decision refers to the precise instant in time to make an optimal handover, while the Where refers to selecting the best network fulfilling our requirements for the switching.

In a homogeneous network environment deciding When to handover usually depends on RSS values, while the Where is not an issue since we use the same networking technology (horizontal handover). In heterogeneous networks the answer to these questions is quite complex. To make the best decisions the information gathered must be evaluated taking into account many parameters obtained from the different information sources, i.e. network, mobile devices, and user preferences. Vertical Handover Decision Algorithm (VHA) are used to weight up and evaluate the parameters involved under each specific criteria. As examples of algorithms allowing to evaluate cross-layer multi-parameters we have techniques such as fuzzy logic, neural networks, and pattern recognition, among others.

3.3. Handover execution

This phase performs the handover itself; besides performing the handover, the phase should also guarantee a smooth session transition process. In order to perform the VHO different handover strategies cooperate with control signaling, and the IP management protocols. This phase is usually known as Handover execution [18], but it also receives the name of VHO assessment or Handoff implementation .

Concerning VNs, the performance of each phase must be focused on the distinctive characteristics and features of such type of networks. The information gathering phase must consider the dynamism of the available information at the devices and the network. Making decisions based on highly dynamic information with a given degree of the device's mobility requires a quick and reliable decision algorithm. Finally, the execution of the VHO must be carefully controlled to achieve accuracy by considering the geographical location, the selected network and the precise time.

IV. HANDOVER MANAGEMENT

In the handover process there must be an entity in-charge of controlling the VHO process. Usually, the handover can be either network controlled or mobile controlled. In the former case it is initiated and controlled by the network, a solution that is typically adopted by operators to achieve load balancing duties and traffic management, among others . In the latter case (mobile controlled) the VHO is initiated and controlled by the mobile device. This type of control is the most common case, usually based on user preferences [20]. Also, the VHO can be network assisted, referring to the VHO initiated by the mobile device but assisted by the network making use of the information services, or mobile assisted when it is initiated by the network but assisted by the mobile device [21].

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During the handover process, when a mobile device reaches a new point of access, the system might execute procedures to manage the connections. These procedures usually perform Registration, Association, Re-association, and Dissociation tasks [21].

V. CONCLUSION

In this paper we described the VHO process, the different phases that are part of this process, as well as the procedures triggered at each phase. Additionally the Media Independent Handover Services Protocol (IEEE 802.21) designed for VHO is briefly described. Moreover, we analyzed the VHO from the Vehicular Network (VN)'s perspective to evaluate the branch of solutions that the conjunction of wireless technologies and VHO techniques offers to satisfy the connectivity needs on the road. Furthermore, we classified the most widely used vertical handover decision algorithm (VHA) in the literature into different sets of algorithms depending primarily on the information used to make decisions, and the techniques employed. Concerning VNs, we consider that MIHS protocol must be taken into account when designing the VHO architecture. Multiple-parameters-based algorithms should be used to select the information, in order to the take the most of the context environment.

When gathering information in VNs we must take into account the vehicular mobility prediction and the vehicular speed in order to improve the selection effectiveness in the presence of highly dynamic channel conditions. In addition, the decision process must rely on a fast MCDM algorithm to perform an accurate decision, and to switch to the best candidate network within a very short period of time. Finally, when executing a seamless VHO, low latencies and high security levels must be achieved. To do so, we consider Mobile IP as one of the candidate solution offering the best trade-off.

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16x10 GBPS Optical Communication System Using Optimized Semiconductor Optical Amplifier with Low Input Signal Power

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Abstract - **In this paper, the transmission performance of 16x10 *Gbps* wavelength division multiplexing system using Semiconductor optical amplifier (SOA) with 0.8nm channel spacing has been demonstrated at different signal input power. It is found that the signal can be transmitted with acceptable quality factor and bit error rate up to 261 km transmission distance at -30dBm signal input power. In addition, it is also observed that the system provides acceptable performance upto 342 km and 350 km transmission distance at -10dBm and -20dBm signal input power respectively without using power compensation methods. We show improvement in transmission distance at minimum input optical power.**

Index Terms: SOA, WDM system, BER, Q factor

I. INTRODUCTION

As the optical signal travels in a fiber waveguide, it suffers attenuation. Optical amplifiers are key devices that reconstitute the attenuated optical signal, thus expanding the effective fiber span between the data source and the destination. For long-haul systems, the loss limitation has been traditionally overcome using optoelectronic repeaters in which the optical signal is first converted into an electric current and then regenerated using a transmitter. Such regenerators become quite complex and expensive for wavelength-division multiplexed (WDM) light wave systems. Currently the optical amplifiers are used which directly amplify the transmitter optical signal without conversion to electric forms as in-line amplifiers [1]. It amplifies the signals simultaneously and decreases the attenuation. With increasing demand for systems with greater capacity and transparent routing, advances must be made in signal amplification and processing. Many of the important advances in optical fiber networks have been made possible by the optical amplifiers [2]. Semiconductor optical amplifiers (SOAs) are prospective devices for optical fiber transmission systems as compared to fiber amplifiers due to their ultra-wideband gain spectrum, low power consumption [3], compact size, low cost [4], large optical gain, and possible integration with other semiconductor optical devices such as the semiconductor laser and the detector, but have been considered to reveal rather high level of noise [5]. Woosuk Choi [6] analyzed the transmission performance of 8 × 10 Gb/s transmission over 240 km wavelength division multiplexing (WDM) signals due to crosstalk in cascaded conventional semiconductor optical amplifiers. Kim et al. [7] successfully transmitted 10 Gb/s optical signals over 80km through SSMF (Standard single mode fiber) with the transmitter using SOAs as booster amplifiers. They have further found the appropriate parameters of input signals for SOAs, such as extinction ratio, rising/falling time, and chirp parameter to maximize output dynamic range and available maximum output power. Singh et al. [8] investigated placement of semiconductor optical amplifier for 10Gbps non-return to zero format in single mode and dispersion–compensated fiber link. In this work, different compensation methods (pre, post and symmetrical) for different positions of the SOA in fiber link have been described. The effect of increase in signal input power for these three power compensation methods are compared in terms of eye diagram, bit error rate, eye closure penalty and output received power. It was found that the post power compensation method is superior to symmetrical and pre power compensation methods when SOA is used.

The paper is organized into four sections. Section 1 presents the introduction. In Section 2, the system setup and description of its components based on semiconductor optical amplifier with its optimized parameters is described. In Section 3, simulation results have been reported and Section 4 includes the conclusion about the feasibility of the system.

The transmission distance of 204km using post, pre and symmetrical power compensation methods with only one channel has been proposed in [8] for SOA. In this paper, we extended the previous work by increasing the number of channels without any power compensation methods by using DS-Normal fiber only and investigated the performance of Semiconductor optical amplifier for wavelength division multiplexed system.

II. SYSTEM SETUP

Figure 1 shows the proposed simulation setup to investigate the performance of system using Semiconductor optical amplifier. Sixteen channels with different center frequencies i.e. 192.35 THz-193.85THz are fed to the input ports. Each transmitter is composed of data source, NRZ rectangular driver, laser source, optical amplitude modulator. Data source generates a pseudorandom binary sequence of data stream. Continuous wave Lorentzian (CW) laser source is used to convert data into optical. Modulation driver is used to

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generate data format of the type NRZ rectangular. The pulses are then modulated using Sin^2 Mach-Zehnder modulator at 10 Gbps. The transmitters are followed by a DS-Normal fiber of the reference frequency 192.35 THz, dispersion -2ps/nm/km and attenuation is 0.2dB/km.

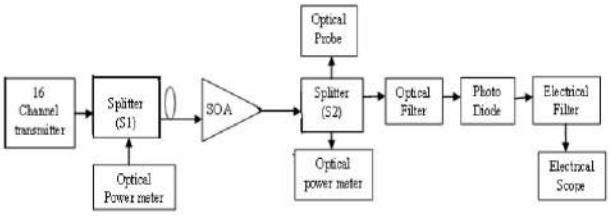

Fig.1 System set up

The output of the modulator is fed to an optical link by using the Semiconductor optical amplifier through an optical splitter. The optimized parameters of SOA used in the simulation are as shown in Table.1. The optical splitter (S1) is used for the measurement of the optical input power for the transmission link. Optical Power meter and Optical probe with splitter (S2) are used for measuring the optical signal power and spectrum at different levels.

Table1. Optimized SOA Parameters

Parameters	Symbol	Value
Bias current	I	110mA
Amplifier Length	L	450 µm
Active Layer width	W	1.5µm
Active Layer thickness	t	0.15µm
Confinement Factor	Γ	0.45
Spontaneous Carrier lifetime	T	0.4ns
Transparency Carrier density	N_t	1×10^{18} cm^{-3}
Material gain Constant	A	3×10^{-16} cm^2
Material Loss	α_p	10.5 cm^{-1}
Input/output insertion Loss	α_{int}	3 dB

Single receiver is composed of optical raised cosine filter, PIN photodiode and electrical raised cosine filter. Electrical scopes are used to observe change in performance. Optical filter component implements a raised cosine transfer function filter having band pass filter synthesis, 1 as raised cosine exponent, 0.2 raised cosine roll off, 193.15 THz center frequency. PIN photodiode is used to convert the optical signal into electrical signal. The responsivity of the PIN detector is 0.87 and quantum efficiency is 0.7 A/W. Electrical filter at the receiver side is raised cosine filter and has bandwidth 8GHz. Electrical scope as the measurement component is used to obtain the eye diagram. From the eye diagram, the values of Q factor, BER, can be analyzed.

III. RESULTS AND DISCUSSION

To demonstrate the performance of the system results on different signal input power based on optimized SOA are obtained at 16x10 Gbps and 0.8nm channel spacing wavelength division multiplexing (WDM) system. Figure 2 shows the quality factor with transmission distance plot of channel-1 i.e 192.35THz detected at the receiver. The acceptable Q factor is obtained at -30dBm signal input power upto 261km transmission distance. It is observed that at -10dBm & -20dBm signal input power acceptable quality factor is achieved for 343km and 350km transmission distance respectively. It is evident that the quality of the received signal decreases with increasing the length of the fiber. This result shows an improvement of 57km transmission distance over the results reported in [8], where they analyzed the transmission distance of 204km using post, pre and symmetrical power compensation methods with only one channel. Here in this paper the reported total length of optical communication link is 261km without any power compensation methods using DS-Normal fiber.

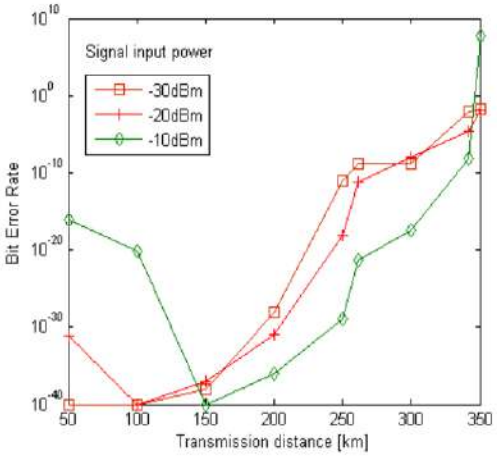

Fig.2 Quality factor vs. transmission distance at different signal input power

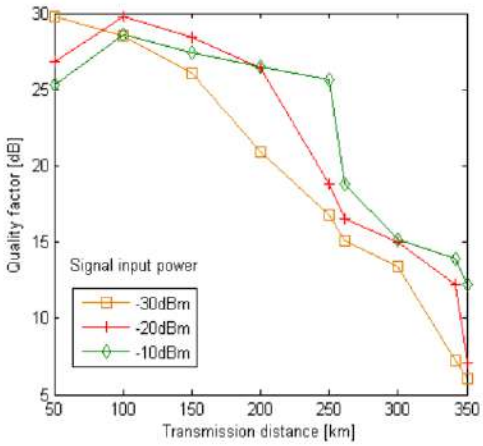

Fig.3 BER vs. transmission distance at different signal input power

Figure 3 reveals the plot of bit error rate vs. transmission distance for different signal input power. For minimum signal input power of -30dBm acceptable bit error rate (10^{-9}) is achieved upto 261km transmission distance. It is also observed that the bit error rate decreases with an increase in the signal input power at the optical fiber link.

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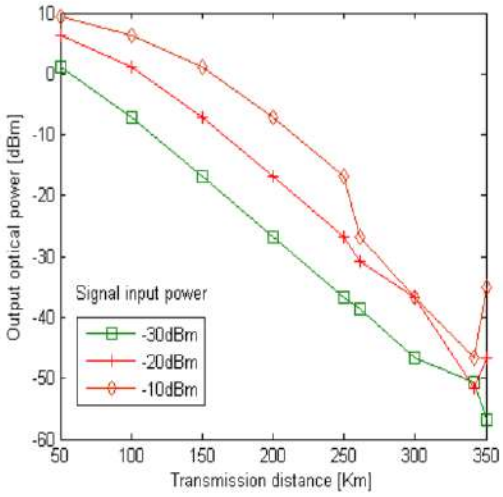

Fig.4 output optical power vs. transmission distance at different signal input power

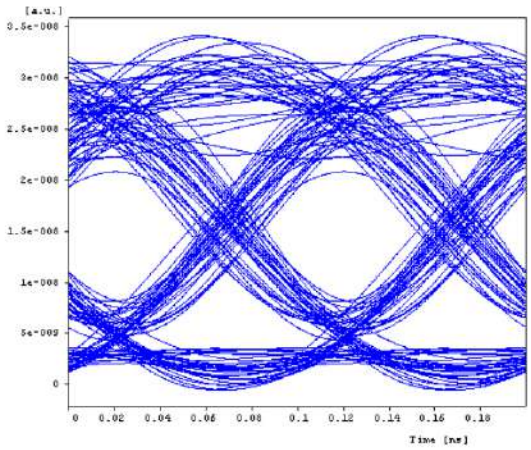

Fig.5 Eye diagram at -30dBm signal input power

The graph between output optical power and transmission distance at the fiber link is shown in Figure 4. It is observed that the optical signal output power decreases due to the fiber non-linearities and fiber attenuation. For 261 km transmission distance -38.70dBm output power is obtained at -30dBm signal input power. At -20dBm and –10dBm signal input power the received optical power is -28.9 & -18.92 respectively for the same distance. The clear eye diagram for -30dBm signal input power is shown in Fig.6. At low signal input power of -30dBm acceptable bit error rate and quality factor for a transmission distance is achieved upto 261km with -38.70dBm signal output power.

IV. CONCLUSION

We evaluate the performance of wavelength division multiplexed system on the basis of output power level, eye diagram, BER measurement, and Q factor. We report the maximum distance of 261 km achieved by optimized SOA with acceptable BER (10^{-9}) and Quality factor (15.19 dB). Furthermore, the simulation results have shown that the signal can be transmitted up to 342 Km & 350 km transmission distance at -10dBm and -20dBm signal input power respectively.

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Li-Fi: A Step towards New Technology

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***Abstract*- Nowadays many people are using internet to accomplish their task through wired or wireless network. As no of users get increased in wireless network speed decreases proportionally. Whether you're using wireless internet in a coffee shop,stealing it from the guy next door, or competing for bandwidth at a conference, you have probably gotten frustrated at the slow speeds you face when more than one device is tapped into the network. As more and more people and their many devices access wireless internet, clogged airwaves are going to make it. One germen phycist.Harald Haas has come up with a solution he calls "data through illumination" taking the fibber out of fiber optic by sending data through an LED light bulb that varies in intensity faster than the human eye can follow.It's the same idea band behind infrared remote controls but far more powerful. Haas says his invention, which he calls D-LIGHT, can produce data rates faster than 10 megabits per second, which is speedier than your average broadband connection. The Visible light communication which may be the future of Internet.**

***Keywords*—Light Fidelity(Li-Fi), Light Emitting Diode (LED), Line of Sight(Los) ,Visible Light Communication (VLC), Wireless-Fidelity(Wi-Fi).**

I. INTRODUCTION

LiFi is transmission of data through illumination by taking the fiber out of fiber optics by sending data through a LED light bulb that varies in intensity faster than the human eye can follow.Li-Fi is the term some have used to label the fast and cheap wireless-communication system, which is the optical version of Wi-Fi.Li-Fi comprises a wide range of frequencies and wavelengths,[1] from the infrared through visible and down to the ultraviolet spectrum. It includes sub-gigabit and gigabit-class communication speeds for short, medium and long ranges, and unidirectional and bidirectional data transfer using line-of-sight or diffuse links, reflections and much more. Li-Fi is a framework for all of these providing new capabilities to current and future services, applications and end users.[2]The term was first used in this context by Harald .Haas in his TED Global talk on Visible Light Communication. "At the heart of this technology is a new generation of high brightness light-emitting diodes", says Harald Haas from the University of Edinburgh, UK,"Very simply, if the LED is on, you transmit a digital 1, if it's off you transmit a 0,"Haas says, "They can be switched on and off very quickly, which gives nice opportunities for transmitted data."

Figure 1 : Li-Fi Enviornmen[4]

It is possible to encode data in the light by varying the rate at which the LEDs flicker on and off to give different strings of 1s and 0s.The LED intensity is modulated so rapidly that human eye cannot notice, so the output appears constantThe technology was demonstrated at the 2012 Consumer Electronics Show in Las Vegas using a pair of Casio smart phones to exchange data using light of varying intensity given off from their screens, detectable at a distance of up to ten metres[2]. In October 2011 a number of companies and industry groups formed the Li-Fi Consortium, to promote high-speed optical wireless systems and to overcome the limited amount of radiobased wireless spectrum available by exploiting a completely different part of the electromagnetic spectrum. The consortium believes it is possible to achieve more than 10 Gbps,theoretically allowing a high-definition film to be downloaded in 30 seconds[4].

It was July 2011,Dr. Herald Hass ,Professor,mobile communication ,University of Edinburgh, publicly demonstrated Light fidelity for the first time, a method of Visible light communication (VLC) technology.further Researchers at the Heinrich Hertz institute in Berlin, Germany have reached data rates of over 500 MBPS using a standard white light LED. Dr. Herald Hass also has setup a spin-off firm to sell a VLC transmitter.[14] Even more sophisticated

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and advance techniques are undergoing development at the University of oxford and the University of Edinburgh. Teams from University of oxford and University of Edinburgh are focusing on parallel data transmission using arrays of LEDs, where each LED transmits a different data stream while other groups are mixtures of red, green and blue LEDs to alter the light's frequency, with each frequency encoding a data channel[7]. Today researchers are working for its feasibility and designing the hardware equipments required for making the technology robust and usable.

II. DESIGN OF LI-FI :

Li-Fi architecture consists numbers of Led bulbs or lamps, many wireless devices such as PDA, Mobile Phones, and laptops. Important factors we should consider while designing Li-Fi as following[4][15]:

(a)Presence of Light

(b)Line of Sight(Los)

(c)For better performance use fluorescent light & LED

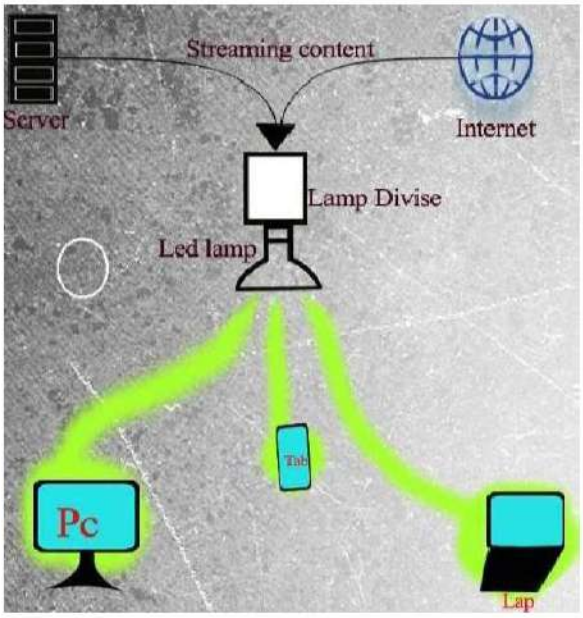

Figure 2: Li-Fi Architecture[15]

As shown in figure 2 streaming content must have proper integration with server & internet network, so that it is easily possible to work efficiently. [3]

III. IMPLEMENTATION: LI-FI

Li-Fi is typically implemented using white LED light bulbs at the downlink transmitter. These devices are normally used for illumination only by applying a constant current. However, by fast and subtle variations of the current, the optical output can be made to vary at extremely high speeds. This very property of optical current is used in Li-Fi setup. The operational procedure is very simple-, if the LED is on, you transmit a digital 1, if it's off you transmit a 0.[15] The LEDs can be switched on and off very quickly, which gives nice opportunities for transmitting data. Hence all that is required is some LEDs and a controller that code data into those LEDs. All one has to do is to vary the rate at which the LED's flicker depending upon the data we want to encode. Further enhancements can be made in this method,[8] like using an array of LEDs for parallel data transmission, or using mixtures of red, green and blue LEDs to alter the light's frequency with each frequency encoding a different data channel. Such advancements promise a theoretical speed of 10Gbps meaning one can download a full high-definition film in just 30 seconds.[2],[3],[4].

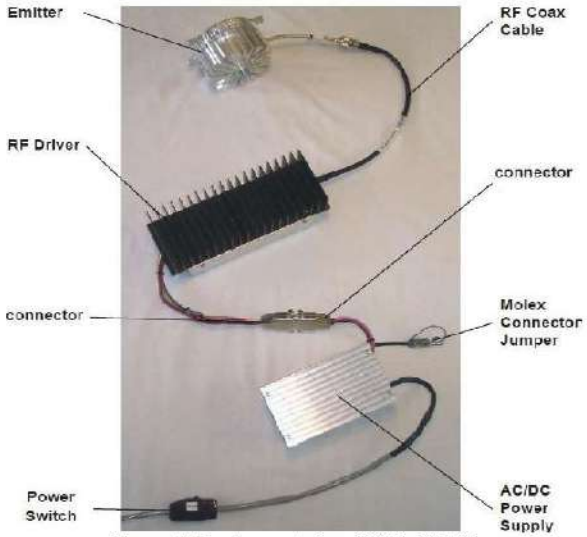

Figure 3:Implementation Of Li-Fi[15]

IV. VALUES OF LI-FI:

A free band that does not need license.
(a)High instalment cost but very low maintenance cost.
(b)Cheaper than Wi-Fi.
(c)Theoretical speed up to 1 GB per second: Less time & energy consumption.
(d)No more monthly broadband bills.
(e)Lower electricity costs.
(f)Longevity of LED bulb: saves money.
(g)Light doesn't penetrate through walls: secured access. [1]

V. LIMITATIONS OF LI-FI:

(a)The main problem is that light can't pass through objects, so if the receiver is inadvertently blocked in any way, then the signal will immediately cut out. If the light signal is blocked, or when you need to use your device to send information you can seamlessly switch back over to radio waves‖, Harald says[15].

(b)Reliability and network coverage are the major issues to be considered by the companies while providing VLC services.

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Interference from external light sources like sun light, normal bulbs; and opaque materials in the path of transmission will cause interruption in the communication[11]

©High installation cost of the VLC systems can be complemented by large-scale implementation of VLC though Adopting VLC technology will reduce further operating costs like electricity charges, maintenance charges etc.

(d)This research report categorizes the global VLC technology market; based on component, applications, and geography. Li-Fi uses light-emitting diodes (LEDs) which are rapidly gaining in popularity for standard light bulbs and other domestic and commercial purposes. They are expected to be ubiquitous in 20 years. VLC is not in competition with Wi-Fi, Prof. Haas says, it is a complimentary technology that should eventually help free up much needed space within the radio wave spectrum.

(e)We still need Wi-Fi we still need radio frequency cellular systems. You can't have a light bulb that provides data to a high-speed moving object or to provide data in a remote area where there are trees and walls and obstacles behind,[11]. Accordingly Best hotspots are :

(a)The remote control devices under the ocean: radio wave doesn't work there.
(b)Petrochemical plants: radio wave data transmission is not secured there.
(c)Hospitals: for medical purpose.
(d)Street lights, traffic signals: for traffic update.
(e)Aircraft cabins for emergency conversation [14]

Table 1: COMPARISION BETWEEN WI-FI & LI-FI:

Parameter	Li-Fi	Wi-Fi
Speed	High	High
Range	Low	Medium
Data Density	High	Low
Security	High	Medium
Reliability	Medium	Medium
Power Available	High	Low
Transmit/Receive Power	High	Medium
Ecological Impact	Low	Medium
Device -To-Connectivity	High	High
Obstacle Interference	High	Low
Bill Of Materials	High	Medium
Market Maturity	Low	High

VI. CONCLUSION:

Li-Fi is certainly not useless, but it has certain inherent limits for the technology. Li-Fi may not be able to replace conventional radios altogether, but it could turbo charge the development of wireless television and make it easier to throw a wireless signal across an entire house. The concept of Li-Fi is currently attracting a great deal of interest, not least because it may offer a genuine and very efficient alternative to radio-based wireless. As a growing number of people and their many devices access wireless internet, on one way, it can transmit the data at higher rate and on the other it is very cheap as compared with WI-FI .The airwaves are becoming increasingly clogged, making it more and more difficult to get a reliable, high-speed signal. This may solve issues such as the shortage of radio-frequency bandwidth and also allow internet where traditional radio based wireless isn't allowed such as aircraft or hospitals.

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Image Retrieval Based On Image Segmentation Using Integration of Colour and Texture

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***Abstract*-The adaptive integration of the colour and texture attributes in the development of image descriptors is one of the most important topics that need to be investigated for the research in computer vision. Segmentation is nothing but making the part of image or any object. Pattern recognition and image analysis are the initial steps of image segmentation. The immense interest shown in the colour–texture-based segmentation is mainly motivated by two factors. The first is related to the observation that the imaged objects are often described at perceptual level by distinctive colour and texture characteristics, while the second is motivated by the large spectrum of possible applications that can be addressed by the colour–texture integration in the segmentation process. Over the past three decades a number of techniques in the field of colour–texture segmentation have been reported and it is the aim of this article to thoroughly evaluate and categorise the most relevant algorithms. In this paper the review of image segmentation is expressed by using different technique.**

***Index Terms* - Colour, Image Segmentation, image analysis, texture.**

I. INTRODUCTION

Use of colour and texture information collectively has strong links with the human perception and in from many practical scenarios the colour-alone or texture-alone image information is not suffi- ciently robust to accurately describe the image content. An example is provided by the segmentation of natural images that exhibit both colour and texture characteristics.

Image segmentation is the first step and also one of the most difficult tasks of image analysis,which has objective of extracting information which is represented in the form of data from image via image segmentation, feature measurement[17] and object representation as shown in figure. The result of segmentation of image is considerably depends on the accuracy of feature measurement. Image segmentation process that subdivides an image into its constituent parts and extracts those parts of interest or objects. Automatic image segmentation also done but the most critical task is that the segmentation result affect all the subsequent processes of image analysis[3]. Image (and video) segmentation is a critical step of image analysis occupying the middle layer of image engineering, which means it is influenced not only from data but also from human factors.

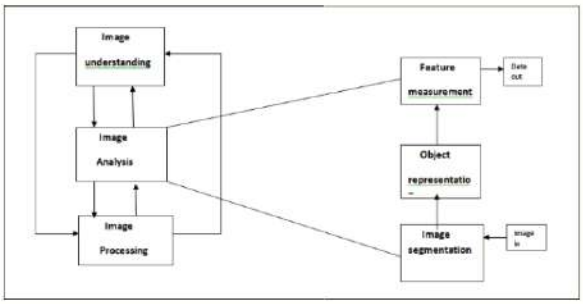

Figure 1: Image Engineering And Image Segmentation [17].

II. COLOUR IMAGE SEGMENTATION

Image segmentation is the process of separating or grouping an image into different parts. These parts normally correspond to something that humans can easily separate and view as individual objects and so many different methods have been developed in order to segment images. The segmentation process in based on various features found in the image. This might be color information that is used to create histograms, or information about the pixels that indicate edges or boundaries or texture information. The color image segmentation is also widely used in many multimedia applications, for example; in order to effectively scan large numbers of images and video data in digital libraries, they all need to be compiled directory, sorting and storage, the color and texture are two most important features of information retrieval based on its content in the images and video.

III.CLASSIFICATION OF SEGMENTATION TECHNIQUES

Image segmentation can be broadly classified into two types:
1. Local segmentation
2. Global segmentation

Global segmentation is concerned with segmenting a whole image. Global segmentation deals mostly with segments consisting of relatively large number of pixels[1].This makes estimated parameter values for global segments most robust.

Image segmentation can be approach from three different philosophical perspectives. They are as region approach, boundary approach and edge approach as illustrated in figure .

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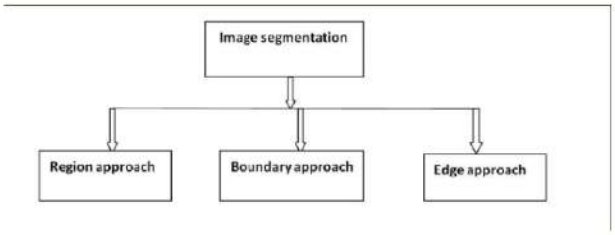

Figure1. Image segmentation approach [4]

If the pixel belongs to object, it has value one, otherwise it is zero. Segmentation[14] is the operating at the threshold between low-level image processing and image analysis. After the complete procedure of segmentation, the pixel belongs to the object.

- Structural Techniques
- Shochastic Techniques
- Hybrid Techniques

Structural Techniques[14] use some information about the structure of the region for segmentation.

Stochastic techniques are applied on discrete pixels without knowing or considering any structural information of the region. Statistical analysis is one of the techniques on which the stochastic technique is based.

Hybrid technique[14] include those techniques which possess the characteristics of both structural and stochastic techniques.

Segmentation Based On Edge Detection

The intensity data of an image only provides partial and uncertainly information about the location of edges. Edge detection technique is finding pixel on the region boundary. This method attempts to resolve image segmentation by detecting the edges or pixels between different regions that have rapid transition in intensity are extracted[17][9] and linked to form closed object boundaries. The result is a binary image[10]. One source of uncertainly comes from the existence of noise introduced in the imaging process and later in the transmission and sampling process. The other source of uncertaionly comes from fact that any measurement device is imperfect and their results are only partial observation. The easiest way to detect edges in an image is to look for places in the image where the intensity changes rapidly, using one of this criteria:

- Places where the first derivative of the intensity is larger in magnitude than some threshold.
- Places where the second derivative of the intensity has a zero crossing.

Threshold Method

One of the simplest approach of segmentation is based on the pixel values. The technique is to utilize the thresholding based segementation which could help to simple region growing steps. Thresholding algorithms can be selected manually as per a priori knowledge or automatically by image information. Thresholding algorithms further divided to edge-based, region-based and hybrid. Edge-based algorithms are related with the edge information. The Structures of an object can be depicted by edge points. Common edge detection algorithms such as canny edge detector and Laplacian edge detector can be classified to this type of regions. These algorithms are used to find the edge pixels while eliminating the noise influence.

Region Based Segmentation Methods

A region denoted by R of an image is defined as a connected homogenous subset of the image with respect to some criterion such as gray level or texture. Regions in an image are a group of connected pixels with similar properties. In the region approach, each pixel is assigned to a particular object or region.

Compared to edge detection method, segmentation algorithms based on region are relatively simple and more immune to noise[15][5]. Edge based methods partition an image based on rapid changes in intensity near edges whereas region based methods, partition an image into regions that are similar according to a set of predefined criteria. Region-based segmentation also requires the use of appropriate thresholding techniques.

A. Region Growing

Region growing[4] is a technique for extracting a region of the image that is connected based on some predefined criteria. This criteria based on intensity information. Region growing is an approach to image segmentation in which neighboring pixels are examined and added to a region class of no edges are detected. This algorithm presents several advantages over other color image segmentation algorithms. Region growing approach is simple. The border of regions found by region growing are perfectly thin and connected. The algorithm is also very stable with respect to noise. Limitation is that, it requires a seed point, which generally means manual interaction.

B. Region Splitting and Merging

Split and merge technique is the opposite of the region growing. This technique works on the whole image. Region splitting is a top-down approach. It begins with a whole image and divides it up such that the segregated part are more homogenous than the whole. Hence, a merging phase after the splitting is always desirable, which is termed as the split-and-merge algorithm. Any region can be split into subregions, and the appropriate regions can be merged into a region. Rather than choosing seed points, user can divide an image into a set of arbitrary unconnected regions and then merge the regions

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in an attempt to satisfy the conditions of reasonable image segmentation.

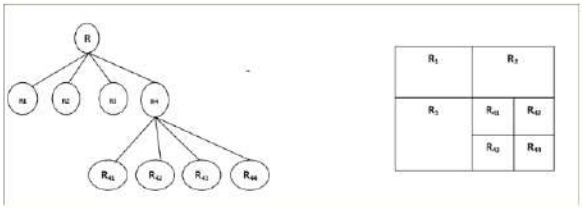

Figure2. Quad tree[10]

IV.CATEGORISATION OF SEGMENTATION

The abundance of literature on image segmentation makes the categorisation both necessary and challenging. Most of the earlier literatures have categorised them as a) Edgebased b)Point/Pixel based c) Region based and d) Hybrid approach. categorised them as colour based and texture based algorithms. A more general method of categorisation based on approach towards image analysis and applicable even beyond image segmentation domain are the bottom-up and top-down approaches. In image segmentation domain, they are often stated as model driven (top-down) and image driven approach (bottom-up).

A. Image Driven Approach

Image driven approach operates directly on the image pixels and detects objects solely based on the image features (Maxwell, 2005). Image driven approach extracts object based on the statistical features of the image derived from the pixels. This includes most of the solely edge based segmentation techniques. Edge based techniques detects edges and then closes the regions by contour generating algorithms (Schiewe, 2002). Canny Deriche operator is considered as good edge detector for remote sensing purposes (Carleer et al. 2005). However, different algorithms can also be tried. Edge detection is now more used for feature.

B. Model Driven approach

Model based approach assumes that objects in an image are present in a certain pattern.Interested readers can look into Rosenfield and Davis (1979) for more understanding of image models and segmentation. A list of models generally used for image segmentation are a) Object Background/Threshold Model, b) Neural Model, c) Markov Random Field Model, d) Fuzzy Model, e) Fractal Model, f) Multi-resolution and g) Transformation model namely Watershed model and Wavelet model. MRF model, Fuzzy model, Fractal model and Neural model have been widely studied.

V. APPLICATION OF IMAGE SEGMENTATION

Image segmentation can be applied in variety of different fields, e.g. pattern rec-ognition, image compression, Traffic control systems,Video surveillance and image retrieval. It is applicable to machine vision,in medical imaging such as

- Locate tumors and other pathologies
- Measure tissue volumes
- Diagnosis, study of anatomical structure

It is applicable in Object detection and in recognition tasks in object detection it is applicable in Pedestrian detection, Face detection, Brake light detection, Locate objects in satellite images (roads, forests, crops, etc.). In Recognition Tasks it is applicable to Face recognition, Fingerprint recognition, Iris recognition.

CONCLUSION

Image segmentation has a promising and challenging future as the universal segmentation algorithm. There have been many image segmentation methods created and being created using many distinct approaches and algorithms but there is no single method which can be considered good for all type of images, nor all methods equally good for a particular type of image. we survey several segmentation methods. For various applications, there are suitable segmentation methods that can be applied. If the requirement is that the pixels of each cluster should be linked, then region-based segmentation algorithms, especially, the JSEG and the fast scanning algorithms, are preferred, because of their better performances.

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Review on Design of Band-Pass Filter Using Artificial Neural Network

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Abstract- **For the design of Band pass FIR filters complex calculations are required. Mathematically, by substituting the values of pass-band ripple, stop band attenuation, pass-band frequency F1, pass-band frequency F2, sampling frequency in any of the methods from window method, frequency sampling method or optimal method we can get the values of filter coefficients h(n). Here, window method is used in which Kaiser window method has been chosen preferably because of the presence of ripple factor (β).Here, I have design Band pass FIR filter using artificial neural network which gives optimum result i.e. the difference between the actual and desired output is minimum.**

*Keyterms:***Introduction,Windowfunctions,Artificialneuralnetwork, Problemmethodology,Results**

I. INTRODUCTION

The basic function of digital filter is to eliminate the noise and to extract the signal of interest from other signals. A digital filter filter is a basic device used in digital signal processing. There are several techniques available to design the digital filters. But generally while designing a digital filter, first an analog filter is designed and then it is converted into the corresponding digital filter. With the technological evolution, great advances have been made on design techniques for various digital filters. A filter is essentially a system or network that selectively changes the wave shape amplitude – frequency and or phase – frequency characteristics of a signal in a desired manner . A digital filter is a mathematical algorithm implemented in hardware and/or software that operates on a digital input signal to produce a digital output signal for the purpose of achieving a filtering objective.

A. ANALOG FILTERS [8]

This is necessary because generally digital filters are designed using analog filters. Some parameters related to analog filters:

1. **Pass band:** It passes certain range of frequencies. In the pass band, attenuation is 0.
2. **Stop band:** It suppresses certain range of frequencies. In the stop band, attenuation is infinity.
3. **Cut-off frequency:** This is frequency which separates pass band and stop band.

Types of analog filters:

The different types of analog filters are as follows:

1. **Low pass filter (L.P.F):** It passes the frequency from 0 upto some designated frequency, called as cut-off frequency. After cut-off frequency, it will not allow any signal to pass through it.
2. **High pass filter (H.P.F):** It passes the frequency above some designated frequency called as cut-off frequency. If input signal frequency is less than the cut-off frequency, then this signal is not allowed to pass through it.
3. **Band Pass Filter (B.P.F):** It allows the frequencies between two designated cut-off frequencies.
4. **Band Stop Filter (B.S.F):** It attenuates all frequencies between two designated cut-off frequencies, while it passes all other frequencies.
5. **All Pass Filter:** It passes all the frequencies. But by using this filter the phase of input signal can be modified.

II. FIR FILTER DESIGN

The design of a digital filter involves five steps:

A. Filter Specification

This may include stating the type of filter, for example low pass filter, the desired amplitude and/or phase response and the tolerances (if any) we are prepared to accept, the sampling frequency and the wordlength of the input data.

B. Coefficient Calculation

At this step, we determine the coefficients of transfer function, H(z), which will satisfy the specifications given in (1). Our choice of coefficient calculation method will be influenced by several factors, the most important of which are the critical requirement in step (1).

C. Realization

This involves converting the transfer function obtained in (2) into suitable filter network or structure.

D. Analysis of Finite Wordlength Effects

Here, we analyze the effects of quantizing the filters coefficients and input data as well as the effect of carrying out the filtering operation using fixed wordlengths on the filter performance.

E. Implementation

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This involves producing the software code and/or hardware and performing the actual filtering.

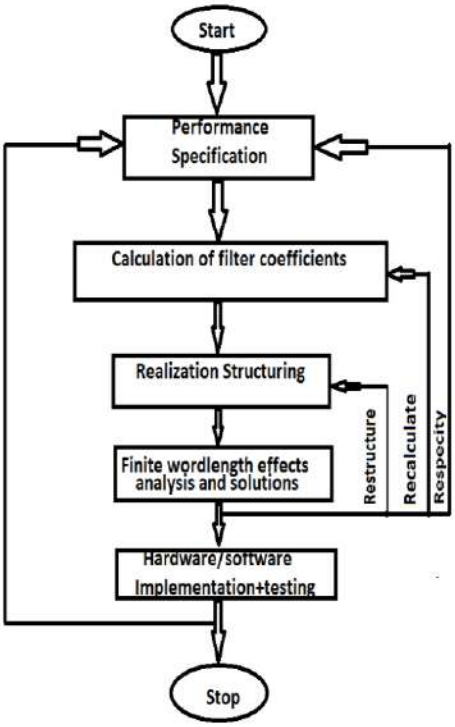

Fig.1.Design of digital filter

The criteria is a linear phase response in frequency domain called phase response (Jin et al., 2006) as shown in Fig.. Finally, because there is a tradeoff between filter complexity and implementation feasibility, complexity and implementation feasibility, complexity is a performance criteria. Ideal filter characteristics are practically unrealizable.

We have many methods to design FIR filter that are:-

- Fourier series method
- Frequency Sampling method
- Window method

The most of these design techniques suffer from some kinds of drawback, Some of them could not give optimal design in any sense, some is lacking of generality, some need long computing time, and so on (Bagachi and Mitra, 1996). Kaiser window method has been used because of the presence of ripple parameter beta.

A. Various Window Functions

There are many windows proposed that approximate the desired characteristics. The basic window functions are listed below:

Rectangular Window

$$w_r(n)=\begin{cases}1, & \text{for } -(M-1)/2 \le n \le (M-1)/2 \\ 0, & \text{otherwise}\end{cases} \quad (1)$$

Bartlett Window

$$W_T(n)=\begin{cases}2n/(M-1) & \text{for } 0 \le n \le (M-1)/2 \\ 2-2n/(M-1) & \text{for } (M-1)/2 < n \le (M-1) \\ 0, & \text{otherwise}\end{cases} \quad (2)$$

This window is also called Barlett window.

Kaiser Window

Kaiser determined empirically that the value of β need to achieve a specified value of A is given by

$$\beta=\begin{cases}0.1102(A-8.7) & \text{for } A>50 \\ 0.5842(A-21)^{0.4}+0.07886(A-21) & \text{for } 21 \le A \le 50 \\ 0.0 & \text{for } A<21\end{cases} \quad (3)$$

Recall that the case β = 0 is the rectangular window for which A = 21. Further more, to achieve prescribed values of A and df, M must satisfy equations

$$M=\begin{cases}\dfrac{A-8}{14.36df}+1 & \text{for } A>21 \\ (0.922/df)+1 & \text{for } A \le 21\end{cases} \quad (4)$$

Finite Impulse response filters (Öner and paper., 1999) are preferred for their stable and linear phase characteristics. But due to long impulse response of FIR filters there will be more hardware complexity.

Linear-phase form:

When an FIR filter has a linear-phase response, its impulse response exhibits certain symmetry conditions. In this form exploit these symmetry relations to reduce multiplications by about half.

B. ARTIFICIAL NEURAL NETWORK

An Artificial Neural Network is an information processing paradigm inspired by the way the densely inter-connected, parallel structure of the mammalian brain process information. ANN have successfully applied to a number of problems including the identification and control of dynamical systems, communications networks, coordination of robotics handeye movements.It is also referred to as a neuromorphic system, follows connectionist architecture, and parallel distributed processing. Artificial Neural Networks are collections of mathematical models that emulate some of the observed properties of biological nervous system. The key element of the ANN is the novel structure of the information processing systems.

Some other advanrtages of ANN are as under:

1. Adaptive learning

2. Self-Organisation

3. **Real Time Operation**

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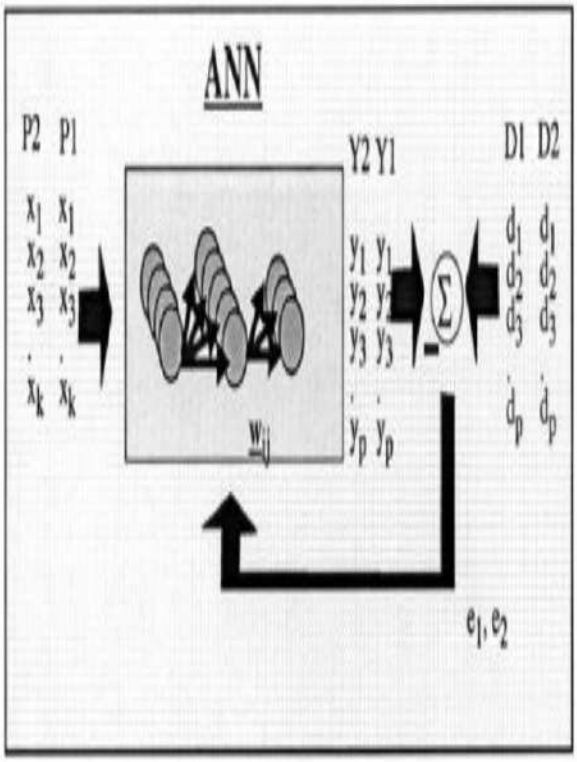

Fig.2 General structure showing performance of the artificial neural network

C.Bandpass Filter

A band-pass filter is a device that passes frequencies within a certain range and rejects (attenuates) frequencies outside that range. Optical band-pass filters are of common usage.An example of an analogue electronic band-pass filter is an RLC circuit (a resistor–inductor– capacitor circuit). These filters can also be created by combining a low-pass filter with a high-pass filter.

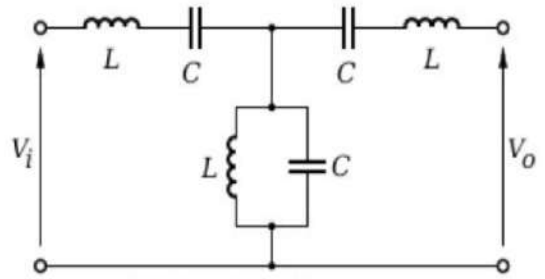

Fig.3 Bandpass filter

D.Multilayer Perceptron Networks

Multilayer Perceptron Networks form a class of feed forward neural networks. They are not a single layer network but consist of an input layer, arbitrary number of hidden layers and an output layer as shown in figure 1.5.Here input is fed to each of the input layer neurons. The outputs of the input layer feed into each of next layer neurons and so on, forming a layered structure having one input layer , one output layer and L-2 hidden layers in an L layer network.

III. FORMULATION OF PROBLEM

The design of digital filter means basically finding the values of filter coefficients so that given filter specification are achieved the window based design method are exclusively used for calculating there coefficient. We have used Kaiser window for this purpose. The Kaiser window function goes somehow in overcoming the incorporating a ripple control parameter, ANNs have been used for the design of digital filter with Passband ripple, stop band attenuation, passband frequency F1, passband frequency F2, sampling frequency as input parameters. In this thesis ANN have been used to design the band pass FIR filter coefficient that are matching with coefficient given by Kaiser with here the multi layer perception feed forward network has been used for the design because this method is efficient, accurate,less complex and easily implemented. The network has been trained in such a manner so that the error comes minimum, means there may be very less difference in the results comes from actual calculations that has been come from matlab and the output comes from trained artificial neural network.

A.OBJECTIVE:

The objective of the present work are divided into the following sections.

(1) To prepare the data sheet using different values of filter parameter achieve the filter coefficient.

(2) Choosing ANN a Band-pass FIR filter has been designed such that its coefficient match with coefficients obtained with window method.

IV.EXPERIMENTATION

The code has been implemented in MATLAB. The name Matlab stands for matrix laboratory MATLAB is an intercalate system whose basic data element is an array that does not require dimensioning. This allows solving many technical computing, in a fraction of the time for the simulation and the corresponding analyses of the given application the following framework and distributed design situations have been taken case of and then implemented feel typical set of settings.

Preparation of data sheet
With following that are

(1) Passband Ripple (Ap)

(2) Stopband Attenuation (As)

(3) Pass Band Frequency(F1)

(4) Passband Frequency (F2)

(5) Sampling Frequency (Fs)

Filter coefficient are calculated and in this topic works is carried out using approximately 25 such values of all the above

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parameters to calculate the filter coefficients. The range of different parameters has been taken which are:

(a) Ap 0.7 - 1.3 dB

(b) As 40-55 dB

(c) F1 7000 – 11000 hz

(d) F2 17000-21000 hz

(e) Fs 47000-52000 hz

Using this data set the Artificial Neural Network has been trained and can be use to calculate filter coefficients for input parameters in this range. Now, ANN is use to design the Band pass FIR filter. There is very no difference in the Ann results and the calculated results.

CONCLUSION

Artificial Neural Network is better and easy method of design of Band Pass FIR Filter. Also, using Fourier series,Frequency sampling or Window methods the filter can be design but for each unknown parameter the filter coefficients have to calculated. In comparison with ANN, the trained network can calculate the filter Coefficient for unknown parameter in that specified range. Using ANN if error graphs are drawn between ANN output and Kaiser Window method is almost zero if we use back propagation method.

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WIMAX/IEEE802.16 Network: A Review

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Abstract: **WiBro (Wireless Broadband) is a Korean version of Mobile WiMAX/IEEE 802.16e system, which is designed for mobile broadband wireless access. Being a subset of IEEE 802.16e, WiBro employs orthogonal frequency division multiple access (OFDMA) and time division duplexing (TDD) schemes operating at 2.3 GHz bands. In mid 2006, the world first commercial Mobile WiMAX service, based on WiBro specification, started in Seoul, Korea. Along with the development of mobile communication and broadband technology, WiMax has become a hot spot for global telecom operators and manufacturers.WiMax promises to deliver the Internet throughout the globe, and connect the "last mile" of broadband wireless connectivity services. In this paper, we gives the overview of WIMAX technology followed by network architecture. Also discuss the application of wimax such as VoIP along with VoIP codec.**

Keywords :Wimax , Protocol Architecture , MIMO (Multi Input Multi Output), OFDMA , SSVoIP.

1. INTRODUCTION

Along with the advance of communication technology, the need for ubiquitous access to the Internet is increasing today. Many systems are being developed to support reliable high-speed data communication environment for mobile users. A prominent technology is Mobile WiMAX/IEEE 802.16e [6]. WiMAX is defined for the worldwide interoperability of broadband wireless access by the WiMAX Forum, which promotes conformance and interoperability of the IEEE 802.16 standards. Mobile WiMAX is a mobile version of WiMAX, and it is based on IEEE 802.16e-2005 standard. In this system, some functionalities are newly adopted to support mobility. Mobile WiMAX has strengths in providing better mobility support compared with WLANs (Wireless Local Area Networks) and a higher transmission rate than conventional circuit based cellular networks. WiBro (Wireless Broadband) service, which is based on Mobile WiMAX technology, is a portable Internet service in

Korea. The functionalities of WiBro are defined by a Mobile WiMAX system profile, and it will be certified under one of the Mobile WiMAX system profiles. WiBro operates at 2.3 GHz bands with a 10 MHz channel bandwidth, and it employs orthogonal frequency division multiple access (OFDMA) and time division duplexing (TDD) schemes. Furthermore, WiBro provides a seamless data communication even when we move at a speed of 60 Km/h. In 2006, WiBro systems were deployed in Seoul, Korea, and the world first commercial service based on Mobile WiMAX/IEEE 802.16e commenced [4]. In wired networks physical layer threats are not important but in wireless air is used as medium so physical layer threats comes into picture [11]. The WiMax network system mainly comprises of core network and access network. The core network includes the network management system, router, AAA agency or server, user database, and Intern gateway equipment. It mainly provides an IP connection to WiMax users. The access network includes base station (BS), subscriber station (SS) and mobile subscriber station (MS). It mainly provides wireless access to WiMax users [5]. Fig 1 shows the wimax network architecture.

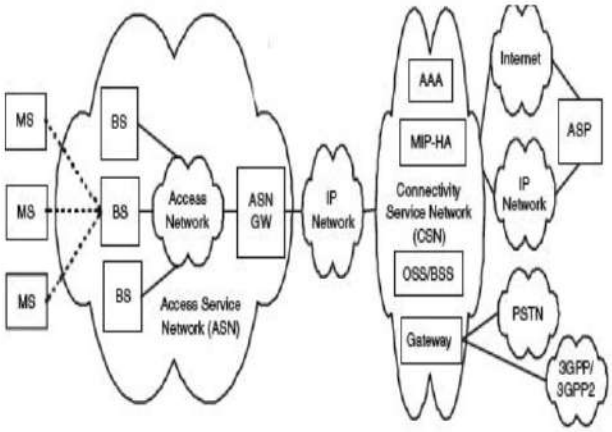

Fig 1 Shows the WiMax Network Architecture [5]

2. PROTOCOL ARCHITECTURE

The IEEE 802.16 protocol [8] is structured first of all in the Physical (PHY) and the Medium Access Control (MAC) layers. The MAC layer can be further separated into three sub layers, the first one is Service Specific Convergence Sub-layer (CS), and the second is Common Part Sub-layer (CPS) and third is the Security Sub layer. CS is the sub-layer that communicates with upper layers to obtain network data. In the process it transforms these data into MAC Service Data Units (SDUs). The format of the CS payload itself is CS depended.CPS provide mainly the core MAC functionality being answerable for function such as bandwidth allocation, connection establishment and connection maintenance. The

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Security Sub-layer addresses procedures such as verification, approval, key establishment, allocation and management. It is also responsible for encryption and decryption of traffic passing from the PHY to the MAC layer and vice versa. It exchanges MAC PDUs with the physical layer. Security sub layer (SSL) defines two protocols Encapsulation and PKM protocol, whereas physical layer is answerable for receiving and transmitting MAC frames. The physical layer permits great flexibility to service providers in matters of cell planning, cost, radio capabilities, services, and network capacity. It supports both Time Division Multiplexing (TDD) and Frequency Division Duplexing (FDD) configuration. The uplink (UL) channel is based on TDMA burst transmission and is divided into a number of time slots (their number may vary over time that are assigned for specific purposes such as registration, argument, and user traffic. Each burst carries MAC PDUs of changeable size. The Downlink (DL) channel makes use of Time Division Multiplexing (TDM). The multiplexed data of each SS forms a single stream that is received by all SS within the same network cell [10].

When two parties establish a link, they are sheltered via a set of protocols that guarantee privacy and unique access of the authorized parties. Fig 2 shows the 802.16e Protocol Architecture.The unique handshaking between the base station (BS) and subscriber station (SS) is done at the MAC layer through security sub layer [5].

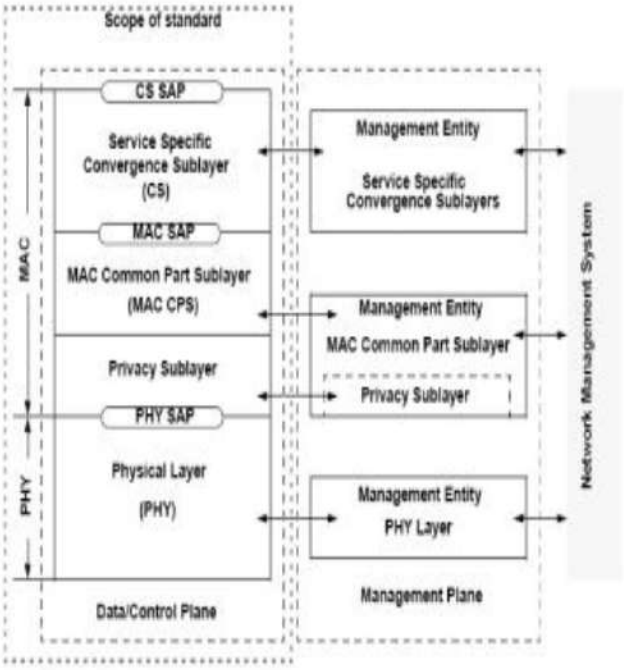

Fig 2: 802.16e Protocol Layer Architecture [5]

3. TECHNOLOGIES OF WiMax

3.1 MIMO

The rapid development of wireless communication sets forth stricter requirements for the system capacity and frequency spectrum efficiency. There have been various attempts to meet these requirements, such as the expanding band width of system, optimizing modulation mode, or adopting a complex CDMA system. However, the application of these methods is restrictive. Obviously, neither the expansion of band width nor the increase of modulation order is limitless, and the channels of CDMA system are not orthogonal to each other perfectly. The MIMO (Multiple Input Multiple Output) system was born at the right moment. By using Space Time Coding (STC) technology, it realizes space division multiplexing using multi-element array, which greatly improves the frequency spectrum efficiency within the limited bandwidth. For this reason, MIMO becomes one of the necessary key technologies for WiMAX, LTE, 802.11n and nearly all "popular" wireless communication systems in the future.

MIMO means using multiple transmitting and receiving antennae at the transmitting and receiving terminals respectively. The signals are transmitted and received by multiple antennae at the transmitting and receiving terminals, and accordingly the quality
of service is improved for each user. Compared with the traditional single-element system, MIMO technology greatly improves the unitization rate of frequency spectrum, which enables the system to transmit data by higher speed under limited bandwidth [7]. The block diagram of MIMO system with N transmitting antennae and M receiving antennae is shown in Figure 3.1.

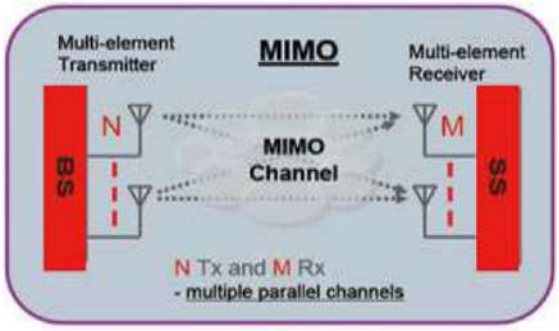

Fig 3.1 Shows MIMO System [7]

WiMAX802.16e defines three options of MIMO. They are Space-time Transmit Diversity (STTD), Spatial Multiplexing (SM) and adaptive switching. It also defines three coding matrix: Matrix A, Matrix B and Matrix C. In the WiMAX802.16e system, MIMO and OFDMA are combined to improve the network coverage and redouble the WiMAX system capacity. Accordingly, the costs of network construction and maintenance are reduced greatly, which promotes the development of mobile WiMAX.

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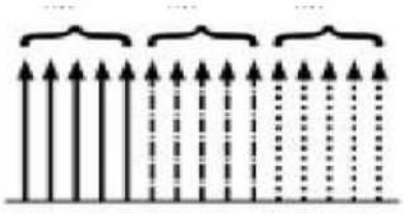
3.2 OFDMA

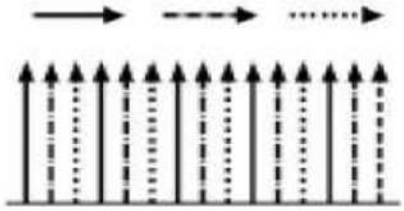
The OFDMA multiple-access system divides the transmission bandwidth into a series of orthogonal sub-carrier sets without overlap, and allocates these sub-carrier sets to different users to realize the multiple-access. The OFDMA system allocates the bandwidth resources available to users in demand, which realizes the optimized utilization of system resources easily. As different users occupy non-overlapped subcarrier sets, there is no interference between users in case of ideal synchronization, i.e., no Multiple Access Interference (MAI). The figure at right gives the sketch map of The OFDMA system, where the gray, white and dark grey time-frequency trellis represent different sub-carrier sets which do not overlap on the frequency band and are allocated to different users. OFDMA solution is considered as dividing total resources (time and bandwidth) on the frequency to realize the multiuser access.

3.2.1 Sub-Channel OFDMA

The sub-channel OFDMA divides the bandwidth of the entire OFDM system into several sub-channels, and each sub-channel has several sub-carriers allocated to a user and each user may occupy more than one sub-channel [7]. The sub-channel is composed of two types of OFDM sub carriers: localized and distributed, as shown in Figure 3.2.1. The localized type allocates several successive subcarriers to a sub-channel (user). In this type, the system can select an optimum subchannel (user) for transmission by scheduling to obtain the multiuser diversity gain (Figure a). Additionally, the localized type reduces the difficulty of channel estimation. However, the frequency diversity gain obtained by this type is small, and the average performance of users is relatively poor. The distributed type spreads the sub-carriers allocated to a sub-channel to the entire bandwidth, and the sub-carriers are arranged alternately to obtain the frequency diversity gain (Figure b). But the channel estimation is complex, scheduling is not applicable, and the anti-deviation capability is poor. The two types should be selected subject to the actual situation in design.



(a) Localised



(b) Distributed

Figure 3.2.1 OFDMA Sub-channels [7]

4. APPLICATIONS

Among various types of multimedia applications, VoIP is perhaps the most prosperous application for the Mobile WiMAX network since the demands for voice communication continue to grasp the significant position in the market. Skype is one of the most popular VoIP applications today. However, many people still have concerns about how well WiBro networks can provide the voice communication[9].

4.1 VoIP Transport System

VoIP uses a combination of protocols for delivering phone data over networks. Various signaling protocols are used, SIP and H.323 can be regarded as the enabler protocols for voice over IP (VoIP) services [3]. VoIP communications require these signaling systems to setup, control, initiate a session and facilitate real-time data transfer in order to provide clear communications. SIP and H.323 works in conjunction with the Real Time Transport Protocol (RTP) and the User Datagram Protocol (UDP) to transfer the voice stream. Voice data is putted in data packets using the RTP protocol. The RTP packets, enclosed inside the UDP packets, are then transferred to the receiver.

4.2 VoIP Codecs

RTP and UDP protocols are the logical choice to carry voice when TCP protocol favors reliability over timeliness. Voice signals are digitally encoded. This means that each voice signal is converted from digital to analog and back. The analog signal is firstly sampled based on a sampling rate of 8 KHz, 8 bits per sample is the most frequently cases. Next, the output is encoded according to many factors: the compression rate and the framing time or the frames length. Finally, one or more of these frames are encapsulated into an RTP/UDP/IP packet for transmission over the network. All these practices are accomplished by one of various audio codecs, each of which vary in the sound quality, the bandwidth required, the computational requirements, encoding algorithm and coding delay [3, 1, 2] :

• **G.711** is the default standard for all vendors, very low processor requirements. This standard digitizes voice into 64 Kbps and does not compress the voice, It performs best in local networks where we have lots of available bandwidth.

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• **G.729** is supported by many vendors for compressed voice operating at 8 Kbps. Excellent bandwidth utilization and Error tolerant with quality just below that of G.711.
• **G.723.1** was once the recommended compression standard. It operates at 6.3 and 5.3 Kbps. High compression with high quality audio. Although this standard reduces bandwidth consumption, voice is much poorer than with G.729 and is not very popular for VoIP.

CONCLUSION

In the WiMAX802.16e system, MIMO and OFDMA are combined to improve the network coverage and redouble the WiMAX system capacity. Accordingly, the costs of network construction and maintenance are reduced greatly, which promotes the development of mobile WiMAX.These techniques offers high frequency spectrum efficiency. . WiMax rises from a high base, and used to be considered as the most powerful competitor of mainstream mobile communication standards. The appearance of WiMax offers theoretical foundation and technical support to the broadband service of wireless access, which represents the development orientation of broadband wireless technology. Its superiority in supporting capacity of data bandwidth is recognized by all. WiMax has a superior and predominant technical position and influence in the history of wireless communication.

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Comparative Analysis of 64-BIT Square Root Carry Select Adders

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***Abstract*--- As the adders are the most widely used components in integrated circuits, design of an efficient adder is of much concern. Power dissipation, speed and delay are the most important design objectives for adder circuits. Performance analysis of different fast adders is studied in this paper. This proposed work shows that the designed carry select adder is better than the regular SQRT carry select adder.**

***Key Words*: Multiplexer, BEC, SQRT CSLA, RCA**

I. INTRODUCTION

In VLSI systems, high speed of data path logic systems as well as the design of area and power efficiency are the most substantial areas of research. In general digital adders, the speed of adders is dependent upon the time required to propagate the carry throughout the adder. The sum for next bit position is generated sequentially only after the sum of previous bit positions is obtained and carry is propagated to the next position. Thus to eliminate the problem of carry propagation delay, we use CSLA in which multiple carries are generated and then select a carry to generate the sum. However, CSLA is not an area efficient carry select adder because it uses many pairs of ripple carry adders (RCA) which generates partial sum and carry by taking the values C=0 and C=1and then multiplexers are used to select the final sum and carry.

The rest of the paper illustrates the following sections. In section II, BEC is introduced which is added to replace the RCA. In section III, new architectures is represented for reduced areas and power consumption of CSLA. Section IV represents the simulations for this new architecture. And section V illustrates the conclusion of the paper.

II. BINARY TO EXCESS-1 CONVERTER

In CSLA, for the reduction of the area and power consumption BEC is used instead of RCA with C=1. This concept is used for reducing the delay of designed CSLA as compared to the regular SQRT CSLA. For the replacement of n bit RCA, we require n+1 bit BEC. Let us take a 4-bit BEC whose function table is represented in table 1. And its structure is given In fig. 1. Fig. 2 explains the basic working of CSLA by using 4-bit BEC together with the multiplexer. Multiplexer used is 8:4 and it gets its input as (E3, E2, E1 and E0) and the another input is the BEC output. It generates two results in parallel and the multiplexer is used to select one output from these inputs.

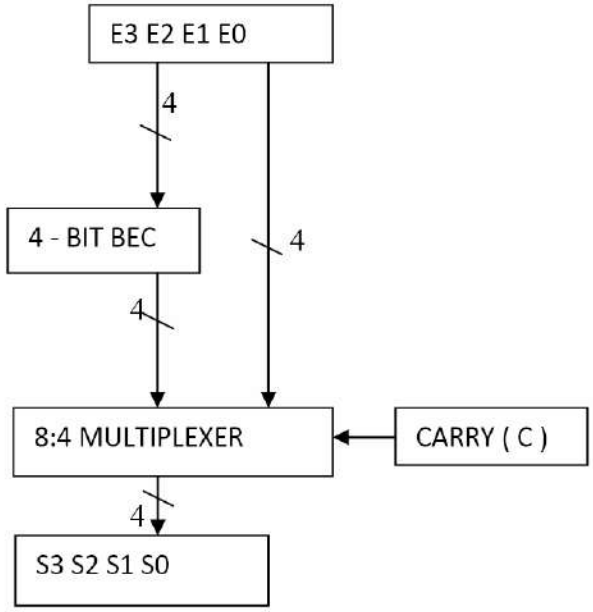

Fig 1: 4- bit BEC using 8:4 multiplexer

TABLE 1: Function of 4 bit BEC

E (3:0)	S (3:0)
0000	0001
0001	0010
----	----
----	----
1111	0000

The boolean expressions for the 4 bit BEC are listed as follows:
S0 = NOT E
S1 = E0 OR E1
S2 = E2 OR (S0 AND S1)

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S3 = S3 OR (S0 AND S1 AND S2)
Where E3, E2, E1 and E0 are the inputs of BEC block and S3, S2, S1 and S0 are the outputs of multiplexer..

III AREA AND DELAY CALCULATIONS IN DIFFERENT ADDERS

The Delay in ay adder block is calculated by the total number of gates in the longest path of the logic blocks. All gates are to be made up of AND , OR and INVERTER gates and each gate have the delay equal to one unit and area equal to one unit. Then we add the total number of gates along the longest path of the logic block which shows the maximum delay. Area is evaluated by adding the total number of AOI gates existing in each logic block. Based on this approach delay and area evaluation of XOR gate is done as follows:

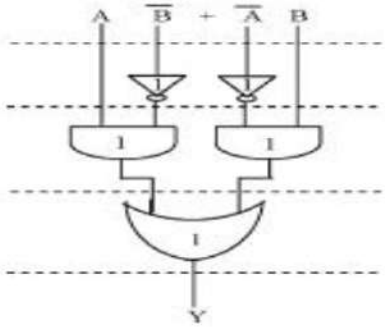

Fig 2: XOR Gate using AOI

Depending on the same approach, the CSLA adder blocks of 2:1 multiplexer and half adder are tabled as follows:

TABLE 2: Area and Delay of different CSLA blocks

Design	Delay	Area
XOR	3	5
2:1 MUX	3	4
Half Adder	3	6
Full Adder	6	13

III (A) DELAY AND AREA EVALUATION OF 64-BIT REGULAR SQRT CSLA

The SQRT CSLA has five groups consisting of RCAs with different sizes. It is shown in Fig. 3. All the numerals specified within [] represents the delay values.

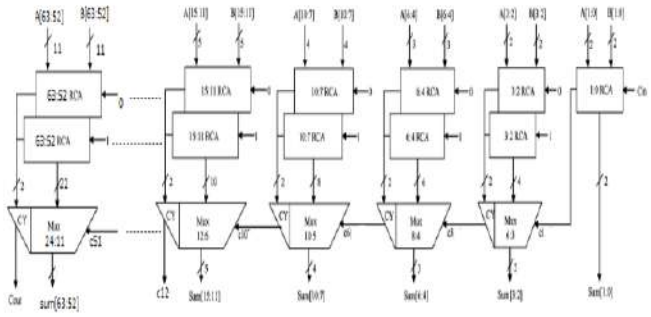

FIG 3: Structure of 64-BIT regular SQRT CSLA

A 16, 32, 64 or 128 bit SQRT CSLA can also be constructed in two modes of different sized blocks. RCAs are the most compact full adders but their performance is limited by the time taken to propagate the carry from LSB to MSB. By making the additions in parallel and reducing the carry delay, we can increase the speed of CSLA from 40% to 90%.in Fig. 3 , Regular 64-bit SQRT CSLA consists of different groups where Group 0 consists of 2-bit RCA. It has only one ripple carry adder which adds up the input bits and carry and generate the sum. The carry output obtained from Group 0 acts as the selection input for the multiplexer in Group 1, selects the output from corresponding RCA (C=0) or RCA (C=1). In the same way, the remaining groups will be selected on the basis of the carries from their groups.

In Regular SQRT CSLA, we use only one RCA to make the additions of LSB bits. The addition of remaining bits except LSBs is performed by using two RCAs one of which assumes the carry C=0 and other of carry C=1 within a group. Within a group there are two RCAs receiving the same data inputs but different carry inputs. The upper adder uses carry input of 0 and the lower adder uses the carry input of 1. The actual carry input selects one of the RCAs as shown in Fig. 3, the sum and carry output of the upper RCA will be selected if C=0 and sum and carry output of lower RCA will be selected if C=1.

III (B) DELAY AND AREA EVALUATION OF MODIFIED 64-BIT REGULAR SQRT CSLA

The structure of 64 bit modified SQRT CSLA is similar to that of the regular CSLA, the only difference is that we use BEC in place of RCA with C=1. This BEC performs in similar way as that of the RCA with C=1. The structure of the modified 64-bit SQRT CSLA is shown in Fig. 4. The number of bits n required for the BEC is equal to one more bit than that of RCA. This structure also consists of various groups with different sizes of bits. each group in the modified structure consists of the RCA, BEC and one corresponding multiplexer. In Fig. 4,Group 0 consists of one RCA only which have the input of lower significant bit and carry bit and generates the

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result of sum and carry output which is acting as the selection line for the multiplexer of the next group. similarly the process is repeated for the next higher groups but they consists of BEC logic instead of RCA with C=1.Based on the consideration of values of delays, the propagation time of selection input C1 of 8:3 mux is earlier than the sum of RCA and BEC. For remaining groups the selection propagation input is later than the RCA and BEC. Thus, the sum of group 1 and c1 are depending upon the multiplexer and the results calculated by RCA as well as BEC respectively. Similarly sum2 from Group 2 depends upon the C1 and the multiplexer. For the remaining parts of the structure the propagation time of the multiplexer input is always greater than the propagation time of the data inputs from the BECs. Therefore the delays of the remaining multiplexers are depending upon the propagation time of the multiplexer's selection input and delay value of the multiplexer.

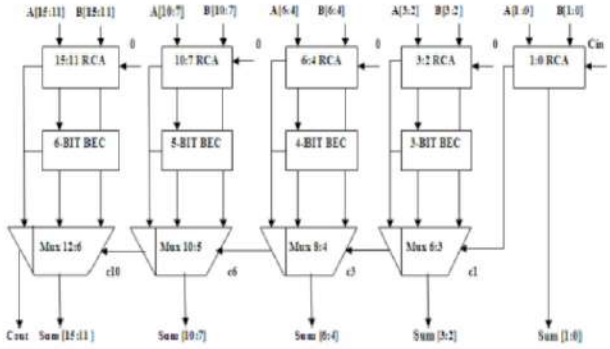

FIG. 4: Structure of modified 64-BIT SQRT CSLA

The comparison between the delay values and areas of the 16, 32, 64 and 128 bit regular SQRT CSLA and modified CSLA is illustrated in the Table 3.

Table 3: Comparison of parameters of different CSLAs

Word Size	Adder	Delay (ns)	Area (um^2)	Power (uW)			Power-Delay Product(10^{-15})	Area-Delay Product(10^{-21})
				Leakage Power	Switching power	Total power*		
8-bit	Regular CSLA	1.719	991	0.007	101.9	203.9	350.5	1703.5
	Modified CSLA	1.958	895	0.006	94.2	188.4	368.8	1752.4
16-bit	Regular CSLA	2.775	2272	0.017	263.7	527.5	1463.8	6304.8
	Modified CSLA	3.048	1929	0.013	235.9	471.8	1438.0	5879.6
32-bit	Regular CSLA	5.137	4783	0.036	563.6	1127.3	5790.9	24570.2
	Modified CSLA	5.482	3985	0.027	484.9	969.9	5316.9	21845.7
64-bit	Regular CSLA	9.174	9916	0.075	1212.4	2425.0	22246.9	90969.3
	Modified CSLA	9.519	8183	0.057	1025.0	2050.1	19514.9	77893.9

Table 4 contains the simulation results of both CSLA structures in terms of delay, area and power. The area represents The total cell area of the design and the total power is sum of the leakage power, switching power and internal power. The percentage reduction in the cell area, total power, power-delay product as function of the bit size are represented in Fig. 6(a), The percentage delay overhead is also plotted in Fig 6(b). It is clear from the fig 6 that the area of 8bit, 16bit, 32bit and 64bit proposed SQRT CSLA is reduced by 9.7%, 15%, 16.7% and 17.4% respectively. The total power consumed is also reduced by 7.6%, 10.5%, 13.6% and 15.4% with the bit size. Also the delay area overhead shows a similar decreasing trend with the bit size. The delay overhead for 8,16 and 32 bit is 14%, 9.8% and 6.7% respectively, whereas for the 64 bit it is reduced to 3.76%.

Table 4: Structure of modified 64-BIT SQRT CSLA

S. No.	Adders (bits)		Delay (ns) values	Area Values
1.	16 – bit	Regular	16.27	43
		Modified	14.67	47
2.	32 – bit	Regular	20.96	90
		Modified	18.83	102
3.	64 – bit	Regular	33.85	189
		Modified	23.71	212
4.	128 – bit	Regular	42.23	439
		Modified	35.29	441

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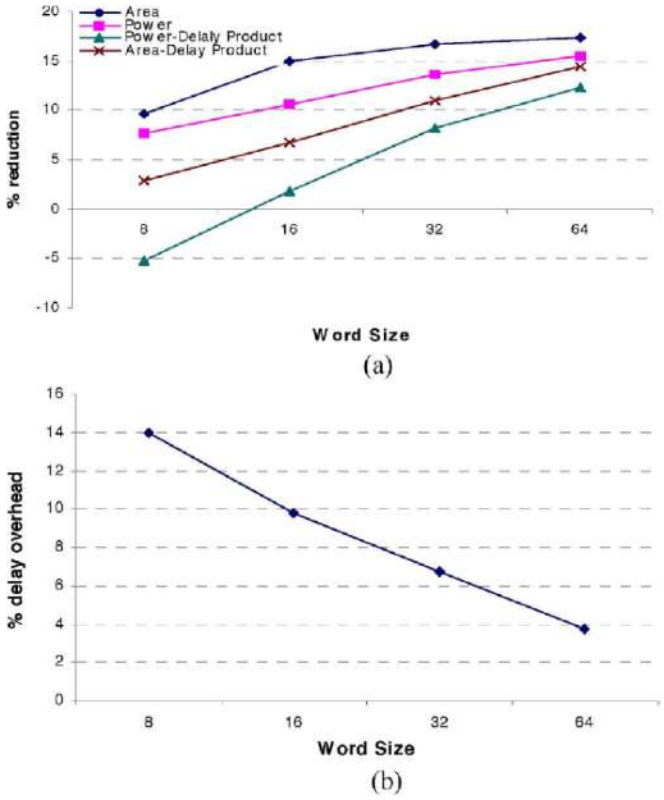

FIG. 6: (a) Percentage reduction in the cell area, total power, power delay product (b) Percentage of delay overhead

IV CONCLUSION

In this paper we have studied an efficient approach to reduce the area and delay of the SQRT CSLA structure. The area is reduced by reducing the number of gates which is done by replacing the RCA with BEC. The compared results illustrates that modified 64-bit SQRT CSLA has slight larger area for lower order bits and furthermore it is reduced for the higher order bits. The modified structure of 64 bit SQRT CSLA is thus a low area and high speed approach in the VLSI hardware implementations.

An efficient approach is proposed in this paper to reduce the area and delay of SQRT CSLA architecture. The reduction in the number of gates is obtained by simply replacing the RCA with BEC in the structure. The compared results shows that the modified SQRT CSLA has a slightly larger area for lower order bits which further reduces for higher order bits. The delay is reduced to a great extent with the modified SQRT CSLA. Thus the results shows that using modified method the area and delay will decrease thus leads to good alternative for adder implementation for many processors. The modified CSLA architecture is therefore low area and high speed approaches for VLSI hardware implementation.

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Ear Biometrics A New Scenario For Secure On Line Transaction Using PCA Based Authentication

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Abstract---**The researches discuss if the ears are unique or unique enough to be used as biometrics. Ear shape applications are not commonly used, but we can use Ear Biometrics for authentication while using web marketing. In this paper we present the basics of using ear as biometric for person identification and authentication for web marketing. Also the error rate and application scenarios of ear biometrics are presented**

1. INTRODUCTION

In general, biometrics is the science of measuring physical properties of living beings.

"**Biometrics is the automated recognition of individuals based on their behavioral and biological characteristics.**" (ISO/IEC)

Biometrics technologies and applications have attracted increasing attention over the past two decades (in particular since the events of '9/11') because of -

- advances in computation and imaging
- the receptiveness of decision-makers in government and business to solutions, substantive or otherwise, for perimeter control, the identification of criminals, reduced identity theft or forgery and enhanced security in electronic transactions
- media coverage that has reflected both claims made by vendors (or those seeking research/commercialization funding) and utopian/dystopian visions in science fiction
- access to public and private capital for biometrics research and development, fuelling recurrent biometrics booms

Biometrics establishes identity by recognizing an individual's physiological characteristics, in particular those - such as fingerprints - that are innate to the person, are unique and do not change over time. Early biometric technologies were based on manual recording and referencing of data but data collection, analysis and matching is increasingly automated. Digital biometric schemes centre on pattern recognition based on acquiring biometric data from an individual, extracting a feature set from the acquired data, and comparing that set against a template in one or more databases.

In principle any physiological or behavioral characteristic can form the basis of a biometrics scheme if it satisfies the following requirements -

- universality - every individual should have the characteristic
- distinctiveness - any two individuals should be sufficiently different in terms of the characteristic
- persistence - the characteristic should remain sufficiently unchanged over a life (in practice, unchanged during adulthood)
- collectability - it should be feasible to readily determine and quantify the characteristic
- Outside the laboratory a biometric scheme should satisfy other requirements -
- acceptability - individuals should accept use of a specific biometric identifier
- performance - encompassing factors such as accuracy, speed (including time preparing people for encounters with the technology) and the resources required to achieve the desired recognition
- scalability - the scheme should encompass more than one individual, in some circumstances involving millions of individuals
- non-invasiveness - allowing capture of information without damaging an individual's physical integrity and ideally without special preparation by/of an individual
- robustness - it should accommodate environmental and operational variation (eg the technology copes with noise, humidity, individuals whose occupations obscure particular identifiers)
- Biometric systems play a significant role in almost all the security aspects. As it uses human traits for the identification purpose which cannot be stolen or lost, they are proving to be a better solution than pins and passwords. There are many human traits that can be used as a biometric like fingerprint, face, signature, facial geometry, retina, hand geometry, finger geometry, vein structure of hand, voice, DNA, odor, keyboard strokes. It has been seen that finding two ears which are completely identical is almost impossible and ear does not change much with time, unlike face. Moreover, ear satisfies all the properties that should be possessed by a biometric [2]. The ear has been proposed as a biometric. The difficulty is that we have several adjectives to describe e.g. faces but almost none for ears. We all can recognize people from faces, but we hardly can recognize anyone from ears.

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2. LITERATURE REVIEW

- The most famous work among ear identification is made by Alfred Iannarelli at 1989, when he gathered up over 10.000 ears and found that they all were different. Already at 1906 Imhofer found that in the set of 500 ears only 4 characteristics was needed to state the ears unique (Hoogstrate et al., 2000)[1].
- A biometric specialist company Bromba GmbH (2003) has compared different biometrics including ear shape. In the table 1 the constancy of different biometrics is compared. The reasons for variation over time are e.g. growth, aging, dirt, and injury. In a good biometric there is as little as variation possible. According to table 1 ear biometrics based on ear form are averagely permanent: already used biometrics like iris, retina and DNA are more permanent than ear form. At the same level are e.g. fingerprint and hand geometry. Less permanent than ear form are e.g. signature, facial structure and voice. On the concept of ear identification concept it is quite possible to use this mechanism for identification of particular person. We have scanning technology as well as programming tools like C# .net framework to achieve this goal. Moreover we have different software's which are able to identify different parameters regarding recognition of 9 points (3 sub points) related to ear part having distinguishable distance from the center of the ear like Matlab, even this software is quite able to differentiate illumination factors , color effects etc. due to bright light and dim light surroundings. With the help of these tools we can aid one more component for identification of a person for different purposes like secure web marketing, which is in growing phase

Biometrics Traits	Permanence over Time
Fingerprint (Minutia)	******
Signature (Dynamic)	****
Facial Structure	*****
Iris Pattern	*********
Retina	********
Hand Geometry	*******
Finger Geometry	*******
Vein Structure of back of the hand	******
Ear Form	******
Voice (Tone)	***
DNA	*********
Odor	*******
Keyboard Strokes	****

Table 1. The permanence of different biometrics over the time. The best permanence has most *- symbols and the worst least. (Bromba GmbH, 2003) (*, out of ten values,)

3. EAR BIOMETRICS METHODS

There are at least three methods for ear identification:

(i) taking a photo of an ear,
(ii) taking "earmarks" by pushing ear against a flat glass and
(iii) taking thermo-gram pictures of the ear. The most interesting parts of the ear are the outer ear and ear lope, but the whole ear structure and shape is used.

The structure of ear does not change over the time. The medical literature reports [4] that ear growth after the first four months of the birth is highly linear i.e. proportional. The anatomy used for different parts of the ear is shown in the fig. 1.

Taking photo of the ear is the most commonly used method in research. The photo is taken and it is combined with previous taken photos for identifying a person. The earmarks are used mainly in crime solving. Even though some judgments are made based on the earmarks, currently they are not accepted in courts. The thermogram pictures could be one solution for solving the problem with e.g. hair of hat.

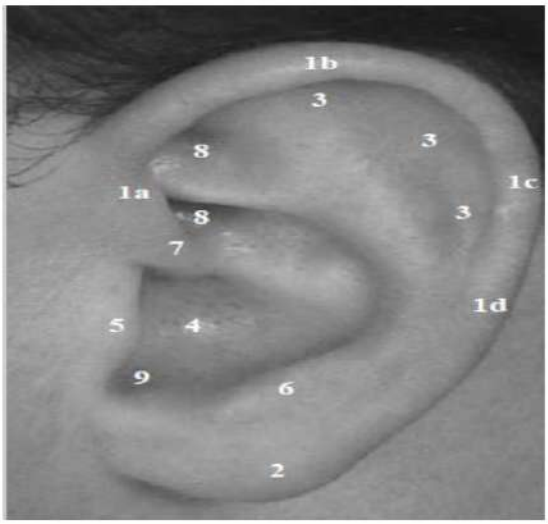

Figure 1 Anatomy of the ear

- Helix Rim
- Lobule
- Anthelix
- Concha
- Tragus
- Antitragus
- Crus of Helix
- Triangular Fossa
- Incisure Intertregica [4]

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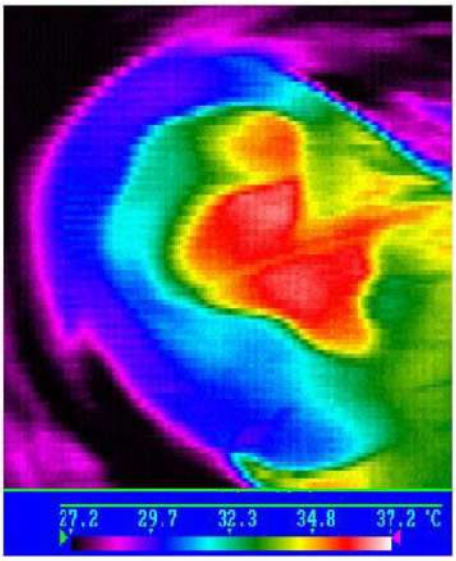

Fig. 2. Thermogram of an ear. Image provided by Brent Griffith, Infrared Thermography Laboratory, Lawrence Berkeley, National Laboratory. (Burge et al., 1998)

4 PRINCIPAL COMPONENT ANALYSIS IN EAR RECOGNITION

Victor, Bowyer and Sarkar (2002) [3],have made a comparison between face and ear recognition. They used principal component analysis (PCA - Principal Component Analyzer, also known as "eigenfaces"), which is a dimensionality-reduction technique in which variation in the dataset is preserved. The classification is done in eigenspace, which is a lower dimension space defined by principal components or the eigenvectors of the data set.
The process consists of three steps:

- Preprocessing,
- Normalization
- Identification (See figure 3 for more details).

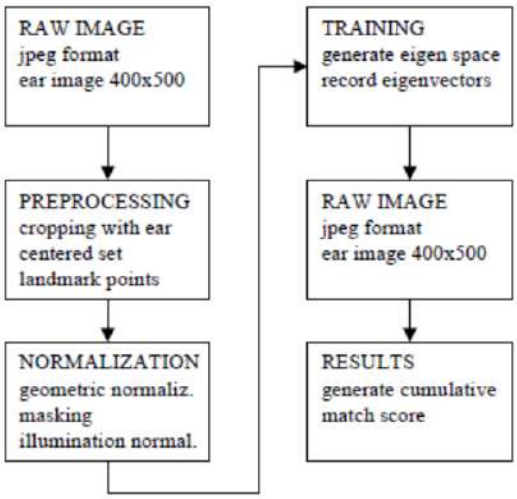

Fig. 3. Steps of PCA method.

5 APPLICATION SCENARIOS

There are several application areas where biometrics can be used either in identification or authentication. In identification the characteristic is compared with characteristics in a database for identifying who the person is. In authentication the characteristic of the person is in e.g. an ID card and this legal information is combined with the new one. (Ratha et al., 2001)
Biometrics can be used e.g. when collecting a child from daycare or boarding an aircraft or anything else between them (Ratha et al., 2001). A typical example of using biometrics is an automatic teller machine (ATM). In this vision the user inserts the bankcard and types the personal identification number (PIN). Simultaneously the camera records the face and ear and the identity of the person will be supplementary verified. So not only the bankcard and the PIN have to be compatible with each other, but also the used biometrics has to fit in. (Burge et al. 1998)
Passive ear biometrics is ideal with different security levels. Currently access rights are handled mainly with different kinds of identity cards with passive transmitters. Anyone who gets the card can use it. In some cases there can be video cameras, which record the people who use the card. However it is not real time system. Using passive ear biometrics no person is allowed to enter restricted area without recognition the person. In the case two attempts of identification do not match, a camera is activated and linked to the security counsel's office. The security personnel can visually combine the picture in the database and the taken picture and decide if the person is allowed to enter to the restricted area. (Burge et al., 1998)
Hoogstrate et al. (2000) have researched the ability to identify a person from surveillance videotapes. There were many robberies of gas stations in The Netherlands. The offender was wearing a baseball cap, shawl and a cloth hanging from the cap to his face so that the face was covered. However the ears were visible. This is the fact that raised the question is people can be identified just from ear. The quality of the videotapes is increasing, which supports the possibility to use ear identification.
Applications using biometrics are more secure than traditional user name and password combinations. A requirement for personal identification systems is cost effectiveness: the systems should work with standard video and computer hardware. An advantage compared with e.g. retinal and iris scan is that ear recognition is less intrusive. (Moreno et al. 1999)

Biometrics is the cutting edge of security. Biometric Fingerprint Scanners offer a high security solution to identity theft from a stolen laptop computer.
There are several choices available for laptops with biometric fingerprint scanners. IBM offers several of the Lenovo models with the built in devices. Sony's Vaio and the Acer Aspire series both offer the scanner as an option. The new Alienware M17 also comes equipped with a fingerprint

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reader. These are all readily available and offer not only the reader and the software suite but also deliver great tutorials on how and when to use the system.

Laptop Computers that come with fingerprint scanners standard:

- Lenovo SL500 ThinkPad
- Lenovo T500 ThinkPad
- Acer Aspire 4736
- Acer Aspire 6920G
- Acer Aspire 3935
- Alienware M17
- Sony Vaio BX
- Dell XPS M1530
- Dell Latitude E6400/6500
- Toshiba Satellite P105-S6114
- Toshiba M400
- Gateway E-155C

When using biometrics for authentication purposes there are several viewpoints to taken into account. The system has to be Comfort, which means that the duration of the verification has to be as low as possible and the system must be easy to use. It also has to be Accurate so that the error rate is as low as possible. The system has to be Available when needed and where needed. The Costs of the system affects also to the use of biometric system.

6 ERROR POSSIBILITIES IN EAR IDENTIFICATION

There are several error possibilities in ear identification. Basically the human ear shape is the same during the whole life and the growth is proportional. However, the gravity can cause ear stretching. The stretching is about five times greater from age of four months to age of eight years and again after about 70 years [2]. The ear can be covered e.g. with hair or a hat. Also the lightning and pose variation can cause error situations. In identification the idea is to check if the biometrics extracted from the picture sufficiently matches with the previously acquired ones. Because there are changes in the environment and the subject, some tolerance has to be accepted. This tolerance can be defined in terms of false reject rate (FRR) and the false acceptance rate (FAR), exhibited by the system. Usually one of the two is trying to be minimized depending on the required security level.

CONCLUSION

After studying the case studies and various research papers it has been observed that there is a new way of authentication of human being i.e. using Ear Biometrics. The area is different but the objective is same as the other biometrics have i.e. authentication. Although the work is in progress for recognition of a particular person on the basis or Ear but there exist lots of concepts which can propagate the desired method in right direction like identification of left ear or right ear, atmospherically affected layer of ear, blood pressure effect on skin of the ear[7] etc. Our objective is to translate the digital image into normalized way such that there will be minimum loss of image quality and effective approach to finding the right person for concluding something. Our objective is to implement such approach to internet for secure web marketing which is a growing phase of new technology.

In conclusion, we may add that though ear is still an infant in the ever enlarging field of biometrics. As the revolutionary advancement progresses in technology day by day, so ear biometrics in identification of a person is quite valuable technique.

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Wireless Sensor Network - An Overview

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Abstract: Wireless Sensor Networks consist of small nodes with sensing and wireless communication capabilities. It enables new applications and requires non-conventional paradigms for protocol design due to several constraints. Many routing, power management, and protocols have been designed for WSNs where energy awareness is an essential design issue. The sensing technology combined with processing power and wireless communication makes it lucrative for being exploited in abundance in future. The focus has been given to the routing protocols and application areas which might depend on the application and network architecture. The routing techniques are classified into categories hierarchical, and location based routing. This survey paper aims at reporting an overview of wireless sensor network technology, applications and standards, features in wireless sensor network design, and evolutions.

Keywords: wireless sensor network, Security, protocols, applications.

INTRODUCTION

A wireless sensor network is the main area of interest among researchers nowadays. Wireless sensor network is defined as self-configured and infrastructure less wireless network to monitor physical and environmental conditions, like temperature, sound, pressure, , vibration, motion or pollutants and cooperatively pass data through the network to a main location where data can be observed and analyzed. Base station acts like an interface between the user and the network. One can get information from the network by requesting queries and gathering result from the base station. Wireless sensor network consists of hundreds of thousands of sensor nodes, which can communicate among themselves using radio signals. A sensor node might vary in size from that of a shoebox down to the size of the grain of dust. Nodes are cheaper in price that is why many new applications of sensor networks such as environment monitoring, vehicular sensor network, body sensor network, sheet brake sensing in paper machine etc. have been emerged. Wireless sensor network operate in complex and noisy real world and real time environments. Topology of the wireless sensor networks can vary from a simple star network to multihop wireless network. Due to recent advancement in technologies, the manufacturing of small and low cost sensors became technically and economically feasible. The sensing electronics measure condition related to the environment surrounding the sensor and transforms them into an electric signal. Managing such a signal acknowledges some properties about objects located or events happening in the area of sensor. A large number of the disposable sensors can be networked in many transmissions, position finding systems, and power units. Sensor nodes are usually scattered in the sensor field, that area where the sensor nodes are located. Sensor nodes cooperate among themselves to produce high-quality information about the physical environment. Each sensor node has its decisions on its mission, the information it has, and knowledge of its computing, communication, and energy resources. Each of these thrown in different directions, sensor nodes has the capability to collect and route data either to other sensors or back to an external base stations. Base station can be a fixed node or a mobile node capable of connecting the sensor network to an existing communications infrastructure or to the Internet where a user can have access to the reported data.

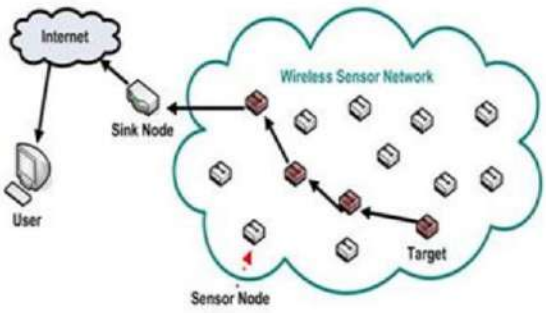

Fig: components of WSN

The main components of a sensor node are a microcontroller, transceiver, external applications that require unattended operations. A Wireless Sensor Network contains hundreds or thousands of these sensor nodes. These sensors communicate either among each other or directly the base station. Large number of sensors allows for sensing over larger geographical regions with greater accuracy. Basically, each sensor node comprises sensing, processing, memory, power source and one or more sensors.

CONTROLLER

The controller performs tasks, processes data and controls the functionality of other components in the sensor node. The mostly used controller is a microcontroller,other types that

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can be used as a controller are: a general purpose desktop microprocessor, digital signal processors.A microcontroller is often used in many embedded systems such as sensor nodes Transceiver

Sensor nodes often make use of industrial, scientific and, medical band which gives free radio, spectrum allocation and global possibility. The available choices of wireless transmission media are radio frequency (RF), optical communication (laser) and infrared. Less energy is required by lasers, but need line of vision for communication and is sensitive to temperature of surrounding. Infrared needs no antenna but it is limited in its broadcasting capacity example lasers. WSN applications include most of Radio frequency-based communication. The functions of both transmitter and receiver are combined into a single device known as a transceiver. Transceivers often have less different identifiers. The in services states are transmit, receive, sleep and idle. Current genesis transceivers have built-in state machines that perform some operations automatically. Most transceivers operating in idle mode have power consumption almost equal to the power consumed in appropriate mode. It is better to absolutely shut down the transceiver rather than leave it in the idle mode when it is not transmitting or receiving.

External Memory

From an energy perspective, the most relevant kinds of memory are the on-chip memory of a microcontroller and Flash memory. Flash memories due to their cost and storage capacity are used. Memory requirements are mostly application dependent. Two types of memory based on the storage purpose that are user memories used for storing application related and personal data and for programming the device program memory is used . Program memory also contains recognition data of the device if present.

Power source

A wireless sensor node is a popular solution when it is difficult or impossible to run a mains supply to the sensor node. The wireless sensor node is frequently placed in a difficult to reach location, changing the battery repeatedly can be costly and inconvenient. Significant aspect in the development of a wireless sensor node assures that there is always adequate energy available to function the system. The sensor node absorbs power for communicating, data processing and sensing. Extra energy is needed for data communication rather than other process.

Sensors

because it cost low, compatible to attach with other devices, ease of programming and low powerconsumption.

Sensors are hardware devices that produce a measurable response to a change in a physical condition like climate, compression. Sensors monitor parameters of physical data. The persistent analog signal produced by the sensors is digitized by an analog to digital converter and sent to controllers for further working. A sensor node must be small in size, consume acutely low energy, operate in high well matured densities, be self-governing and operate abandoned, and be adaptive to the environment. Sensors are divided into three categories that is passive, Omni-directional sensors, narrow-beam sensors and active sensors. Passive sensors are those that sense the data without managing the environment by perceptive. They are self-powered that means energy is needed only to amplify their analog signal. Active sensors actively examine the environment and they require continuous energy from a power source. Narrow beam sensors have a clear-cut notion of direction of measurement, that to a camera. Omni directional sensors have no approach of direction involved in their measurements.

The overall theoretical work on WSNs works with passive, Omni-directional sensors. Each sensor node has a certain area of coverage for which it can reliably and accurately report the particular quantity that they are observing. Different types of power consumption in sensors are signal sampling and conversion of physical signals to electrical ones, signal conditioning, and analog-to-digital conversion. Spatial density of sensor nodes is 20 nodes per cubic meter in the field.

APPLICATIONS OF WSN

The applications for WSNs are diverse, typically involving some kind of monitoring, controlling and tracking. Specific applications include habitat monitoring, nuclear reactor control, fire detection, traffic monitoring, and object tracking. In a classic application, a wireless sensor network is dispersed in a region where it is meant to collect data through its sensor nodes.

Environmental monitoring: environmental monitoring can be used for animal tracking, forest surveillance, flood detection, landslide detection. A landslide detection system makes use of wireless sensor network to detect the slight movements of soil and changes in various changes that may occur before or during a landslide.

Military applications: Wireless sensor network is an integral part of military command by monitoring friendly forces, equipment's and ammunition. It is used for battlefield

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surveillance and battle damage assessment and also detects nuclear and chemical attack.

Area Monitoring: The sensor nodes are installed over an area where event is to be monitored. When the sensors disclose the event being advised, it is reported to the base station, which then takes appropriate actions. Example- geofencing of gas or oil pipeline.

Health care monitoring: wireless sensor networks can be embedded to hospital building to track and monitor patients and all medical resources. Special kinds of sensors can be used which can measure blood pressure, body temperature. Special types of sensor which when worn or implanted for health purposes are known as body sensor network.

Industrial monitoring: wireless sensor networks have been installed for machinery condition based maintenance, as they offer significant cost saving and enable new functions.by the cost of wiring the installation of sensors are limited.

Structural monitoring: wireless sensors can be used to monitor the movement inside the buildings and infrastructure like bridges, tunnels, flyovers.

Agriculture sector: wireless sensor network frees the farmer from the maintenance of wiring in a challenging environment. Using pressure transmitter's gravity feed water systems can be monitored to monitor tank levels, pumps can be controlled by wireless input/output devices

Waste water monitoring: there are many opportunities for using wireless sensor networks in this field. Facilities not wired for power or data transmission can be monitored using industrial wireless I/O devices and sensors powered using solar panels or battery packs.

ROUTING PROTOCOLS IN WSNs

In this section, we survey the state-of-the-art routing protocols for WSNs. In general, routing in WSNs can be divided into flat-based routing, location-based routing and hierarchical-based routing, depending on the network structure. In flat-based routing, nodes are assigned equal roles or performance. However, nodes will play different roles in the network in hierarchical based routing and sensor nodes positions are exploited to route data in the network in location based routing. A routing protocol is treated adaptive if certain system parameters can be controlled in order to adapt to the current network conditions and available energy levels. These protocols can be categorized into multipath-based, negotiation-based, coherent-based routing techniques depending on the protocol operation. In addition to the above, routing protocols can be classified into three types like proactive, reactive, and hybrid protocols depending on how the source finds a route to the destination. All routes are computed before they are really needed in proactive protocols whereas in reactive protocols routes are figure out on demand and hybrid protocols are combination of these two protocols. When sensor nodes are fixed, it is desirable to have table driven routing protocols slightly than using reactive protocols. Sufficient amount of energy is used in discovery of route and composition of reactive protocols. Another type of routing is cooperative routing in which nodes send data to a central node where data can be assembled and can be used for processing and reducing the cost of route in terms of energy used. Other protocols depend on timing and position information.

FLAT ROUTING

The first category of routing protocols is the multihop flat routing protocols. In flat networks, each node plays the same role and sensor nodes combine together to perform the sensing task. Due to the large number of nodes, it is not feasible to select a global identifier to each node. This application has force to data centric routing where the base station sends data to certain regions and waits for data from the sensors located in the other regions. Data is being requested through queries. Example is Sensor Protocols for Information via Negotiation (SPIN)

HIERARCHICAL ROUTING

The concept of hierarchical routing is also utilized to perform energy efficient routing in wireless sensor network. Higher energy nodes can be used to process and send the information while low energy nodes can be used to perform the sensing in the proximity of the target in a hierarchical architecture. Creation of clusters and assigning special tasks to cluster heads can greatly contribute to system scalability, lifetime energy efficiency. Hierarchical routing is mainly two-layer routing where one layer is used to select cluster heads and the other layer is used for routing. Example is Low energy adaptive clustering hierarchy (LEACH)

Location based routing protocols:

In this kind of routing, sensor nodes are addressed by means locations. The distance between neighboring nodes can be estimated on the basis of incoming signal. Equal number of neighboring nodes can be obtained by exchanging information between neighbors the location of nodes may be available directly by communicating with a satellite, using GPS (Global Positioning System), if nodes are appointed with a small low power GPS receiver. Some location based

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schemes demand that nodes should go to sleep if there is no activity so as to save energy. More energy can be obtained by having as many sleeping nodes in the network as possible. Example is Geographic and Energy Aware Routing (GEAR).

QoS-based routing

The network has to balance between energy consumption and data quality. In particular, the network has to satisfy certain quality of service metrics like delay and energy, while delivering data to the base station.

Security

The future of wireless sensor network is very conventional it will not be successfully deployed if security and privacy issues are not addressed appropriately. These issues become important because wireless sensor networks are usually used for very critical applications.

Data Confidentiality

Data confidentiality is the most important issue in network security. Every network with security focus will commonly abode this problem. A sensor network should not leak sensor readings to other neighbors. In military application, the data stored in the sensor node may be immensely sensitive.

Data Integrity

With the application of familiarity, an enemy may be unable to steal information. This does not mean that the data is safe. The enemy can change the data, so that it can send the sensor network into discipline. For example, an awful node can manipulate the data within a packet. This new packet can then be sent to the original receiver. Data loss or damage can even occur without the presence of a malicious node due to the nasty communication. Data integrity secure that any received data has not been adjusted in transit.

CONCLUSION

Wireless sensor networks have been identified as one of the most prospective technologies. Our aim is to provide both a general overview of wireless sensor network. That includes its components, application areas and routing in sensor networks is a new research area, with a limited but rapidly growing set of results. Many routing protocols have been proposed which are not suitable for all applications in wireless sensor network. Many issues and challenges exist that need to be solved in the sensor networks.

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De-noising Medical Images Using BFO

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Abstract - **In medical images noise is introduced due to the acquisition techniques or the intrinsic (i.e., sensor) and extrinsic (i.e., environment) conditions. This noise introduced in images creates hindrance in getting the correct and useful information from the medical images. Till date the most challenging problem for researchers is removing noise from the original signal. The paper proposes the noise reduction method for the medical images such as computed tomography (CT) imaging and magnetic resonance imaging (MRI).This paper presents a broad overview on the Bacterial Foraging Optimization Algorithm which is an artificial intelligence nature-inspired optimization algorithm technique based on mimicking the foraging behavior of E. coli bacteria to the field of medical imaging and also provides the useful overview of the comparison of the BFO with the other noise reduction techniques.**

Keywords - Bacterial foraging algorithm (BFA), Image denoising, magnetic resonance imaging, ultrasound, computed tomography (CT) imaging, magnetic resonance imaging (MRI).

1. INTRODUCTION

Medical imaging refers to the techniques and procedures that takes images of the human body parts for various clinical diagnosis and medical procedures.In the broader way, it Is a part of biological imaging that incorporates radiology, thermograph, medical photography, MRI , endoscopy and microscopy etc. Image denoising is the process of removing noise from the image to get the specified information from the image. One of the fundamental challenges in the field of image processing is denoising, where the underlying motive is to regain actual image by suppressing noise from a noise-contaminated version of the specified image. While various techniques and algorithms are introduced to remove the noise but still the problem of image noise is an open challenge, especially in situations where the images are acquired under poor conditions where the noise level is very high. This paper presents a new technique that is bacterial foraging optimization (**BFO).** It is based on the recently proposed BFA which mimics the basic foraging behaviour of E. coli bacteria. The main properties of a good image denoising model is that it will remove noise while preserving edges.

2. DENOISING ALGORITHMS

There are two basic approaches used for the image denoising that are spatial filtering methods and transform domain filtering methods.Various other methods such as total variation, curvelet transform, contourlet transform and many other transform are used to denoise the images

2.1 Spatial filtering methods

It is the traditional way for the denoising of images in which the linear and non linear filters are used . With **non-linear filters**, the noise is removed without any attempts to explicitly identify it. Spatial filters employ a low pass filtering on groups of pixels with the assumption that the noise occupies the higher region of frequency spectrum. Generally spatial filters remove noise to a reasonable extent but at the cost of blurring images which in turn makes the edges in pictures invisible. In recent years, a variety of nonlinear median type filters such as weighted median [4].

2.2 Transform Domain Filtering

The two types of transform domain filtering methods data adaptive and non-adaptive are also used for the purpose of the image denoising. The noise removing process may be performed in the spatial-domain or in a transform-domain depending on the application, a efficient transform, e.g., discrete Hartley transform (DHT) , discrete wavelet transform (DWT) , discrete Fourier transform (DFT) , discrete cosine transform (DCT) etc. may be enrolled.

3. BACTERIAL FORAGING OPTIMIZATION (BFO)

Bacteria Foraging Optimization (BFO) algorithm is nature inspired artificial intelligence technique that is based on the food seeking as well as the reproductive behavior of the bacteria named E coli. It is probabilistic technique used to find approximate solutions to extremely difficult problems. The Artificial intelligence technique is copied from the working of the bacteria E coli.The food seeking behavior of the bacteria is copied and the similar algorithm is prepared which is then used to denoise the image so that the image can be made noise free.

3.1 Foraging Theory

Foraging is the food seeking behavior of the bacteria that shows the procedure how the bacteria search for and obtain nutrients in a way that maximizes the ratio E/T (where E is the energy obtained and T is the time spent foraging) or maximizes the long-term average rate of energy intake. In the

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process of foraging, E. coli bacteria undergo four stages, namely, chemotaxis, swarming, reproduction, and elimination and dispersal. In search space, BFOA seek optimum value through the chemotaxis of bacteria, and realize quorum sensing via assemble function between bacterial, and satisfy the evolution rule of the survival of the fittest make use of reproduction operation, and use elimination-dispersal mechanism to avoiding falling into premature convergence. [3]

3.2 Chemotaxis

Chemotaxis is the type of process that simulates the movement of bacteria cell through two process that are swimming and tumbling . Biologically, an *E.coli* bacteria can move in two different ways. It can swim for a period of time in the same direction, or it may tumble, and alternate between these two modes of operation for the entire lifetime..[3] Chemotaxis movement is continued until a bacterium goes in the direction of positive-nutrient gradient. After a certain number of complete swims, the best half of the population undergoes the reproduction and eliminating the rest of the population. In order to escape local optima, an elimination-dispersion event is carried out where some bacteria are liquidated at random with a very small probability and the new replacements are initialized at random locations of the search space.[2]

The flow chart of Bacterial foraging optimization is designed according to the behavior of the food seeking of the E Coli Bacterium. The various stages of the process includes the initiation,evaluation and then the starting and ending of Chemotaxis process which is followed by the reproduction and dispersal.

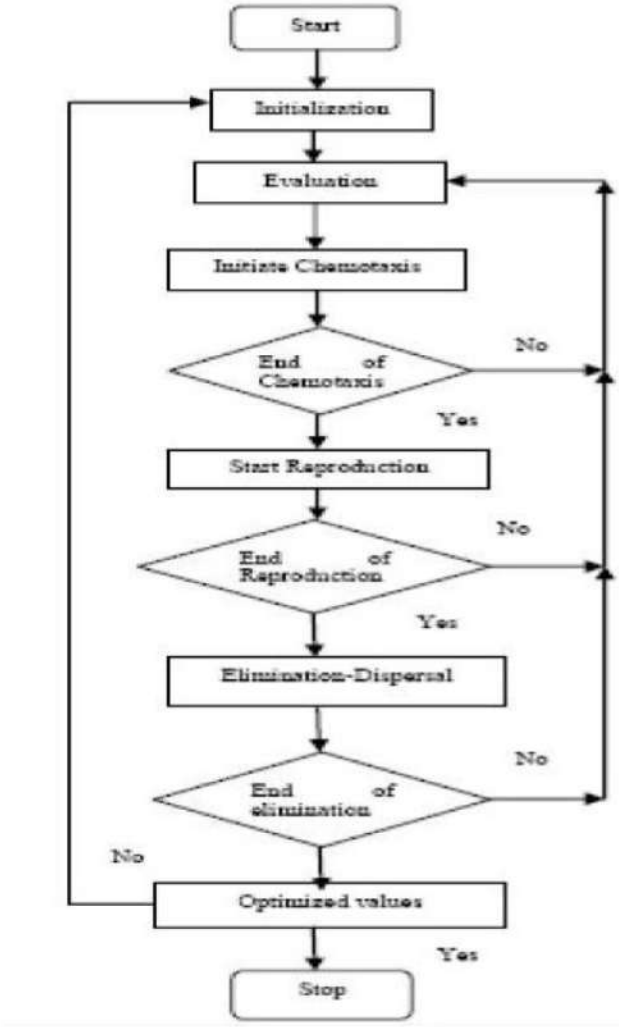

Fig 1. Flow Chart of BFO algorithm [2]

Riya Mary Thomas (March 2013)," Survey of Bacterial Foraging Optimization Algorithm"

In this paper the chemotaaxis behavior of E Coli is explained as below:

(A1) If in neutral medium, the alternate tumbles and the runs ⇒ search.

(A2) If swimming up in a nutrient of the gradient or out of the noxious substances), swim longer (climb up nutrient gradient or down noxious gradient) ⇒ seek increasingly favorable environments.

(A3) If swimming down the nutrient of the gradient (or upnoxious substance gradient), then search ⇒ to avoid unfavorable environments. In elimination-dispersal event the gradual or unexpected changes in the local environment where a bacterium population lives it may occur due to the various reasons such as a significant local rise of temperature may kill a group of bacteria that are currently in a region with a high concentration of nutrient gradients. Events can take place in such a

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method that all the bacteria in a region are killed or a group is dispersed into a new location [1].

In 2002 K. M. Passion ***proposed Bacterial Foraging optimization Algorithm*** which is inspired by the Foraging behaviour of E.Coli bacteria. Natural selection tends to eliminate animals with poor foraging strategies and favour the propagation of genes of those animals has successful foraging strategies. Bacteria foraging strategies are the motivation for BFA optimization.

The various stages of the behavior of the bacteria foraging i.e the food seeking capability is considered into mind and the new algorithm is designed.Accordingly a new optimization technique is made that is applied to the noiseful version of the images. As the bacteria moves from point to point in search of food ,Similarly,in the algorithm designed, the processing for the image is done by pixel to pixel according to the code designed based on the bacteria behavior. The pixel to pixel working on the image has the benefit of the removal of noise more accurately.

CONCLUSION

This article describes a survey of BFO noise removal technique for denoising medical images. The major advantage of Bacterial Forging Optimization Algorithm is that it is simple and easy to implement in order to optimize medical images.Also the other advantage is that this algorithm works pixel to pixel hence improving the noise more accurately in terms of performance taking into measures such as peak signal to noise ratio, noise to signal ratio, mean squared error etc. The disadvantage of BFO is that pixel to pixel removing of noise may sometimes becomes a complex process in case of high pixel images. From the literature analysis it is inferred that noise removal by BFO produces very commendable results and the results of the BFO artificial intelligence technique does varies a lot as compared to the other denoising images.

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Image Enhancement Techniques: A Selected Review

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Abstract - **In Medical ultrasonography the image quality varies greatly between patients and organs. Improved image quality enhances the diagnosis accuracy and has the potential to open up for increased use of ultrasound imaging e.g. in breast and prostate cancer diagnosis and screening. This is main reason that image enhancing is used in huge number of applications. In this paper a number of image enhancing techniques have been defined from which researcher can get an idea.**

INTRODUCTION

Medical ultrasonography is used in a wide range of areas of patient diagnosis, where maybe obstetrics (woman and unborn child during pregnancy) and cardiology (heart and blood vessels) are the most well known to the general public. The image quality varies greatly between patients and organs. Improved image quality enhances the diagnosis accuracy and has the potential to open up for increased use of ultrasound imaging e.g. in breast and prostate cancer diagnosis and screening.

The medical ultrasound imaging modality suits especially well for imaging of soft tissue and muscles. It owes its popularity amongst others to its non-invasive nature, and that the equipment is inexpensive and portable compared to e.g. nuclear magnetic resonance (NMR) and X-ray computed tomography (CT). Furthermore, it has no known medical side effects, and the images are produced in real-time, therefore shortening the delay between patient examination and diagnosis. Ultrasound waves propagating in human tissue are longitudinal compression waves traveling at about 1540m/s. The temporal wave frequency utilized for most medical imaging is within the approximate interval from 1 to 15MHz, corresponding to wavelengths between 1.5 and 0.1mm.

Conventional ultrasound imaging is based on the pulse-echo technique, which essentially relies on transmission of a pulse, receiving echoes and interpreting them to form an image. The image reconstruction is done assuming the speed of sound to be constant within the object. Measurement of the amplitude of the received echoes, while relating to their respective time-of- flight, makes it possible to map the position of back-scattering targets along the direction of the ultrasound beam. By scanning the ultrasound beam in a plane or a volume, a two-dimensional (2D) or three dimensional (3D) image is constructed.

The ultrasound pulse is generated by a piezo-electric transducer which converts an applied voltage pulse into the ultrasonic vibration which is transmitted into the body. The back- scattered vibrations are received by the transducer, which converts them into electric signals that are interpreted by the ultrasound scanner to generate the image. The transducer is often divided into an array of individual elements.

The principal objective of image enhancement is to process a given image so that the result is more suitable than the original image for a specific application. It accentuates or sharpens image features such as edges, boundaries, or contrast to make a graphic display more helpful for display and analysis. The enhancement doesn't increase the inherent information content of the data, but it increases the dynamic range of the chosen features so that they can be detected easily.

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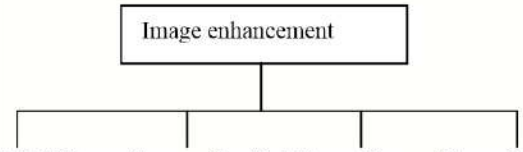

Point Operation **Spatial Operation** **Transform Operation** **Pseudocoloring**

Contrast Stretching Noise Smoothing Linear Filtering False Coloring Noise clipping
Median Filtering Root Filtering Pseudocoloring
Window Slicing HP, LP & BP Filtering
Homomorphic Filtering
Histogram Modeling Zooming

Figure 1: Image Enhancement

LITERATURE REVIEW

In this section we are presenting the research work of some prominent authors in the same field and explaining a short description of various techniques for image enhancing.

A. Rivera et al. (2012), "Content-Aware Dark Image Enhancement through Channel Division"

This paper, propose a content-aware algorithm that enhances dark images, sharpens edges, reveals details in textured regions, and preserves the smoothness of flat regions. The algorithm produces an ad hoc transformation for each image, adapting the mapping functions to each image's characteristics to produce the maximum enhancement. Author analyze the contrast of the image in the boundary and textured regions, and group the information with common characteristics. The results are then adaptively mixed, by considering the human vision system characteristics, to boost the details in the image.

B. Zhengetal.(2001), "GeneticImage ehancement Basedon Saturation Feedback"

In this paper an adaptive approach for color image enhancement is proposed. In this approach, the saturation feedback technique is used as a means of supplementing color image sharpness and contrast. This technique of the saturation feedback can serve to bring out image details that have low luminance contrast. In the technique, the feedback parameters are the key component and are usually determined manually. In order to realize the adaptive color image enhancement, the genetic algorithm is employed to search global optimal parameters for saturation feedback automatically.

C. Verma et al. (2012), "High dynamic range optimal fuzzy color image enhancement using Artificial Ant Colony System"

This paper presents a novel approach for the enhancement of high dynamic range color images using fuzzy logic and modified Artificial Ant Colony System techniques. Two thresholds, the lower and the upper are defined to provide an estimate of the underexposed, mixed-exposed and overexposed regions in the image. The red, green and blue (RGB) color space is converted into Hue Saturation and Value (HSV) color space so as to preserve the chromatic information. Gaussian MFs suitable for the underexposed and overexposed regions of the image are used for the fuzzification. Parametric sigmoid functions are used for enhancing the luminance components of under and over-exposed regions. Mixed- exposed regions are left untouched throughout the process. An objective function comprising of Shannon entropy function as the information factor and visual appeal indicator is optimized using Artificial Ant Colony System to ascertain the parameters needed for the enhancement of a particular image. Visual appeal is preferred over the consideration of entropy so as to make the image human-eye-friendly. Separate power law operators are used for the saturation adjustment so as to restore the lost information. On comparison, this approach is found to be better than the bacterial foraging (BF)-based approach.

D. Kaur et al. (2013), "Image Enhancement Using Particle Swarm Optimization and Honey Bee"

In this paper, a new approach to automatic image enhancement using HB is implemented by specifying intensity of the edges pixels and also earlier reported PSO results were used. Further comparatively analysis is

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performed between HB and PSO results. The obtained results indicate that the proposed HB yields better results in the terms of both the maximization of number of the pixels in the edges and pick signal to noise ratio (PSNR). Computational time is also relatively small in the HB as compared to the PSO case which is earlier reported.

E. Anand et al. (2013) in the paper, "Sharpening enhancement of ultrasound images using contourlet transform"

The furry regions of ultrasound images are to be enhanced for good quality visual perception. This paper proposes a contourlet transform (CT) based sharpening technique (ST) for contrast enhancement in ultra-sound (US) images. While sharpening, noise emphasize is the drawback of the classical ST methods. The proposed ST is operated on the multiscale, multidirectional CT decomposition of the underlying US image. The new ST not only sharpens the US image but also control the noise effect with tunable parameters. The results are compared with common un sharp masking and recently proposed nonlinear un sharp masking. The parameters like enhancement measure, structural similarity, and blind image quality measure evaluate the improved performances of the proposed technique.

Table 1. Comparative Analysis of Various Techniques

S.No	Paper Name	Author Name	Technique Used	Application Area
1	**Content-Aware Dark Image Enhancement through Channel Division**	Ramirez Rivera, A.Byungyong Ryu ;Oksam Chae;	Content-aware algorithm	Human Visual system,In medical
2	**Genetic Image Enhancement Basedon Saturation Feedback**	Zheng, H., Pan, L., Xiang,Yong, Wong, A. and Nahavandi, Saeid	Saturation feedback technique	Human visual system
3	**High dynamic range optimal fuzzy color image enhancement using Artificial Ant Colony System**	Om Prakash Verma, Puneet Kumar, Madasu Hanmandlu, Sidharth Chhabra,	Fuzzy logic and modified Artificial Ant Colony System techniques	In Medical ForHuman eye
4	**Image Enhancement Using Particle Swarm Optimization and Honey Bee**	Jaspreet Kaur, Sukwinder Kaur and Maninder Kaur	Particle Swarm Optimization and Honey Bee"	In testing of Medical images for tumour detection.
5	**Sharpening enhancement of ultrasound images using contourlet transform**	S.Anand, R.Shantha Selva Kumari, T.Thivya, S.Jeeva	Contourlet transform	For image enhancement of ultrasound Images

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CONCLUSION

This paper presents a short description of various image enhancement techniques to make familiar with different ways to improved image quality which enhances the diagnosis accuracy and has the potential to open up for increased use of ultrasound imaging e.g. in breast and prostate cancer diagnosis and screening. From the mentioned techniques Counter let Transform is the best technique because it overcomes the problem of the classical ST that improves the noise while enhancing. Being multiscale, multidi-rectional, and anisotropic,CT efficiently captured the geometrical features. But one of the limitations of CT is that the image enhancement is not much better.

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Saving cache memory using locking cache in Real-time systems

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Abstract – ***Locking cache is a practical alternative to conventional caches in real-time systems. With similar performance than conventional caches, a locking cache allows a simple, accurate schedulability analysis. This work presents a new application of the locking cache. Along the modern trend to design Systems-On-a-Chip (SOCs) in which a single IC, usually a programmable device like an FPGA, is designed with one or more microprocessors and peripherals, a locking cache is used to reduce the cache size to the minimum that satisfies the system schedulability. Although results are not as good as the authors expected, the developed technique is promising, and future work may lead to very interesting cost reductions in the size of the memory hierarchy of real-time systems while maintaining their schedulability properties.***

Keywords: Cache memories, Cost aware, locking cache, Real-Time systems, System on a Chip

I. INTRODUCTION

The choice of a processor for the design of a strict real-time system is a complex problem. The designer must estimate the performance required for the tasks to run meeting their respective deadlines. Once the architecture is selected and the system tasks developed, the designer is challenged to verify the system schedulability by any of the usual methods (static analysis, simulation, monitored execution, etc.) [1].If the test result is negative, i.e. tasks do not meet their time constraints, the designer must modify the tasks to reduce its response time, or choose a new more powerful processor to meet the deadlines of all the tasks. Choosing a processor with more than enough performance to start the design may seem like a good idea, but it is a way to increase the system cost that, in some cases, may not be acceptable. Using a processor with architectural enhancements such as speculative execution, cache memories, branch prediction, etc. is a good way to achieve higher performance while maintaining the system cost bounded. However, these architectural improvements present a behavior difficult to predict and extremely complex to analyze, which often represents an Insurmountable complexity in the schedulability analysis of the real-time system that forces the designer to discard them. The ability to implement Custom processors in FPGAs or ASICs have partly simplified the choice of the processor for a real-time system [2].

With these tools, it is possible to build a system with its performance adjusted to the actual requirements, decreasing the cost of the resulting system. What's more, the designer can incorporate those architectural improvements that interest him most, choosing those with an affordable complexity analysis and a significant increase in performance. This paper presents a proposal for the use of locking cache memories to ensure that the system is schedulable, but maintaining, on the one hand, the simplicity of the schedulability analysis, and on the other hand, the system cost as low as possible in terms of memory hierarchy. This proposal is most attractive to the designer of ad-hoc processing systems implemented in programmable logic devices like FPGAs.

A. Cache memories

Conventional cache memories are one of the most effective ways to enhance the performance of a system [3]. But three problems make their use unattractive in real-time systems:

- Their behavior is difficult to predict, and although there are a large number of publications on this area [4], the complexity of these techniques make their use extremely difficult in real applications.

- The cost of the memory used to build the cache is very high, which makes their use not recommended in systems where the final price is a determining factor.

- The cache memory has to be very close to the processor to get the best performance results, which in practice compels the designer to implement it into the same silicon die, or inside the same FPGA in which the CPU is located. This can significantly increase the cost and complexity of development process if the cache size is relatively large.

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B. Locking caches

The basic operation of a locking cache memory is simple: a set of selected blocks from main memory are loaded and locked into the cache memory, and a locking mechanism prevents the cache content replacement. Since there are no changes in the contents of the cache, and these contents are chosen at design time, the location of every instruction — cache or main memory— is fixed and a-priori known, so it is its execution time. Thus it is possible to use well-known techniques to estimate the execution and response times of all the tasks, easing the schedulability analysis required for real-time systems.

There are multiple variants of the use of locking cache memories in real-time systems [5, 6, 7, 8, 9, 10]. The most basic form is called static locking. In this technique, a subset of the system memory is chosen to be loaded and locked into the cache memory, remaining there for the lifetime of the system. Other techniques are generically called dynamic locking, since the content locked in cache can be changed during the system runtime, provided that the replacement happens at fixed or known points to maintain the simplicity of the schedulability analysis.

Although static locking delivers worst performance results than dynamic locking techniques [11], several reasons exist that have decided the authors in favor of the static locking technique for the proposal presented here:

- Dynamic locking needs additional hardware, and in some cases an additional memory, to manage the cache contents replacement in a controlled way. Since the aim of this work is to reduce the hardware required by the resulting system it seems appropriate to use the technique which requires no additional hardware.

- With the use of the static locking technique the selected instructions have to be loaded and locked into the cache before the system starts execution. In those cases where the system is implemented in a FPGA or similar programmable device the cache contents can be "hard-coded" in the design and so the cache controller may be greatly simplified (as there is no need to replace its content). This by no means would require a hardware re-design or re-synthesis if the code of the tasks needs modification. For example, the ISE Design Suite software used to program Xilinx FPGA devices offers the possibility to modify the contents of the memory blocks inside the FPGA working directly with the bit stream (the file to download into the FPGA) at the very last step of the design process.

In any case, to achieve the best possible performance with the locking cache, two techniques are used simultaneously:

- To exploit spatial locality for those instructions not loaded into the cache (which produce cache misses at runtime) and reduce the number of memory transfers, a pre fetch buffer is included into the cache controller. This buffer has a size equal to a single cache line and allows the system to transfer instructions using bursts of the same length as if a conventional cache memory were used.

- A genetic algorithm is used to perform the selection of those blocks from main memory that have to be loaded into the locking cache.

II. Searching the minimal cache size

The proposal presented in this article is based on the results obtained in previous research works. These results showed that when the size of the system, measured in terms of the memory occupied by the instructions of the tasks, was significantly larger than the size of the cache memory, the performance of the system with a locking cache was far better than using a conventional cache. This suggests that it is possible to maintain the schedulability of the real-time system (with a cache with its content locked at runtime) while reducing significantly the size of the cache memory size.

In those previous works about locking caches, the selection of the blocks to be loaded was performed using a genetic algorithm or a greedy algorithm. The goal of both algorithms was to select a set of blocks to guarantee the system schedulability and, at the same time, to improve some system performance parameter such as the system utilization or the slack of the tasks.

However, the main goal for many real-time designers is to guarantee that the system is schedulable only, with little or no interest in optimizing the performance of the resulting system. Therefore, although the use of a cache memory of minimal size produce a performance loss, savings in energy consumption and system costs compensate it.

The algorithms used to decide the set of blocks which must be loaded into the locking cache use multiple input parameters. These parameters include information about the tasks of the real-time system, about the temporal requirements of the system, and of course, information about the locking cache.

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One of these input parameters is the size of the cache memory, precisely a piece of information that in this work should not be an input parameter but a result of the algorithm, as in this case the goal is the search of the minimum locking cache size that guarantee the schedulability of the real-time system. Therefore, selection algorithms must be modified to produce this value instead of requiring it as an input.

However, before facing the change of the search algorithms, the authors have preferred to conduct a study to verify that the use of a static locking cache memory allow the reduction of the cache memory size of schedulable real-time systems.

III. EXPERIMENTS

A. Experiments description

The goal of the experiments carried out is to determine what is the minimum size of the cache memory required to guarantee a real-time system is schedulable, using both a conventional cache and static locking cache. To perform these experiments the following elements have been used:

- 13 sets of tasks have been developed. Each task set is composed by a number of tasks ranging from 3 to 8 tasks. The code for each task has been synthetically created and may contain sequential code, loops, nested loops, if-then-else conditional structures and any combinations of these.

- The processor used is a MIPS R2000 and the following cache characteristics are assumed: a cache line size of 16 bytes (4 32-bit wide instructions). Fetching an instruction from cache takes 1 cycle while fetching an instruction from main memory takes 10 cycles. The mapping functions used for the conventional cache are direct, 2-way set-associative, 4-way set-associative and full associative. The mapping function for the locking cache is only direct-mapping, because this one is the most restrictive for the locking cache.

- To estimate the response time for the tasks using a conventional cache, a modified version of the SPIM simulator (a freely available, widely used MIPS simulator) has been used. Cache effects can be analyzed without interference since the simulator does not include any architectural enhancement. From the original version of SPIM, modifications include the simulation of a parametric (size, mapping) cache.

- The genetic algorithm described in has been used to estimate the response time for the tasks when using a static locking cache.

Two factors may have a decisive impact on the performance of a system using a cache memory, with or without locking.

The first factor is the structure of tasks code: the use of large sequences of sequential instructions, small nested loops, etc. The second factor is the number of expulsions the tasks suffer at runtime due to higher priority tasks; this affects the tasks response times and the overall utilization of the system.

The structure of the tasks has been taken into account at the time the synthetic tasks were created, making use to different control flow mechanisms. The number of expulsions has been included when two real-time systems originate from the same task set.

Each task set produce 2 different (called type A and type B) real-time systems to schedule for a total of 26 systems. A fixed-priority preemptive scheduler is used in every case where the task priority is assigned according to a Rate Monotonic policy. Also, notice that it is assumed that the deadline for a given task, D, is equal to the task period, T.

Type A and type B systems originating from the same task set differentiate in the periods assigned to the tasks only. Tasks priorities are the same in both cases, but in the type A systems the periods are sufficiently large to achieve an overall system utilization below 50% when running on a conventional cache of 4096 lines. Whereas in the type B systems the periods of all tasks have been reduced, thus increasing the number of expulsions experienced by the lower priority tasks and therefore increasing the overall utilization of the system above 90%, again with a conventional cache of 4096 lines.

The reason to use a 4096-lines cache as a reference is that for any of the set of tasks created the sum of the sizes of the tasks is less than 64Kbytes (4096 blocks of 16 bytes, the size of a cache line) so all systems run without cache misses (except mandatory misses).

On the other hand, why use the same set of tasks with two groups of different time periods is due to the results obtained in previous works. In these studies a strong relationship was found between the performance of the locking cache and the sizes of the tasks and the cache itself.

Specifically, when the cache was very small compared to the size of the tasks, the performance of a locking cache was clearly better than the performance obtained using a conventional cache. Conversely, when the size of the cache was close to the sum of the sizes of the tasks, a locking cache provided worse performance than a conventional cache.

The goal is that a given system requires different caches in terms of cache size— allowing the evaluation of the effect of the cache size. Achieving such a goal is possible by modifying the tasks periods and therefore the system utilization because to maintain the utilization below 100% (a requirement for the system to be schedulable) it will be

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necessary to reduce the execution time of the tasks of the system, reduction that can be obtained increasing the size of the available cache.

Once the tasks for the real-time systems have been created (a total of 13 sets of tasks, each using two sets of periods for a total of 26 systems), the experiments have been carried out this way:

To find the minimum size required to schedule a system using a conventional cache (Minimum Size of Conventional cache, MSconv) these systems have been simulated using a modified version of the SPIM simulator. This version of SPIM gives as result, among other information, the execution and response times of tasks, the overall utilization of the system and an error message if any of the tasks misses its deadline. Each system is simulated with all possible sizes of a conventional cache ranging from a single line to 4096 lines, until the minimum size that guarantees schedulability of the system is found.

To find the minimum size required to schedule a system using a static locking cache (Minimum Size of Locking cache, MSlocking) a genetic algorithm has been run. The genetic algorithm provides several results from the analyzed system, including the overall system utilization, execution and response times of all the tasks, and an error message if the system is not schedulable. All these results are estimates and represent a safe upper bound for the results that would be obtained in the case the system were actually implemented and the locking cache were filled with the blocks selected by the genetic algorithm.

The number of executions, both the modified SPIM simulator and the genetic algorithm, required to obtain the results presented below have been enormous, but this have been

Automated and reduced through the use of scripts that perform a binary search on the size of the cache memory.

B. Experimental results

Table 1 and Table 2 show the results for the 13 sets of tasks and the two sets of periods with the column "Conv. 4096" containing the system utilization when a conventional cache memory of 4096 lines is used to simulate the execution of systems. These data allows comparing the effect of tasks periods and system utilization on the performance of the system using a locking cache.

Columns "Lines conv." and "Lines lock." show the minimum cache size required to make the system schedulable for a conventional and a static locking cache respectively. The absolute difference between these two columns is shown in the "Diff" column. Positive values indicate the locking cache makes the system schedulable with a lower number of lines than the conventional cache. Finally the percentage ("%") show the relative difference in percentage between "Lines conv." and "Lines lock.". Positive values indicate a smaller locking cache is required to schedule the system.

From Tables 1 and 2 the first conclusion is that for a total of 26 systems, the locking cache needs a lower number of lines than conventional cache in 12 cases (46% of total experiments). However, if results are studied as a function of the type of periods, the locking cache beats the conventional cache in 9 of 13 systems when the global utilization is below 50% (type A periods) and the conventional cache beats the locking cache in 10 of 13 systems when global utilization is over 90% (type B periods).

Table 1. Results for systems with periods Type A

Task set	Type A periods				
	Conv. 4096	Lines conv.	Lines Lock.	Diff	%
1	0,35	544	261	283	52,02
2	0,35	549	302	247	44,99
3	0,44	436	450	-14	-3,21
4	0,36	75	105	-30	-40,00
5	0,38	156	150	6	3,85
6	0,32	448	161	287	64,06
7	0,41	488	372	116	23,77
8	0,35	380	400	-20	-5,26
9	0,29	89	14	75	84,27
10	0,28	96	4	92	95,83
11	0,34	377	267	110	29,18
12	0,39	80	129	-49	-61,3
13	0,32	77	60	17	22,08

Table 2. Results for systems with periods Type B

Task set	Type B periods				
	Conv. 4096	Lines conv.	Lines lock.	Diff	%
1	0,96	2219	2313	-94	-4,24
2	0,98	3044	2870	174	5,72
3	0,93	954	1482	-528	-55,35
4	0,96	377	515	-138	-36,60
5	0,97	1414	1880	-466	-32,96
6	0,94	2932	2751	181	6,17
7	0,98	1727	3448	-1721	-99,65
8	0,93	1687	2300	-613	-36,34
9	0,98	572	711	-139	-24,30
10	0,92	1567	1826	-259	-16,53
11	0,92	1831	1756	75	4,10
12	0,97	1012	2975	-1963	-193,97
13	0,95	534	1401	-867	-162,36

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The effect of the type of periods applied is not definitive, however. For example, for task set number 2, the locking cache beats the conventional cache independently of the type of periods while for task set number 12, the conventional cache beats the locking cache in both cases. The reason of this behavior is the structure of the tasks that form the system. Tasks in set 12 include nested loops up to three levels while tasks in set 2 have only one level of loops.

Figure 1 shows the distribution of reduction/increase (percentage column) of lines needed to make the systems schedulable. Again, positive values (columns on the right side) indicate that the locking cache mechanism demands smaller caches than conventional cache. Figure 2 and 3 show the same frequency histogram, but grouping systems using the type of periods.

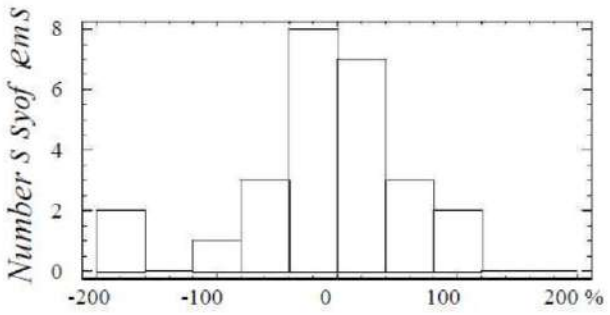

Figure 1. Frequency histogram for all 26 systems.

From Figure 1, we can observe that the reduction or increase or lines needed by locking cache is similar (except for two extreme systems). That is, systems designer may save cache size or may spent more cache size, but in similar quantities.

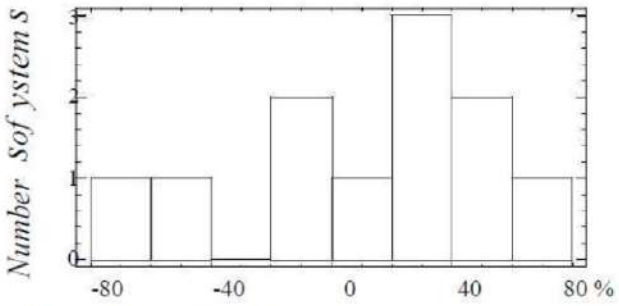

Figure 2. Frequency histogram for systems with type A periods.

Figure 2 shows that the system designer will save more cache memory and in more cases. When the locking cache needs more lines than the conventional cache, this extra amount of cache memory is usually small, lower than the saving for those systems with cache reduction.

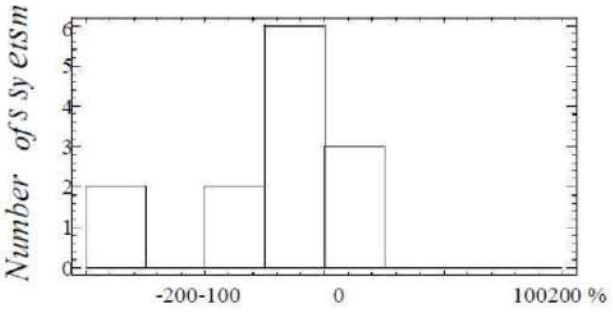

Figure 3. Frequency histogram for systems with type B periods.

Figure 3 shows the opposite results for cases to Figure 2. When system utilization is very high, the locking cache will need greater caches than conventional, and in more cases. This increase is significantly larger than the cache saving in those cases where locking cache behaves better than the conventional cache.

Results are not excellent, but authors think the locking cache may reduce the size of cache memory needed to make the systems schedulable. The conclusion from a detailed analysis is that the genetic algorithm used is to blame. This algorithm is not designed to optimize the cache size which is the way it has been used in this work. When the cache size is around the limit to make the system schedulable, the genetic algorithm behaves in an erratic way because the metrics used to evaluate individuals are not available (global utilization and response time of tasks). So it is clear that a specifically designed genetic algorithm, or any other kind of algorithm, may improve the results shown.

Also, there are dynamic ways to use a locking cache that have demonstrated better performance compared against conventional caches. Those techniques require additional hardware, but the cost of this extra hardware may be lower than the cost of saved cache memory.

IV. CONCLUSION

Locking caches have been shown to be a real and provided by a cache memory but without the drawbacks the use of a conventional cache present when performing the system schedulability analysis.

But this paper has presented a novel application of the use of static locking caches. In systems where the hardware is designed ad hoc, the use of static locking cache may help to reduce costs and allow the designer to adjust the size of the memory cache to the minimum required to guarantee the real-time system is schedulable.

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A notable reduction of the cache memory size is possible when the overall system utilization is low if a static locking mechanism is used, as can be seen in the experiment results of the majority of these cases. It is important to highlight that over-dimensioning the cache size (and therefore reducing the system utilization) is a common measure used in the design of real-time systems to tackle the problems a conventional cache imposes to the temporal reasoning of the system.

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Ambiguities in Natural Language

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Abstract— **This paper analyzes some forms of linguistic ambiguities in English. Language is a hallmark of intelligence, and endowing computers with the ability to analyze and generate language a field of research known as Natural Language Processing (NLP)- has been the dream of Artificial Intelligence(AI).**

Index Terms—**MBQT intelligence**

I. PROBLEM DEFINATION

In this paper, we are dealing with common ambiguities that are found in language and make language ambiguous that create lots of understanding problems along with brief comparative study of resolving techniques that are required in language understanding.

II. RELATED WORK

A. (2009) has concluded the various types of ambiguities. It is studied that there are quite a number of ambiguities which varies from each other in different ways and also concluded the tagging approach which is part of speech tagging that is used for disambiguation.

B. (Neetu Sharma, Samit Kumar, Dr. S. Niranjan, 2012) have concluded that Word Sense Disambiguation is applied by a combination of learning algorithms. The study is aimed at comparing the performance of using machine learning algorithms for Word Sense Disambiguation (WSD) and traditional approach of knowledge based. There are many machine learning algorithm like naïve bayes, decision tree, neural network, clustering, decision list etc.It is also concluded that machine learning algorithm works faster with good accuracy as compare to knowledge based or dictionary based methods.

C. (Tamara Martín Wanton , Rafael Berlanga LLavori, 2012) have studied clustering-based Approach for Word Sense Disambiguation. It defined that clustering is the way to identify groups of semantically related word senses that can be successfully used in a disambiguation process. In this paper, they presented an unsupervised disambiguation method relying on word sense clustering that also reveals the implicit relationships (not asserted in WordNet) existing among these word senses. They also investigated in depth the role of clustering and its contribution to WSD.

III. INTRODUCTION

Natural language processing is the task of analyzing and generating by computers, languages that humans speak, read and write [1][2][3].NLP is concerned with questions involving three dimensions: language, algorithm and problem. Figure 1 expresses this point. On the language axis are different natural languages and linguistics. The problem axis mentions different NLP tasks like morphology, part of speech tagging etc. The algorithm axis depicts mechanisms like HMM, MEMM, CRF etc. for solving problems. Here we are going to deal with the problems that are related to ambiguities.

IV. AMBIGUITY

It is commonly known in the field of Natural Language Processing that even simple sentences have a large number of possible readings. Ambiguity is one reason why computers do not yet understand natural language. A word, phrase, or sentence is ambiguous if it has more than one meaning. The word 'light', for example, can mean not very heavy or not very dark. Words like 'light', 'note', 'bear' and 'over' are lexically ambiguous. They induce ambiguity in phrases or sentences in which they occur, such as 'light suit' and 'The duchess can't bear children'. However, phrases and sentences can be ambiguous even if none of their constituents is. The phrase 'porcelain egg container' is structurally ambiguous, as is the sentence 'The police shot the rioters with guns'. Ambiguity can have both a lexical and a structural basis, as with sentences like 'I left her behind for you' and 'He saw her duck'.[1][2]
The notion of ambiguity has philosophical applications. For example, identifying an ambiguity can aid in solving a philosophical problem. Suppose one wonders how two people can have the same idea, say of a unicorn. This can seem puzzling until one distinguishes 'idea' in the sense of a particular psychological occurrence, a mental representation, from 'idea' in the sense of an abstract, shareable concept. On the other hand, gratuitous claims of ambiguity can make for overly simple solutions. Accordingly, the question arises of how genuine ambiguities can be distinguished from spurious ones. Part of the answer consists in identifying phenomena with which ambiguity may be confused, such as vagueness, unclarity, inexplicitness and indexicality.[1][2][5]

A. TYPES OF AMBIGUITIES[5][6]

We have studied the total five ambiguities. These are following:

- Lexical Ambiguity

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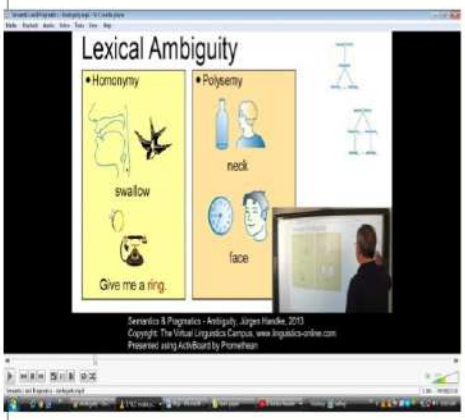
- Structural Ambiguity
- Referential Ambiguity
- Scope Ambiguity
- Pragmatic Ambiguity

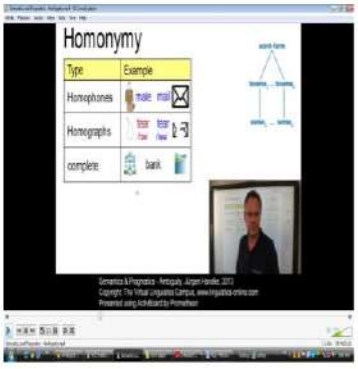
1) LEXICAL AMBIGUITY

It defines it as ''a word with more than one possible meaning in a context''. Lexical ambiguity is by far the more common. Everyday examples include nouns like 'chip', 'pen' and 'suit', verbs like 'call', 'draw' and 'run', and adjectives like 'deep', 'dry' and 'hard'. There are various tests for ambiguity. One test is having two unrelated antonyms, as with 'hard', which has both 'soft' and 'easy' as opposites. There are two types of lexical ambiguities:

- Homonymy
- Polysemy



a) Homonymy: It is relationship between two or more separate lexical items have same form but different unrelated meaning i.e the items called homonymy that have same phonetic or written form. Example: Swallow(as a bird /to swallow).



Types:

- Homophone- It has different spellings and meanings but have same sounds. Example: The verb 'desert' and the noun 'dessert', which sound the same but are spelled differently, count as distinct words (they are homonyms). So do the noun 'bear' and the verb 'bear', even though they not only sound the same but are spelled the same.
- Homographs-It has different meaning and pronunciation and have same spellings. Example: Tear, Tear.
- Complete-It has different meaning but have same spellings and sounds. Example: Bank.

b) POLYSEMY: It deals with two multiple meaning means single lexeme with several senses called polysemy. Example: Face(of a human/ of a clock).

TYPES:

- Metonymy-It has different meaning of a single lexeme. Example: Bank account (He has bank account/ he married bank account) that is name of the attribute stands for the name itself.
- Metaphors-It has .Example: Position(Good position to watch/he is at a good position in the university).

2) STRUCTURAL AMBIGUITY

It is a question of "what goes with what". In this we have several options and ways in which constituents relate to each other.

Structural ambiguity occurs when a phrase or sentence has more than one underlying structure, such as the phrases 'Tibetan history teacher', 'a student of high moral principles' and 'short men and women', and the sentences 'The girl hit the boy with a book' and 'Visiting relatives can be boring'. These ambiguities are said to be structural because each such phrase can be represented in two structurally different ways,

Example: '[Tibetan history] teacher' and 'Tibetan [history teacher]'. Indeed, the existence of such ambiguities provides strong evidence for a level of underlying syntactic structure (see SYNTAX). Consider the structurally ambiguous sentence, 'The chicken is ready to eat', which could be used to describe either a hungry chicken or a broiled chicken. Two types of attachment are used here:

a) Coordinate attachment- Co-ordinates in a sentence such as AND, OR, BUT attach two or more parts together.

Example: What can you eat if you are told in the refectory "You can have peas and beans or carrots with the set meal".

- [peas] and [beans or carrots]
- peas and beans] or [carrots]

This is known as co-ordinate attachment.

b) Prepositional attachment-

Example: What are you being asked to do in "Put the box on the table by the window in the kitchen".

Put the box (a specific box - the one on the table by the window) in the kitchen.

Put the box on the table (a specific table - by the window in the kitchen). etc!

This is known as prepositional attachment.

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3) REFERENTIAL AMBIGUITY

It is defined as More than one object is being referred to by a noun phrase or pronoun phrase.

Example: What can THEY refer to in: "After THEY finished the exam the students and lecturers left."

- Students only
- Lecturers only
- Both

4) SCOPE AMBIGUITY

A scope ambiguity is an ambiguity that occurs when two quantifiers or similar expressions can take scope over each other in different ways in the meaning of a sentence. "It is not lexical but structural in nature.

Example: Every man loves a woman.

The more prominent meaning of this sentence is that for every man, there is a woman, and it's possible that each man loves a different woman. But the sentence also has a second possible meaning, which says that there is one particular woman who is loved by every man.

V. SOME TECHNIQUES OF AMBIGUITY RESOLUTION[6]

There are multiple techniques in resolving the ambiguities in languages from traditional approach of knowledge based to modern technique of word sense disambiguation. There are two techniques briefly written below:

A. KNOWLEDGE BASED

- Knowledge of context
- Knowledge of concept
- Use of dictionaries, thesaurus, WordNet etc.

Example:

1) Context based (Syntactic constraints)

Actual meaning of the word is defined by understanding the context.

Example-

a) In context = dinner, "pitcher" means "container of liquid"

b) In context = baseball, "pitcher" means "thrower of ball."

2) Selectional restrictions (Semantic constraints)

Rule: Concept A can only combine with concept B in mode Z if A or B have specified features.

Example-

a) "The bat ate its dinner." The subject of "ate" is generally animate. Therefore "bat" means "flying mammal" not "wooden club."

b) "The sick bat lay on the ground." The adjective "sick" generally modifies animate objects. Hence "bat" = flying mammal.

c) "The broken bat lay on the ground." The adjective "broken" generally modifies inanimate objects. Hence "bat" is a wooden club.

d) "The horse ran up the hill. It was very steep." vs. "It soon got tired."

"Steep" applies to surfaces, hence "it" = hill.

"Tired" applies to animate objects; hence "it" = horse.

B. MACHINE LEARNING ALGORITHM

It is based upon multiple algorithms which defines rules or corpa as knowledge based on the basis of any training data. Then that rules apply on the test data to disambiguate the word senses.

There are two types of machine learning algorithms.

1) SUPERVISED

- Decision Trees
- Naïve Bayes
- Bayes Nets
- Support Vector Machines (SVMs)
- Neural network

2) UNSUPERVISED

- Clustering approach

VI. CONCLUSION

The above literature survey concludes that Ambiguity is a crucial problem for natural language understanding and processing and there are variety of ambiguities and number of ways to remove ambiguity in a language .Machine learning algorithms of various forms such as classification algorithms and clustering algorithms are performed on ambiguous dataset and then it make rule based corpa as a training set and that model is applied on the test set and hence in this way ambiguity is resolve in the test set.

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Biofuels: Recent Advances in Fermentation Technology and Microbiology Biofuels from Microbes

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***Abstract*— Bio-fuels are produced from living organisms mainly from microorganisms and plants. Bio-fuel is a fuel that uses energy from carbon fixation. Examples of carbon fixation are plants and microalgae. Bio-fuels are made from biomass conservation. Biomass is biological material derived from living, or recently living organisms. Biomass most often refers to plants or plant-derived materials which are specifically called lingo-cellulosic biomass. As a renewable energy source biomass can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of bio-fuel.**

***Key words*— Bio-Butanol, Bioprocess Engineering, Biofuels, Bio-ethanol, Microbial production, Myco-Diesel**

I. INTRODUCTION

Bio-fuels are produced from living organisms mainly from micro-organisms and plants. Bio-fuel is a fuel that uses energy from carbon fixation (Berezina *et al*., 2012). Examples of carbon fixation are plants and microalgae. Bio-fuels are made from biomass conservation. Biomass is biological material derived from living, or recently living organisms. Biomass most often refers to plants or plant-derived materials which are specifically called ligno-cellulosic biomass (Gibson et al., 2011). As a renewable energy source biomass can either be used directly via combustion to produce heat, or indirectly after converting it to various forms of bio-fuel. Conversion of biomass to bio-fuel can be done by three different methods which are classified as:

- Physical process
- Thermo-chemical process
- Biological process

A. Physical process

Physical process mainly contains the process called densification. In this process wood by-products such as chips, slabs are processed into uniform sized particles and then be compressed into fuel wood product. In densification, the dry biomass of logs, pellets and briquettes are forced through matrix under high pressure, followed by immediate cooling for durability and stability (Girard *et al*., 2005).

B. Thermo-chemical process

A range of thermo-chemical processes may be used to convert biomass into fuel that may be used for transportation or storage or to exploit some property of process itself. Many of the processes are involved in this conversion, such as direct combustion of biomass, gasification, pyrolysis, liquefaction (Cheng and Timilsina, 2010).

1) Direct combustion of biomass

In this method there is direct combustion of biomass takes place. This process is mainly used in developing and undeveloped countries, where traditional and inefficient devices for cooking, space heating etc. It mainly includes these processes-

- Co-combustion or direct firing where the biomass is directly fed on boiler furnace, if needed after physical pre-treatment of biomass such as drying or metal removal is applied
- Indirect co-firing is process where biomass is gasified and the product gas is fed to a boiler furnace.
- Parallel combustion is a process whereby biomass is burnt in a separate boiler for steam generation. The steam is used in a power plant together with the main furnace.

2) Gasification

Gasification is a process that converts organic or carbonaceous materials into CO, H_2 and CO_2. Gasification is done in designed reactors called gasifiers (DOE 2005). It takes place at temperature range of about 800-1000^{0}C in the controlled amount of oxidising agent. Gasification is mainly done to produce Syngas or producer gas (Clarke Energy, 2011, Oconner *et al*., 2000). In addition to this some low molecular weight aliphatic hydrocarbons are also produced.

3) Pyrolysis

Pyrolysis is defined as the irreversible thermo-chemical reaction which requires heating to high temperature in the absence of oxygen. The biomass produces, as a product

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of the pyrolysis process under normal conditions, a mixture of complex and highly variable fuel gases, liquid and charcoal (Pro-Natura International, 2004).

4) Liquefaction

It is the process of extraction of liquid from biomass for purpose of generating energy for production of high-value chemicals and materials. The liquid products formed are mainly hydrocarbons and are called bio-oils. Solid biomass can be liquefied by pyrolysis, liquefaction or other thermo-chemical technologies (DOE, 2005).

C. Biological process

The main biological processes used for biomass conversion are fermentation and anaerobic digestion (Alvira *et al.* 2010). Fermentation is the process that converts sugar to acids, gases or alcohols. Fermentation requires micro-organisms because the main components of biomass are lignin, cellulose and hemicelluloses polymers (Mosier et al., 2005). These microbes are mainly yeasts and some bacterial species which contain enzymes like cellulases, hemicellulases. These enzymes are used to breakdown plant polymers which can be converted into simple sugars by enzymatic treatment. There are mainly two basic approaches to biomass breakdown to its products-

- Acid hydrolysis with variety of low acid-high temperature or vice versa or both to breakdown the structure of biomass and release free sugars
- Enzymatic hydrolysis after some sort of pretreatment which allows enzymatic reactions to get desired product.

II. MICROBIAL PRODUCTION OF BIOFUELS

First generation bio-fuels

1st generation bio-fuels are derived from sources such as sugarcane and corn starch etc. Sugars present in this biomass are fermented to produce bio-fuels like bio-ethanol (Rogers *et al.*, 2006) etc. These fuels can be used directly in Fuel cell to produce electricity or serve as an additive to gasoline.

A. Bio-alcohols

Bio-alcohols are biologically produced alcohols. The main bio-alcohols used as a fuel are ethanol, propanol and butanol. They are produced by action of microbes and enzymes through the fermentation of sugars or starch (Hill *et al.*, 2006) .

1) Bio-ethanol

Bio-ethanol is alternative fuel to gasoline that is made from renewable sources. It is produced from sugars derived from wheat, corn, molasses and any sugar or starch from which alcoholic beverages can be made. The ethanol production methods used are enzyme digestion, fermentation of sugars, distillation and drying. The distillation process requires significant energy input for heat. The basic fermentation steps for large scale production of ethanol are:-

- Pre-fermentation process
- Fermentation of sugars
- Distillation
- Dehydration

- *Pre-fermentation*

Prior to fermentation, some crops require saccharification or hydrolysis of carbohydrates such as cellulose & starch into sugar. Hydrolysis means the cleavage of chemical bond by addition of water, whereas when carbohydrates are broken down into its component sugar molecules by hydrolysis. The pretreatment process is different for different substrates. Like for corn as substrate for ethanol production grinding, cooking etc. processes are used. In grinding corn is pressed by two rollers and crushed into small pieces, which increase its surface area. The roller mill/ hammer mill is used for this purpose (Kohl, 2003).

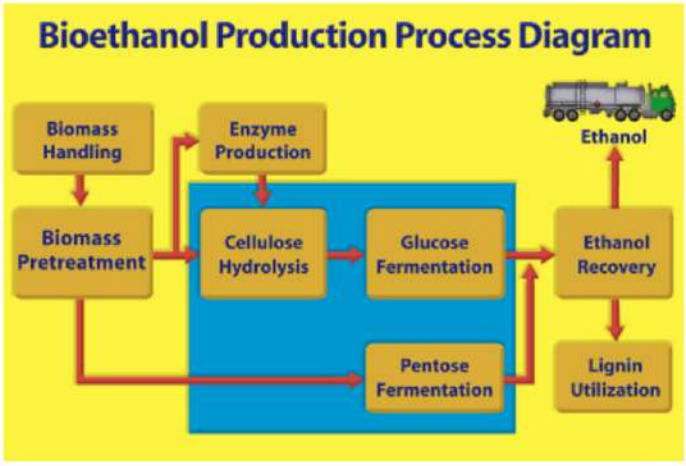

Fig.1. Diagram of Bio-ethanol production process

- *Fermentation*

Fermentation is a biological process in which sugars such as glucose, fructose and sucrose are converted into cellular energy and to produce ethanol and side product carbon dioxide as metabolic waste product. Mainly yeasts perform this type of conversion in the absence of oxygen. Therefore it is considered as an anaerobic process. Fermentation is a slow process, so for industrial reliability it will be fast. For this purpose propagation tank is used. Propagation tank contains water, enzymes, nutrients and yeast culture which is cultured before fermentation. Therefore this technique saves the money and time of industry. Other microbes used for fermentation are *Zymomonas mobilis* (Rogers *et al.*, 2006, Thanonkeo *et al.*, 2007), *E. coli* (Genetically engineered) etc.

- *Distillation*

For ethanol to be used as fuel, the distillation is done i.e. removal of excess water takes place. Distillation is the method to separate two liquid utilizing their different boiling

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points. However, to achieve high purification, several distillations are required. This is because all materials have intermolecular interactions with each other, and two materials will co-distil during distillation. This means that proportion between two materials, in this case ethanol and water can be changed, and still, there are two materials in layers, the liquid and the vapour layers.

- *Dehydration*

There are two dehydration processes to remove water from an azeotropic ethanol-water mixture namely-

- Azeotropic distillation- In azeotropic distillation a chemical called entrainer is added. Usually addition of benzene or cyclohexane takes place to the mixture in vapour-liquid-liquid equilibrium, which when distilled produces anhydrous ethanol.
- Use of molecular sieve to remove water from fuel ethanol- In this process ethanol vapour under pressure passes through a bed of molecular sieve beads. The bead's pores are sized to allow absorption of water while excluding ethanol. After period of time, the bed is regenerate under vacuum or in the flow of inert atmosphere to remove absorbed water. Commonly molecular sieves of 3 Å are used to dehydrate ethanol because diameter of ethanol molecule is 4.4 Å whereas that of water is 2.8 Å. Thus it is ideal to dehydrate ethanol.

a) Recent Searches

Scientists are investigating the use of cellulose to produce ethanol. The ethanol produced from cellulose may be exactly that is created from edible plant parts. Cellulosic ethanol is produced from lignocelluloses which are mixture of lignin, hemicelluloses and cellulose. There is huge amount of non-edible plant waste to recycle. Therefore scientists gave their attention to microbes to convert cellulose and even hemicelluloses in lignocelluloses into ethanol. They use enzymes like cellulases, hemicellulases etc. for pre-treatment of material containing cellulose and other non-degrading components of plants (NREL, 2007, 2011).

b) Feedstock

There are three main kind of feedstock for ethanol production. They are sugar based, starch based and cellulose based. The main feedstock of bio-ethanol are-

Table I: Ethanol Sources and their Constituents

S. No.	Raw Materials	Sugar (%)
1.	Sugarcane	12-16%
2.	Sugarbeet	20%
3.	Wheat	0.6%
4.	Cassava	0.7%
5.	Potato	15.4%
6.	Sweet potato	4.2%
7.	Barley	0.8%

Other feed stocks are switch- grass, hemp, sunflower, straw, cotton, mosses, algae etc.

c) Blends of Bio-ethanol

Ethanol can be used as a fuel with gasoline and other fuels in different ratios. Firstly it was used in 10% ratio with gasoline i.e. E-10 then E-15 were used, up to E-15 there is usage of mixture without or some engine modifications. At the beginning of 21st century there was increase in demand of fuels. So, Scientists were used to modify engines from 0% to 100% ethanol engines (Monitor Technologies, 2006). Up to 2005 E-85 engine vehicles were formed therefore, E-85 ethanol engines were used commonly. After 2008 in many countries like USA, Brazil, scientists successfully developed engines for E-100 ethanol engines. Brazil is recently the largest producer of alcohol fuel in the world. The country produces a total of 18 billion litres annually.

2) Bio-methanol

Methanol is an alternative fuel for internal combustion and other engines, either in combination with gasoline or directly. Methanol is currently made from hydrocarbons or renewable sources, in particular natural gas and biomass respectively. The methanol economy is an alternative to the hydrogen economy, compared to today's hydrogen production from natural gas.

Methanol was first produced by destructive distillation of wood. At present methanol is usually produced by direct oxidative conversion of methane (natural gas) as a raw material or by reductive conversion of atmospheric CO_2 with H_2. This route can offer methanol production from biomass at efficiencies up to 75%. This route is prepared by Hagen, SABD and Olah (Olah, 2005) to offer methanol fuel at a low cost and with benefits to the environment. These production methods are often not suitable for small-scale production. Recently methanol fuel has been produced using renewable energy and carbon dioxide as a feedstock. First commercial scale renewable methanol plant was started in 2006 and completed in 2011 by Icelandic-American company, Carbon recycling International (CRI, 2012). The plants produce 0.5 million gallons per year renewable methanol and have plan to expand to 1.3 million gallons per year by 2012.

3) Bio-butanol

Butanol may be used as a fuel in an internal combustion engine, because its longer hydrocarbon chain causes it to be so fairly non-polar, it is more similar to gasoline than it is to ethanol. Both Bio-butanol and petro-butanol have the same chemical properties. Bio-butanol can be used in unmodified gasoline engines.

a) Production methods

Butanol can be produced by fermentation of biomass by the A.B.E. process, after its main components of acetone, butanol and ethanol. The fermentation occurs in two stages; the first is a growth stage in which acetic and butyric acids are produced and the second stage is characterized by acid re-assimilation into ABE solvents. During this stage, growth slows, the cells accumulate granulose and form endospores.

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The fermentation also produces carbon dioxide and hydrogen (Green, 2011). The process uses the bacterium *Clostridium acetobutylicum* also known as Weizmann organism, because it was firstly used by C. Weizmann for the production of acetone from starch in 1916. The other *Clostridial* species are *C. beijerinckii, C. saccharoperbutylacetonicum* and *C. saccharobutylicum* and their genetically engineered strains (Zverlov *et al*., 2006). The butanol was a by-product of this fermentation. The process also creates a recoverable amount of hydrogen and number of other by-products as acetic, lactic and propionic acids, isopropanol and ethanol (Green, 2011).

Saccharomyces cerevisiae has been chosen as a host for butanol production because it is a genetically tractable, well characterized organism, the current industrial ethanol producer, and it has been previously manipulated for production of other heterologous metabolites (Galazka *et al*., 2010). Moreover, since butanol and ethanol just differ by two carbons, *S. cerevisiae* may use similar mechanisms to tolerate high concentrations of butanol as it does in high concentrations of ethanol (Fischer and Marcuschamer, 2008). Therefore it is genetically modified by strains of *Ralstonia eutropha* for higher production of butanol in industries. The feed stocks of bio-butanol are same as that of bio-ethanol the crops such as Sugarbeet, Sugarcane, Corn grains, Wheat, Cassava and Non-Crops such as Switchgrass, Guayule & agricultural by-products such as Straw, Corn stalks etc.

b) Recent Aspects

Under normal living conditions, *Clostridium* bacterium is natural producers of butanol. However, the application of existing *Clostridium* strains for large scale industry is not feasible in the current economic conditions because of low butanol titre because it also lead to synthesis of significant amount of by-products such as acetone, ethanol, acetate, butyrate and also expensive substrates. Therefore several attempts have been made to construct butanol producing strains by genetic manipulations in many other microbial strains also, such as *Escherichia coli* (Choi *et al*., 2012), *S. cerevisiae*, *Pseudomonas putida*, *Lactobacillus brevis*, *Bacillus subtilis* etc (Berezina *et al*., 2012, Donaldson *et al*., 2010, Ray, 2011).

B. Biodiesel

Biodiesel refers to vegetable oil or animal fat based diesel fuel consisting of long chain alkyl esters. Biodiesel is used in standard diesel engines and therefore distinct from vegetable and waste oils used as fuel in diesel engines. Biodiesel is an oxygenated fuel, meaning it contains a reduced amount of carbon and higher of hydrogen and oxygen content than fossil diesel. This improves the combustion of biodiesel and reduces the harmful emissions from un-burnt carbon.

1) Biodiesel Production

Biodiesel production is the process of producing the biodiesel, through the chemical reactions. The most commonly used method for biodiesel production is transesterification (Knothe, 2001, 2010). The major steps required to synthesize biodiesel are as follow:

2) Feedstock Pre-treatment

Common feedstock used for biodiesel production are recycled vegetable oils or of animal origin (tallow, lard) etc. Some oil or fats may need a pretreatment for degumming, deacidification, bleaching, and dehydration, depending on the compositions of the materials. Degumming is to remove phosphatides from most feed stocks because phosphatides cause turbidity of oil during storage, promote accumulation of water in oil, and increase catalyst consumption. Regardless of the feedstock, water is removed as its presence during base-catalysed trans-esterification causes the triglycerides to hydrolyse, giving salts of fatty acids instead of producing biodiesel.

3) Reactions processes

The reaction process for biodiesel production is called transesterification. Transesterification can be done by alkalines, acids or enzymes. Alkaline transesterification is called base catalysed transesterification and is mainly used as catalyst for oils with high triglyceride content whereas acidic transesterification is also called acid catalysed transesterification used for oils or fats with high free fatty acids which can be converted to esters which are then transesterified to biodiesel. In enzyme based transesterification lipases are used which convert triglycerides and free fatty acids both into biodiesel.

4) Product Purification

Products of reaction mixture contain biodiesel and other by-products such as glycerol, excess alcohol, and trace amounts of water. All of these by-products must be removed to meet the standards, but the order of removal is process dependent. Common methods for purification are settling, filtration and decantation (Cheng and Timilsina, 2010).

a) Blends of Biodiesel

Biodiesel can be used with other fuels in mixture also. Say-100 % biodiesel referred to as B 100, 20% biodiesel and 80% petro diesel is labelled as B 20. It can be used in diesel engines with no or minor modifications. Therefore B20 is popular because it represents good balance of cost, emissions, cold weather performance, material compatibility etc (NREL, 2011).

Other ratios of biodiesel with petro diesel used are 2, 5 and 6 etc. Biodiesel can be used in its pure form (B100), but may require certain engine modification to avoid maintenance and performance problems.

In 2007, biodiesel production capacity was growing rapidly with an annual average growth rate from 2002-06 of over 40%. In 2008 alone production in Europe had risen to 7.8 million tonnes.

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b) Biodiesel feedstock

A variety of oils can be used to produce biodiesel .These feedstock sources are vegetable oil and agricultural feedstock e.g. Rapeseed, Soybean, Pongamia, Field Pennycress, Jatropha (www.sgbiofuels.com), Jojoba, Flax seed, Sunflower, Palm oil, Coconut, Cassava; Animal fats e.g. Tallow, Lard, Yellow Grease, Chicken Fat etc. The other sources include Algae, Waste Vegetable oil, Organic Waste, Halophytes (*Salicornia bigelovii*) and Sewage Sludge

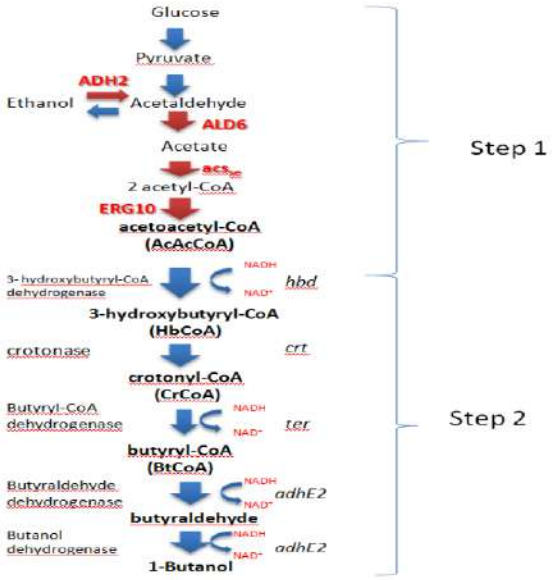

Fig.2. Production process for Butanol

c) Recent Researches

A company named Ecofasa (Spain)'s developers produce biodiesel from the different feed-stock; this feed-stock is trash. They produced this fuel from general urban waste which was then treated by bacteria to produce fatty acids, and later used to make biodiesel (Berkeley biodiesel). Researches on *Jatropha curcus* are also conducting, because the seeds of this shrub like tree are considered to be a viable source of bio-fuels feedstock oil (Girard *et al*., 2005). SG bio-fuels, a San Diego- based *jatropha* developer, have used molecular breeding and biotechnology to produce hybrid seeds that show significant yield improvements. It also claims additional benefits from such strains, including improved resistance to pests and diseases, and also increased cold-weather tolerance (www.sgbiofuels.com). Various algae have also been suggested as potent agent for production of biofuels Carvalho *et al*., 2006, Scott *et al*. 2010) .

Reengineering *E. coli* to produce FAEEs begins with production of ethanol via microbe *Zymomonas mobilis*. From this point, two modifications must be made to the bacterium. First, the organism's beta oxidation process must be reversed. The beta oxidation process is a natural metabolic pathway *E. coli* exploits to break down fatty acids. By engineering the organism to use the reverse beta oxidation process gives it the ability to construct fatty acids. Second, either the fatty acyl-CoA or fatty acyl-ACP proteins from *Acinetobacter baylyi* must be incorporated into *E. coli*'s metabolism. The purpose of these proteins is to combine the FFAs and ethanol into FAEEs in a process is called esterification. This is accomplished by using genetic engineering to incorporate the *atfA* gene from *A. baylyi* in *E. coli*'s DNA. Once these modifications have been made, the reengineered strain of *E. coli* transforms into a biodiesel synthesizer. So metabolic engineers can synthesize any type of fatty acid they wish to target. Therefore in this way biodiesel is produced from genetically engineered E. *coli* strain. This produced biodiesel is completely renewable and emits less green house emission when combusted with gasoline (Hill *et al.,* 2006)

d) Future Aspects

The U.S. National Renewable Energy Laboratory found alternative ways to reduce fossil fuel consumption by using biofuels mainly biodiesel in U.S. navy and states that energy security is the no. one driving force behind the U.S. biofuels programme (Rapier and Robert, 2009).

2. Second Generation Biofuels

Second generation bio-fuels are produced from sustained feedstock. Sustainability of a feedstock is defined, among others, by availability of the feedstock, impact on GHG emissions, and impact on biodiversity and land use. Many second generation bio-fuels are under developed such as cellulosic ethanol, Algae fuel, bio-hydrogen, bio-methanol, DMF, bio-DME, Fischer-Tropsch diesel bio-hydrogen diesel and wood diesel.

C. Cellulosic ethanol

Cellulosic Ethanol is a biofuel produced from wood, grasses, or the inedible parts of plants. It is type of biofuel produced from lignocelluloses, a structural material that comprises much of the mass of plants. Lignocelluloses are composed mainly of cellulose, hemi-cellulose and lignin. Corn Stover, *Panicum virgatum,* Miscanthus grass species, wood chips and tree maintenance are some cellulosic materials for ethanol production. Productions of ethanol from lignocelluloses has advantage of abundant and diverse raw material compared to sources such as corn and sugarcane, but require a greater amount of processing to make sugar monomers available to the micro-organisms typically used to produce ethanol by fermentation.

Production processes

There are two ways of producing ethanol from cellulose are:

- Cellulosic process
- Gasification

Cellulosic process consists of hydrolysis on pre-treated lignocellulosic materials, using enzymes to break complex cellulose into simple sugars such as glucose, followed by fermentation and distillation. Gasification transforms the

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lignocellulosic raw material into gaseous CO and H_2. These gases can be converted to ethanol by fermentation or chemical catalysis. This process uses gasifier, scrubber and bioreactor to ferment cellulose into ethanol. In biological approach the stages to produce ethanol are:

1. In 'Pre-treatment' phases to make the lignocellulosic material such as wood or straw amenable to hydrolysis (cellulolysis), to breakdown the molecules into sugars (Mosier *et al.,* 2005).
2. Separation of the sugar solution from the residual materials say lignin
3. Microbial fermentation of the sugar solution.
4. Distillation to produce roughly 95% pure alcohol.
5. Dehydration by molecular sieves to bring the ethanol concentration to over 99.5%.

In 2010, a genetically engineered yeast strain *Neurospora crassa* was developed to produce its own cellulose-digesting enzymes (Galazka *et al.,* 2010). Assuming this technology can be scaled to industrial levels; it would eliminate one or more steps of cellulolysis, reducing both the time required and costs of production. Additionally Biohydrogen based process have also been suggested by a few authors for the production of Biofuels (Kapdan and Kargi-2006 Das and Veziroglu, 2001). But these processes suffer from drawback of production and storage of hydrogen.To overcome this problem production of hydrogen by microbes have been suggested by number of researchers while employing *Clostridium* (Mathews *et al*., 2009), purple non-sulphur bacteria *Rhodobacter sphaeroides* (Koku *et al*., 2002, Koku *et al*., 2003),

III. CONCLUSION

In recent years several different types of arguments have been raised against the use of biofuels and their role in our future energy supply. These arguments can be divided into issues related to costs, food versus fuel, and lack of sustainability, because biofuels represent as an essential contribution to a future supply and more importantly will contribute to a reduction in carbon dioxide emissions.

As we know the world's population is increasing day by day, therefore the consumption of food demand by them is also increasing. Also the rising incomes in developing parts of the world are allowing millions of people to transition from subsistence diets consisting of mainly grains to those including beef and other similar constituents. Therefore this dietary shift is accelerating the demand for grain around the world at a rate that is much greater than the world's farms can produce and also lead to higher grain, land and food prices.

As this global competition for land materializes, there is a growing belief that producing fuel from traditional food crops such as corn, wheat, soybean etc lead to food crisis in near world. In spite of this pressure, there is enormous potential for next generation biofuels (Second generation biofuels) if they can attain irrefutable low-cost status. In addition to use the fossil energy used as fuel, there would be boon to biomass power as future fuel producers from waste, agricultural residues and perennial energy crops grown on marginal, abandoned or degraded land to achieve low carbon status as fossil fuels have.

Global energy consumption has doubled from last 50 years and will be double again in the next 40 years. Therefore alternative sources are required to fulfil these energy needs. Today about 90% bioethanol productions is from food crops and to fulfil future requirements there must be alternative source to be used. The most reliable source for bioalcohol may be production of alcohol from cellulose in the near future. Ethanol from cellulosic material is successfully isolated at lab scale levels and industrial scale level is also successfully achieved in many countries. Therefore the alternative sources of other biofuels are also discovered and may be discovered in the near future to fulfill biofuels demands in the near future.

To produce biofuels from feedstock microorganisms are used from very long time e.g. *Saccharomyces cerevisiae* is used from very long time for ethanol production. In resent searches many micro-organisms are discovered and modified by genetic modifications to produce high yield of biofuels. There are also many new microbes discovered which gave new alternative sources of biofuels such as *Cunninghamella japonica* and *Gliocladium roseum* which leads to production of 'Myco Diesel" or algal diesel (Chisti, 2007). Therefore in near future many new micro-organisms may also be discovered/ modified to give high yield of biofuels by consuming their desired feedback.

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Code-Switching in Language – A Tool of Social Behavior

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Abstract – **In language Code-Switching is an essential ingredient of bilinguals or multilingual to supplement their speech. It provides linguistic advantage to use speech in an effective manner. Its use may depend upon a particular situation or vice-versa.**

Index Terms:- **Situational Code- Switching, Metaphorical code-switching, Code-Mixing** or **Conversational Code- Switching.**

I. INTRODUCTION

Language is one of the most powerful emblem of social behavior. In normal transfer of information through language, we use language to send vital social messages about who we are, where we come from and who we associate with. It is often shocking to realize how extensively we may judge a person's background, character, and intentions based simply upon the person's language, dialect, or, in some instances, even the choice of a simple word. Given the social sole of language, we try to study the affect of various aspects of language in communication process.

Language study as per social norms or sociolinguistics has become increasingly important and popular field of study; As cultures around the words expand their communication base, inter-group and interpersonal relations take on escalating significance. The basic notion underlying sociolinguistics is quite simple: Sociolinguistics is the study of the effect of any and all aspects of society, including cultural norms, expectations, and context, in the way language is used. The notion is simple, but the ways in which language reflects behavior can often be complex and subtle. Further more, the relationship between language and society affects a wide range of encounters from broadly based international relations to narrowly defined interpersonal relationships.

Here we endeavour to focus our attention to a particular aspect of language i.e. CODE–SWITCHING as a communicative strategy. Code switching is a term in linguistics referring to alteration between two or more languages, dialects or language registers in the course of discourse between people who have more than one language in common. Sometimes the switch lasts only for a few sentences or even for a single phrase e.g. students usually say "chalo collage ka round lagate hain", where base or matrix language is Hindi with English words inserted. The switch is commonly made according to the subject of discourse but may be for a variety of other reasons.

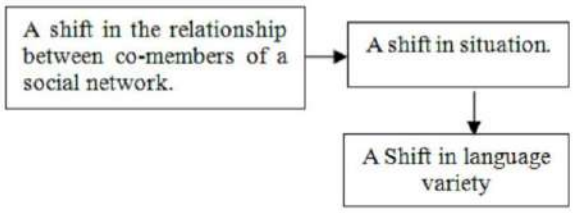
II. CODE SWITCHING

Code–switching is an inevitable consequence of bilingualism. Anyone who speaks more than one language chooses between them according to circumstances. The first consideration, of course, is which language will be comprehensible or understandable to the person addressed; generally speaking, speakers choose a language which the other person can understand.[1]

In Multilanguage communities, different languages are always used in different circumstances, and the choice is always controlled by social rules. Typically one language is reserved exclusively for use at home and another is used in wider community, for example, when shopping many Sikh immigration from NE region of Punjab living in the outer west London suburbs-around Southhall, Hounslow and Feltham speak Punjabi within family and English to outsiders and in more formal settings like school, church, work etc. Because of the linguistic division of labor, each individual could expect to switch codes several times a day. More precisely, this kind of code – switching is called SITUATIONAL CODE-SWITCHING because the switches between languages always coincide with changes from one external situations (for example, talking to a close friend in departmental store) to another (for example, talking to a girl at the cash counter in the same departmental store).

It is worth noting that. SITUATIONAL CODE–SWITCHING can also occur within the particular language. For instance a person would likely not use the same words or phrases when speaking to a superior (e.g. teacher, boss) as he would use when speaking to friends, in an informal situation. A shift in situation creates a shift in language variety. A shift in language variety many signal a shift in the relationship between co-members of a social network, or a shift in the topic and purpose of interaction or shift in privacy of their interaction.

It may be represented diagrammatically as;



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The choice of language is controlled by rules, which members of community learn from their experience, so these rules are part of their total linguistic knowledge. Now a very obvious question arises: Why should a whole community bother to learn three different languages when just one language would do? The rules link the language to different communities, as in Punjab Punjabi is spoken by Sikh community, Hindi among Hindus like Marwadi, Pandit families and Engish in Catholic or convent schools depicting Christianity. In other words each language also symbolizes that community. Speaking English at home would be like wearing a formal party suit at home, and speaking Punjabi in the convent school assembly would be like wearing beach – clothes in school. Given this heavy symbolic load that languages bear, it is entirety to be expected that bilingual or multilingual speakers will use their choice of language in order to define the situation, rather than letting the situation define the choice of language.

But in some cases the situation is less clear, either because it is ambiguous or because the speaker decides to ignore the observable external situation and focus instead on less observable characteristics of the people concerned. Such cases, where it is the choice of language that determines the situation, are called **METAPHORICAL CODE-SWITCHING.**

There are number of situations where code–switching occurs. A family that has recently immigrated to a country where a different language is spoken, may switch back and forth between the language and their mother tongue, while they are learning the new language (this phenomenon is frequently noted among first and second generation immigrants to Canada from India, Pakistan and other developing Asian countries). Also, in countries with a large number of people from different ethnic background, communities will switch between the language of their indigenous roots, and the language of the country they are living in. For example in Singapore, the multi- racial community speaks "Singlish", a mixture of English with Mandarin, Chinese and Malay. Another example is United States, a country where large number of Spanish speaking communities live, a sentence spoken might contain a mixture of Spanish and English words. This phenomenon is so common it has coined the term "Spanglish".

In the above example, code–switching is used for a number of reasons. It is commonly used when a person living in a different country to the language which they usually speak finds that they have no relevant translation of a word, expression or concept created in the country which they are now living in. On the other hand, a person from a different culture to the one in which they are living may find it necessary to switch back to their mother langue in order to explain something which has no linguistic equivalent in the country which they living. In this sense code–switching is inevitable. Alternatively, code–switching is also used in order to help an ethnic minority community retain a sense of cultural identity, in a sense of identity and belonging, and to differentiate themselves from society at large.

There are cases, however, where fluent bilingual talking to another fluent bilingual changes languages without any change at all in the situation. This kind of alternation is called "code-mixing or conversational code –switching". The purpose of code- mixing seems to be to symbolize a somewhat ambiguous situation for which neither language on its own would be quite right. To get the right effect the speakers balance the two languages against each other as a kind of linguistic cocktail-a few words of one language, then a few words of the other, then back to the first for a few more words and so on.

In countries such as India, where English is a lingua franca, educated people whose first language is a language other than English but who are also practically fluent in English often employ code – switching by inserting English words, phrases or sentences into their conversations. The language of conversation among the elite in clubs, officer's mess, central offices is English. English and the major Indian languages have co-existed within the same linguistic area as part of the same socio economic complex for years. Both the codes have been serving important functions in daily social interaction. In fact, close examination reveals that in normal conversation, an average sentence spoken by an Indian invariably contains words from both English & the relevant Indian languages. This has given rise to dialects, jokingly referred to as 'Hinglish', 'Janglish' and 'Banglish' (from Hindi, Tamil and Bangla). It is natural for English using bilinguals in India to keep on switching from one or more of the Indian languages to English according to different per formative occasions & the role they are playing.

Interestingly apart from social norms code-switching has gained significance in commercial sector too. The multinational companies operating from their home countries, have been increasingly using the tool of code- mixing in order to advertise their products. One of the effects globalization has been an increasing use of bilingual advertising. Advertisers now use bilingual advertisements to market their products to consumers. The primary reason is to tap a larger consumer base and reach different linguistic communities. Few interesting examples are the punch lines of popular consumer brands in India like :-

- Tata tea : 'Taste kamyabi ka !'
- Revive starch : 'Super Kadak'
- Nestle : 'Taste bhi Health bhi'
- Ford sells the Ikon car as 'The josh machine!' (the powerful machine).These corporate giants mix English with the national language to convey the regional flavor in advertisements. English is "word as an institutionalized additional language."[2]

Crystal (1987) suggests

Code, or language, switching occurs when an individual who is bilingual alternates between two languages during his/ her speech with another bilingual person. A person who is bilingual may be said to be one who is able to communicate, to varying extents, in a second language. This includes those

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who make irregular use of a second language, are able to use a second language but have not for some time (dormant bilingualism) or those who have considerable skill in a second language.[3]

This type of alteration, or code switching, between languages occurs commonly amongst bilinguals and may take a number of different forms, including alteration of sentences, phrases from both languages succeeding each other and switching in along narrative. There are a number of possible reasons for the switching from one language to another as present by Crystal and these will now be considered; The first of those is the notion that the speaker may not be able to express him/ herself in one language so switches to the other to compensate for the deficiency. As a result, the speaker may be triggered into speaking in the other language for a while. This type of switching tends to occur when the speaker is upset, tired or distracted in some manner. Secondly, switching commonly occurs when an individual wishes to express solidarity within a particular social group. Rapport is established between the speaker and the listener when the listener responds with a similar switch. This type or switching may also be used to exclude others from a conversation who do not speak the second language. An example of such a situation may be to people in an elevator talking in a language others than English. Others in the elevator who do not speak the same language would be excluded from the conversation and a degree of comfort would exist among the speakers in the knowledge that not all those present in elevator are listening to their conversation.

The final reason for the switching behavior presented by Crystal (1978) is the alteration that occurs when the speaker wishes to covey his / her attitude to the listener. Where monolingual speakers can communicate these attitudes by means of variation in the level of formality in their speech, bilingual speakers can convey the same by code switching. He suggests that where two bilingual speakers are accustom to conversing in a particular language, switching to the other is bound to create a special affect. These notions suggest that code switching may be used as a socio-linguistic tool by bilingual speakers.

A varying degree of code switching may also be used between bilingual conversationalists depending on the person being addressed, such as family, friends, officials and superiors and depending upon the location, such as church, home or place of work. The implication here is that there are patterns which are followed reflecting when it is appropriate to code switch with regard to addressee and location. These patterns are the established norm for that particular social group and serve to ensure appropriate language use. It is observed that bilingual speakers attribute different social values to different codes, or languages. Since a different social value is assonated with each code, the speakers consider use of one code more appropriate than the other with different interlocutors.

From the above discussion, it may be concluded that code switching is not a hindrance or language interference on the basis that it supplements speech. Where it is used due to an inability of expression, code switching provides continuity in speech rather than presenting interference in language. The benefits of code switching have also been identified as a means of communicating solidarity, or affiliation to a particular social group, where by code switching should be viewed from the perspective of providing a linguistic advantage rather than an obstruction to communication. Further, code switching allows a speaker to convey attitude and other emotions by those who are bilinguals and again serves to advantage the speaker, much like bolding or underlying in a text document to emphasize points. Utilizing the second language, then, allows speakers to increase the impact of their speech and use it in an effective manner.

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Energy Conservation Model Project

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***Abstract*—In this paper we present a layout scheme for the model project, to produce energy and fertilizers from the domestic waste. The energy is produced by the decomposition of waste in the form of methane gas which can be used in domestic and commercial sector. The other by products are the solid fertilizers in the form of manure and the liquid fortified with essential nutrients. This liquid is used to groom fishes and grow soilless vegetation in the aquaponics system**

***Index Terms*— Production of biogas from domestic waste, Aquaponics technique & production of useful plants.**

I. INTRODUCTION

Energy conservation is an important element of energy policy. Energy conservation reduces the consumption and energy demand per capita and thus offsets some of the growth in energy supply needed to keep up with population growth. This reduces the rise in energy costs and can reduce the need for new power plants and energy imports.

Energy conservation facilities the replacement of non renewable resources with renewable energy. Energy conservation achieved through efficient energy use, in which case energy use is decreased while achieving a similar outcome or by reduced consumption of energy services. Energy conservation may result in increase of environmental value, national security, human comfort and organisation that are direct consumers of energy may want to conserve energy in order to reduce energy costs and promote economic security. Industrial and commercial may want to increase efficiency and thus maximise profit.

II. SOURCES OF ENERGY

A. *Renewable energy resources*- These are the sources in which materials can be reused these are present unlimited in nature.

For example: wind, sun etc

B. *Non-renewable energy resources*- These are the sources in which materials cannot be reused. These are limited in nature.

For example: coal, petroleum etc

In this paper, we present a model project titled "energy conservation from domestic waste." Here, our main purpose is to produce energy from domestic waste in the form of biogas, fertilizers, aquaponics.

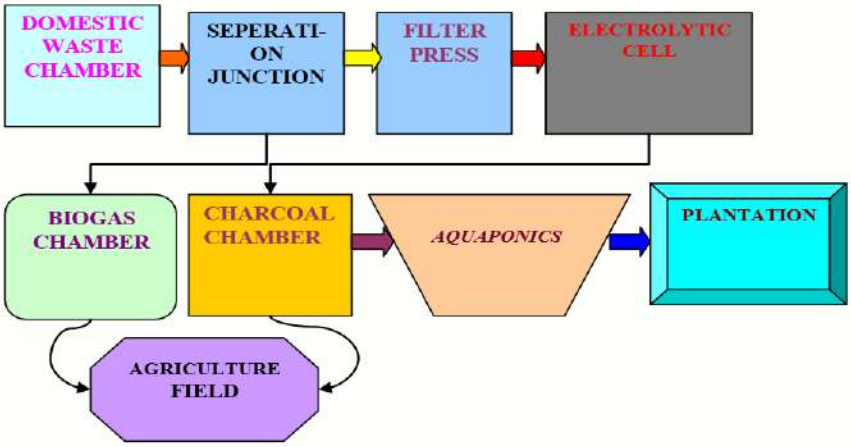

Fig.1 Block Diagram Of Energy Conservation Model Project

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III. . EXPLANATION OF THE COMPONENTS

1) Domestic Waste Chamber: In this chamber , the whole humour waste & industrial waste is collected.
2) Separation Junction: It consists of junction of two or more parts. Here the purpose of the separation junction is to separate solid & liquid waste material. After this solid waste goes to biogas chamber & liquid waste goes to filter press.
3) Filter Press Chamber: In this chamber, a seperation process is employed for impurity separation. Here we use various membranes of different sizes to purify liquid waste material.
4) Biogas Chamber: A biogas chamber converts biological waste into energy, it can use anything from life's took e.g chicken & human waste to agriculture waste composed and plant clipping.When all these things decompose,methane gas is produce. Biogas plant is a technology to capture those methane emissions and burn them to create most useful product. Biogas is produced by anaerobic digestion(it is the collection of process by which micro-organism break down biodegradable material in the absence of oxygen). The additional the benefit is that waste following the burning of methane can be used as fertilizers for agriculture crops.
5) Electrolytic Cell: it is a electrochemical cell , in which the liquid waste coming from filter press chamber undergoes redox reaction, when electrical energy is applied. The decomposition of chemical compound in liquid waste material do the electrolysis process which means to break up.
6) Charcoal Chamber : charcoal is a light black residue consisting of 85% to 98% carbon & any remaining ash. It is obtained by removing water and other volatile constituents from animal & vegetarian substances. It is produced by distructive distillation of wood & used as fuel, filter & absorbent. Its main purpose is adsorption of disgusting smell.
7) Aquaponics: The word aquaponics is the combination of aquaculture & hydroponics. It allows you to produce fish and plants in the one system with a large reduction in waste use. The brand of fishes used in aquaponics are sleepy cod & baramundi.
8) Planatation: water is pumped from fish tank upto the grow bed. Plants are grown in the suspended form in the water filled grow bed. A bio filter converts ammonia to nitrate which are utilized by the plants. Some of the plants which can be grown many asian vegetables, tomatoes, cucumber, various herbs, melons, eggplants and chillies as in Fig.3.

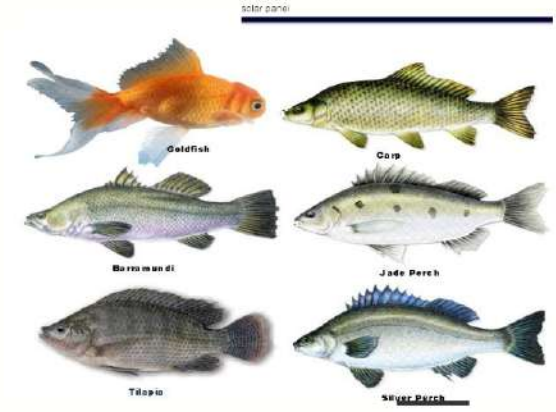

Fig.2. Aquaponics system


Fig.3. Production of useful plants

IV. WORKING

There are different form of waste material like:

- Human waste
- Liquid waste
- Solid waste
- Air emission

From the domestic sector, the waste is largely in solids and liquid forms. Air emission is confined to rural areas & settlements of weaker sections in the cities, where they use coal or wood as fuel for cooking purposes.

The domestic waste materials are collected in the domestic waste chamber, from there it goes to separation junction. In the separation junction we separate the solid & liquid waste. Then solid waste goes to biogas chamber & liquid waste goes to filter press chamber. The main purpose of filter press is to purify waste liquid material. Filter press has a fixed volume and batch operation which simply means that the operation must be stopped to discharge the filter before the next batch produce fish and plants in the one system with a large reduction in waste use. The brand of fishes used in aquaponics are sleepy cod & baramundi.Aquaponics system is shown in Fig.2

Waste liquid material. Filter press has a fixed volume and batch operation which simply means that the operation must be stopped to discharge the filter before the next batch can be started. It however can only hold a specific volume of liquid. This decomposed liquid waste material is passed to the

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charcoal chamber. Charcoal chamber is beneficial for many purpose, here we are using a charcoal chamber for smell reduction. The purified liquid water goes to agricultural fields for production of crops & in aquaponics, the two main components of the system are the fish tank and grow beds with a small pump moving water between the two. The water passes through the roots of the plants before draining back into the fish tank. The plant extracts the water & the nutrients (fish waste) they need to grow, cleaning the water for the fish. The solid waste which goes to biogas chamber has effective significance in the production of biogas. Biogas refers to a gas produced by the break down of organic matter in the absence of oxygen. During the reaction in biogas chamber various gasses are produced like methane (CH_4), carbon dioxide (CO_2), small amount of hydrogen sulphide (H_2S), moisture and siloaxane.

The gasses methane, hydrogen and carbon monoxide (CO) can be combusted or oxidised with oxygen. This energy release, allows biogas to be used as a fuel; it can be used for any heating purposes, such as cooking. It can also be used in a gas engine to convert the energy in the gas into electricity and heat.

V. Conclusion

In this model project the waste material is first separated into solid & liquid mass. The solid waste material is decomposed to produce methane gas. The methane gas is a good source of energy for household as well as commercial sector. The decompose solid mass left after the escape of methane gas is good form of manure which can be used as a fertilizers in the agriculture field . similarly the liquid waste is also purified in various steps and is used in aquaponics. Aquaponics is highly efficient and economical technique to groom the fishes as well as grow the vegetation. Thus the working model of this layout project can be contribute towards energy conservation

Acknowledgment

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Environmental Concerns of Non-Ionizing Radiations and Need for Continuous Monitoring

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***Abstract*—This Awareness among people by media on radiation risks is aggressive but often exaggerated. Ionizing radiation is used extensively in medicine, in industry and in research. No-one can avoid exposure to non-ionizing radiations which include light, ultraviolet radiation, radio and TV transmission waves, and electric and magnetic fields associated with power lines. Some published studies have suggested an association between certain frequencies of non-ionizing radiation and cancer but overall the evidence is not convincing. From India the epidemiological data on these issues are insignificant. There is a need for continued research in this area as stronger base of evidence.**

***Index Terms*—*Non*-ionizing radiations, monitoring need, India**

I. Introduction *(Heading 1)*

The beneficial effects from controlled exposure for medical purposes and the catastrophic effects of large doses of radiation (e.g. during a nuclear accident) are well understood. To evaluate the effects of small doses on the general population, knowledge of exposure from natural and manmade sources of radioactivity in the environment is required.

The formation of ions and free radicals in tissue by radiation and subsequent chemical reactions between these reactive species and the tissue molecules cause biological effects such as cataract, gastrointestinal disorders, damage to central nervous system, impaired fertility, cancer, and changes to chromosome producing mutations in later generations [1]. Low frequency part of the electromagnetic spectrum is called non-ionizing and includes visible light, radio-frequency radiation, and microwaves. Because non-ionizing electromagnetic energy cannot break chemical bonds [2], there is no analogy between the biological effects of ionizing and non-ionizing electromagnetic energy. Many of the biological effects of ultraviolet (UV), visible and infrared (IR) frequencies depend on the photon energy, but they involve electronic excitation rather than ionization. Radio frequency and microwave sources can cause effects by inducing electric currents in tissues which cause heating. At frequencies below that used for broadcast AM radio, electromagnetic source couple poorly with the bodies of human and animals, and thus are very inefficient at inducing electric currents and causing heating. Power frequency sources are clearly too short compared to their wavelength (5000km) to be effective radiation sources. Major information regarding the exposure and the health effects of radiations is emanating from the U.S.A and Europe. There are hardly any reports regarding the radiation exposure or their health effects from India. Present paper reviews the radiation exposure from the non ionizing radiations from different sources.

II. NON-IONIZING RADIATION SOURCES AND EXPOSURE

Non-ionizing radiation refers to any type of electromagnetic radiation that does not carry enough energy per quantum to ionize atoms or molecules—that is, to completely remove an electron from an atom or molecule. Instead of producing charged ions when passing through matter, the electromagnetic radiation has sufficient energy only for excitation, the movement of an electron to a higher energy state. Nevertheless, different biological effects are observed for different types of non-ionizing radiation [2] [3]. Near ultraviolet, visible light, infrared, microwave, radio waves, low-frequency RF (long wave) and power frequency electromagnetic fields from alternating current high voltage (HVPL) are all examples of non-ionizing radiation. Frequencies, sources and biological effects of various non-ionizing radiations are summarized in Table I. [4]. UV radiation above 10eV (wavelength shorter than 125 nm) is considered ionizing. However, the rest of the UV spectrum from 3.1eV (400nm) to 10eV can produce photochemical reactions that are damaging to molecules other than simple heat.

Visible light causes few effects to the human body. Bright visible light irritates the eyes. Visible-light lasers have much more powerful effects and may damage the eyes even at small powers. A principle mechanism by which radio frequency radiation and microwave causes biological effects is by heating (thermal effects). This heating can kill cells. If enough cells are killed, burns and other forms of long term, and possible permanent tissue damage can occur. Cells which are not killed by heating gradually returns to normal after the heating ceases: permanent non-lethal cellular damage is not known to occur.

III. RF RADIATION EMISSION LEVELS AND HEALTH CONCERN

A. Cell Phone

As a result of the enormous increase in mobile phone usage throughout the world (expected to be more than 5 billion

TABLE I. TABLE EFFECTS OF VARIOUS NON-IONIZING RADIATIONS

	Source	Frequency	Biological effects
UVA	Black light, sunlight	750–950 THz	Eye – photochemical cataract; skin – erythema
Visible light	Lasers, sunlight, fire, LEDs etc.	385–750 THz	Skin photo aging; eye – photochemical & thermal retinal injury
IR-A	Lasers, remote controls	215–385 THz	Eye – thermal retinal injury, thermal cataract; skin burn
IR-B	Lasers	100–215 THz	Eye – corneal burn, cataract; skin burn
IR-C	Far-IR laser	300 GHz – 100 THz	Eye – corneal burn, cataract; heating of body surface
Microwave	mobile/cell, cordless phones, ovens, telecom, radar ,Wi-Fi	1–300 GHz	Heating of body tissue
RF-radiation	Mobile/cell cordless phones, TV, FM, AM, shortwave, CB	100 kHz – 1 GHz	Heating of body tissue, raised body temperature
ELF	Power lines	<100 kHz	Cumulation of charge on body surface; disturbance of nerve & muscle responses
Static field	Strong magnets, MRI	0 Hz	Magnetic – vertigo/nausea; electric – charge on body surface

subscriptions worldwide) the concern about effect of mobile phone radiation on human health has increased. Mobile phones use electromagnetic radiation in the microwave range. Other digital wireless systems, such as data communication networks, produce similar radiation. The WHO has classified mobile phone radiation on the IARC scale into Group 2B - possibly carcinogenic. That means that there "could be some risk" of carcinogenicity, so additional research into the long-term, heavy use of mobile phones needs to be conducted [5,6]. The parameter used to measure the radiation emitted by cell phones is the specific absorption rate (SAR) given in units of Watts of power absorbed per kilogram of tissue (W/kg). The permissible upper limit for cell phones set by the U.S. Federal Communications Commission (FCC) is 1.6 W/kg of RF radiation.

B. Cell Phone towers

The current U.S. standard for radiation exposure from cell phone towers is 580-1,000 microwatts per sq. cm. (mW/cm2). European countries have set standards 100 to 1,000 times lower than the U.S. Russia, Italy, and Canada have set standard at 10, whereas the China at 6, and Switzerland, at 4. New Zealand has proposed yet more stringent levels, at .02 microwatts per sq. cm. No cell phone radiation exposure standards for India have come to the notice of the authors [7]. Scientists and advocacy groups say that the current U.S. Federal Communications Commission (FCC) "safe" standards are based on 1985 research, and fail to consider more recent research that found brain cancer, memory impairment, DNA breakdown, and neurological problems with RF at much lower levels. The earlier studies considered only the "thermal" or heating effects of the radiation – in other words, the level at which the radiation would heat tissue, or "cook" a person, in the same exact manner that a microwave oven works. The FCC levels may ensure our tissues are not "cooked", but they fail to address long-term chronic exposure at low levels, or what is called "non-thermal" effect.

IV. POWER FREQUENCY ELECTROMAGNETIC FIELD (EMF) FROM ALTERNATING CURRENT HIGH VOLTAGE POWER LINES (HVPL)

The growth of industry, the use of electrical energy, and the development of electrical power grids have resulted in the increasing exposure of the public to power frequency electromagnetic fields (EMF)) from alternating current high-voltage power lines (HVPL). These developments raise the question of the biological significance of fields from HVPLs. The electromagnetic environment of HVPLs can be characterized by electric and magnetic fields. The electric component significantly exceeds the natural level of the earth's electric field, thereby altering the electromagnetic environment in places of human habitation and necessitating the need for assessment and control. Electrical discharges and induced currents are indirect consequences of the action of the electric component of a HVPL. The magnetic component of the field near HVPLs is relatively small. The electric field in the vicinity of power lines can attain values of several thousand volts/meter. The field decreases sharply with distance from the power line. The presence of a human below a power line distorts and increases the field in the immediate area of the individual. Most investigators have concluded that power line electric fields elicit a measurable reaction in a number of organ systems including the CNS, cardiovascular, blood, and reproductive systems. Some investigators propose that the field elicits regulatory-system reactions based on recorded functional effects, whereas others consider only non-specific or normal physiological reactions that do not pose a threat to human health. There are also reports of no effects of power line electric fields on biological systems. Some investigators proposed that the basic active component of a power line electric field is the induced current. Others have suggested that the biological effects are secondary in nature, and are associated with vibration of hair or fur. It is difficult to conclude about the biological significance of power line electric field, as number of difficulties is still encountered including extrapolation of animal data to humans, and differences in occupational, natural and laboratory settings [8].

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In the absence of clear evidence, USSR using data from wide range of experiments has developed exposure standards for power frequency electric fields emanating from overhead HVPL and are tabulated in Table II. From above discussion it can be said that research in this area is very important and many questions deserving attention still await investigation.

TABLE II. TABLE TYPE STYLES

Location	Intensity (kV/m)
Inside homes	0.5
Around residence	1
Populated areas (Constructed within 10 years)	5
Roads near power lines	10
Unpopulated areas (agricultural zones)	15
Difficult terrain (not suitable for farm machinery)	20

V. INDIAN SCENARIO AND CONCLUSION

From India the epidemiological data on radiation exposure and health effect issues are insignificant. There is a need for continued research in this area as stronger base of evidence on the risks of radiation to protect the public and workers from unnecessary risk of cancer is required. The more recent debate concerning potential risks of high frequency electromagnetic radiation from cell phones nearly ubiquitous exposure with uncertain consequences illustrates another need for further research.

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Impact of Information & Communication Technology (ICT) on Human Resources (Library Professionals) in Amritsar: A Survey

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***Abstract*—This The various forms of ICTs and their application in the libraries have reshaped the library services such as to access, retrieve, store, manipulate and disseminate information to users. Now days, the effective library services depend a lot on the ICT's. This study aims to know the impact of ICT on library human resources. A questionnaire was structured to conduct this survey and all the questions were asked to library personnel to know impact of ICT on them. The present study demonstrates that the application of ICT in libraries has put impact on library personnel in all libraries. Undoubtedly, this impact is more positive and very less negative. The 20 different libraries of Amritsar have been surveyed to know that how the library personnel are dealing with these latest technologies of ICT.**

***Index Terms*—Information & Communication Technology formatting (ICT)**

I. Introduction

Today we are passing through a time which highly depends on the Information and Communication Technology (ICT). Before discussing this topic we must understand what is ICT? Any technology which is used for the transmission of information is called ICT. Such technologies may include Radio, Mobiles, Fax machine, Computer apparatus Technologies, Internet etc. The ICT has put a great impact nearly on all the sectors of the society whether it is the banking, education, transportation, medical or any other system. So ICT is playing a vital role in every facet of life. Where ICT has influenced all the sectors of the society, it has put a great impact on the libraries as well. The developments like E-consortium, E-publishing, E-books, E-journals, digital and virtual libraries etc have brought many benefits as well as issues in the libraries. The application of various components of ICT that are used for information storage, processing, access and dissemination etc have resulted in overwhelming shift in the functioning and management of libraries. As we know that the functioning and management is done by the human resources, so it is understood that ICT has a great impact on the library professionals. Therefore these technologies are automatically changing the working environment and state of infrastructure of the libraries.

II. Statement of the Problem

As we know that we are experiencing an Information Explosion Age where information is pouring from all branches of knowledge at very fast rate and the parallel growth of the ICT tools is helping to great extent to work smoothly to overcome the problems of this age. But one thing came to our mind was how these tools of ICT have been implemented in libraries and what kind of impact human resources in the libraries are experiencing. Keeping these things in mind we decided to conduct a survey of the human resources in the libraries of Amritsar district.

III. Objectives of the Study

A. The present study aims to achieve the following objectives:

- To know the mode of acquiring ICT skills by Human Resources (Library Professionals) in the libraries.
- To know the major purposes of ICT by the Human Resources (Library Professionals).
- To know the problems faced by the Human Resources (Library Professionals) while using the ICT
- To know the automated services provided by the Human Resources (Library Professionals) in the libraries.
- To know the mode of acquiring ICT skills by Human Resources (Library Professionals) in the libraries.
- To examine the overall impact of ICT on Human Resources (Library Professionals) in the libraries.
- To suggest the measures for enhancement of ICT skills among Human Resources (Library Professionals) in the libraries.

IV. Literature Review

Shukla, R. K. (1960) discussed about automation of library and information centres. The main objective of his study is to provide an opportunity to the library and information personnel to acquire adequate professional knowledge and skills such as designing, developing, organizing, controlling and evaluating computerized systems for secondary information work and services. Kent, Allen and Thomas J Galvin (ed) (1978) conducted a study on 'The on-line revolution on libraries' in four parts. In the first part of the book, they explained the role of on- line revolution, lack of interest in using the new tools

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among libraries. In second part, they explained the resource sharing networks and online alerting services. Third part emphasised on training and retraining of librarians and users and fourth part explains the summary. Hammer, Donald P. (1978) carried out a study on library networks. He explained the library co-operation, library consortia and need of the library networking. Sunil Kumar (1981) highlighted the immediate need for the automation of academic libraries of India covering concept, need and purpose of library automation. Ojha, D.C (ed) (1993) examined the role of Information and Communication Technology in providing information at the right time in the right manner to the right person. Esperanza, Sister M (1995) his study attempts to bring out the vital importance and effectiveness of the library system in modern library. He described Libraries, as the power houses of Information and Communication Technology (ICT) which has given rise to revolutionary changes. Barden, P. (1997) described the skills required by the information worker of the future. He referred to Librarians as information workers and suggested that information workers have to develop technology skills and network management. Kajberg,L. (1997) explained the need for competency development and upgrading of public librarian's knowledge in the field of information technology (IT). Murray,J (2000) studied on "Librarian evolving into cybrarians" where he stated that librarians have a unique opportunity to adopt their professional skills to meet the challenges of the information age. There he argued that library/ media centres can be transformed from statistic repositories of print and audio visual materials into dynamics and evolving information technology centre. Kannappanavar, B. U. and Vijayakumar, M. (2001) surveyed the use of hardware and software facilities in University of Agricultural science libraries in Karnataka. The aim of the study was to evaluate the access of networks, information services and barriers in information technology applications. The survey also covered collections of the agricultural university libraries, In house database, use of ICT in administration and the impact of ICT applications on libraries. Results revealed that none of the University libraries at the time of study was having databases and full implementation of ICT applications in their libraries. Smith, I. W. (2001) conducted a study of staff development activity in Australian University libraries. The study revealed various factors influencing staff development. Most of the responses showed that increased information and communication technology applications had led to a greater need to train staff in ICT applications. There was a good balance between training in specific knowledge and job skills and broader professional developmental programs and activities. Cholin, V.S. (2005) provided an overview of information technology implementation in different university libraries in India that provided effective access to resources

available within universities and elsewhere. The study of this document reveals that the university libraries in India are at various stages of development in the application of information technology tools in their day-to-day activities. Dey, Tulima (2012) studies on 'Cybrarian: The librarian of future digital library' where he stated that all resources of libraries are on digital form accessible through networking communication to remote areas. In this age of ICT, he explained the role of library professionals is changing and facing several challenges in their professional ground and focussing them to adopt new situation. The above discussed literature has helped a lot to know the exact picture of the present scenario of application of ICT in the libraries. So this study aims to fill the research gap like how these ICT tools can put impact on Library Professionals. Moreover advancement in technologies has put challenges before the library professionals regarding the usage of these tools etc.

V. Research Methodology

As our title has denoted that we have adopted the survey method for this piece of writing. A questionnaire was designed to conduct this survey and the same was distributed among the 20 different libraries of Amritsar. All the questions in the questionnaire were structured with multiple choices to tick appropriate answers. A total of 45 usable responses could be received out of 50 questionnaires distributed for this study. This study was confined to the libraries existing within the Amritsar district comprising public library, private and Government college libraries. Our respondents comprised librarians, deputy librarians and assistant librarians only including both male and female. Data collected from the respondents through questionnaires was evaluated and analyzed to find the results. The data was processed in Microsoft Excel. The collected data has been analysed by using descriptive analysis comprising percentage analysis.

VI. Analysis of Data:

A. Awareness of ICT

Awareness of ICT	No of Respondents	Percentage
Yes	45	100%
No	-	-

Fig. 1. Shows that all the library professionals under study have awareness about ICT.

B. ICT components being used

Components in use	No. of libraries	Percentage
Computers only	4	20%
Xerox	2	10%
Internet	4	20%
All of above	10	50%

Fig. 2. The human resources (Library Professionals) familiarity with the various technologies.

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Fig: 2 represent the human resources (Library Professionals) familiarity with the various technologies listed. It was found that 20% of the libraries under study use computers only, 20% of the libraries use internet, 10% of the libraries use Xerox as ICT components where as 50% of the libraries use all these components of ICT.

C. Mode of training for ICT

Fig: 3 represent different methods being adopted by library human resources (Library Professionals) to get ICT skills. 17% respondents take risk to acquire the ICT skills through trial and error method. 33% respondents got training from colleagues and friends, 20% from external sources and 30% from the in house training.

Method	No. of respondents	Percentage
Trial & Error method	08	17%
Guidance from Colleagues and Friends	15	33%
Training from the external courses	09	20%
In house training	13	30%

Fig. 3. Modes of training for ICT skills.

D. Purpose of using ICT in libraries

Through the survey, it is found that majority of respondents (51%) use ICT for the library housekeeping operations where as 27% respondents for internet services and only 22% respondents' use ICT for office work.

Purpose	No. of respondents	Percentage
Office work	10	22%
Housekeeping operations	23	51%
Internet Services	12	27%

Fig. 4. Purpose of using ICT in libraries.

E. Problems while using ICT

Problem	No. of respondents	Percentage
Lack of knowledge to use	2	4%
Lack of Confidence to use	6	13%
Lack of Support from Institute	12	27%
None of the above	25	56%

Fig. 5. *Problems while using ICT.*

F. Opinion regarding ICT skills help in updating the knowledge of human resources (Library Professionals).

Fig: 6 express that the maximum number of respondents 49% agree, 40% respondents strongly agree and 11% respondents are disagree that ICT skills help to update their knowledge.

Opinion	No. of respondents	Percentage
SA	18	40%
A	22	49%
CS	-	-
DA	5	11%
SDA	-	-

Fig. 6. ICT skills help in updating the knowledge of human resources (Library Professionals).

- SA- Strongly Agree.
- A- AgreE.
- CS- Can't Say.
- DA- Disagree.
- SDA- Strongly Disagree.

G. Fear regarding ICT replacing Manpower

Fig: 7 reveals that majority of respondents (84%) are not afraid of losing job due to adoption of ICT in libraries where as 16% respondents.

Opinion	No. of respondents	Percentage
Yes	7	16%
No	38	84%

Fig. 7. Fear regarding ICT replacing Manpower.

H. Opinion regarding negative impact of ICT on staff strength

Fig: 8 represents a least number of the respondents (16%) believe that introduction of ICT in libraries has affected the staff strength where as majority of the respondents 84% do not agree with this opinion.

Opinion	No. of respondents	Percentage
Yes	7	16%
No	38	84%

Fig. 8. Adoption of ICT put negative impact on staff strength in libraries.

I. Opinion regarding ICT improved the status of human resources (Library Professionals.

Fig: 9 express that the maximum number of respondents 67% agree and 24% are strongly agrees and 9% respondents can't say that ICT skills improve the status of human resources (Library professionals).

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Opinion	No. of respondents	Percentage
SA	5	25%
A	15	75%
Can't Say	4	9%
DA	-	-
SDA	-	-

Fig. 9. ICT improved the status of human resources (Library Professionals).

J. Job satisfaction among human resources (Library Professionals) using ICT tools.

Through the survey it is found that all the respondents using the ICT tools are satisfied because it saves the time of users and human resources (Library Professionals) also. Table 10.1 shows that 67% respondents are agree and 24% respondents strongly agree and 9% respondents can't say about the job satisfaction using ICT tools.

Opinion	No. of respondents	Percentage
SA	11	24%
A	30	67%
Can't say	4	9%

Fig. 10. Job satisfaction among human resources (Library Professionals) using ICT tools.

K. Opinion regarding reduction in workload of human resources (Library Professionals) using ICT.

Fig: 11 represent that majority of respondents 76% agreed that ICT reduce the workload of human resources (Library Professionals) where as 11% strongly agree and 13% disagree to this statement.

Opinion	No. of respondents	Percentage
SA	5	11%
A	34	76%
D	6	13%

Fig. 11. ICT reduced the workload of human resources (Library Professionals).

L. ICT helps the human resources (Library Professionals) to provide quality library services.

Fig: 12 shows that majority human resources (Library Professionals) 73% agree ,18% strongly agree and 9% are disagree that ICT helps to provide quality library services within less time with less effort.

Opinion	No. of respondents	Percentage
SA	8	18%
A	33	73%
DA	4	9%

Fig. 12. ICT helps the human resources (Library Professionals) to provide quality library services.

CONCLUSION

After analyzing the collected data, the researchers have reached to the conclusion that ICT tools have increased the satisfaction level of the library professionals on the whole, as majority of the respondents responded positively. Although, the majority of the respondents (50%) do not face any problem while using ICT tools yet the factors like lack of support, lack of confidence and lack of knowledge to use pose problems for using such tools/ techniques. ICT tools are basically used for Housekeeping operations and office work. This study reveals that libraries are lacking somewhere in providing training to their professionals for effective usage of such tools. The overall impact has been positive on the library professionals as majority of the respondents were of this opinion that use of ICT tools enhances/ updates their knowledge. Majority of the respondents disagree the question with ICT tools replacing manpower in libraries. Rather they have strong agreement for upliftment of the standard of living of library professionals with the adoption of ICT tools in libraries. These library professionals agree to the statement that ICT tools have reduced the workload of library. Thus overall impact has been found towards positive side.

RECOMMENDATIONS

Proper training for the efficient use of such tools is highly required. Library professionals should be motivated to use these tools/ techniques and get benefited. These tools/ techniques should also be used for other purposes like researches etc. in addition to housekeeping operations.

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Increasing Influence of Media on Corporate Communication

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Abstract - **Corporate Communications is a long term strategic initiative or frame work in which all communication and media specialists integrate to manage perceptions and ensure effective and timely dissemination of information which helps to create positive corporate image .The economic liberalization brought euphoria about the mass communication job market resulting in hundreds of private institutes opening shops in metros. Public Relations an important tool of corporate communication received another spurt in the 1990s which opened the Indian Markets to various overseas players and brought with it various lobbyists and Interest groups. Corporate Communication includes media relations, corporate public relations, brand promotions such as event and sponsorships which helps to get desired responses from various stakeholders .Media vehicles is a umbrella term which mostly comprises interpersonal communication, Brain storming, video and idea boxes, internet, Social Gathering, exhibitions etc. Corporate communication practitioner takes helps of these vehicles which helps them to act quickly in any situation and be sufficiently analytical to take decisions based on best options so that they can perform honest and truthful communication.**

Globally many consultancy firms and Media monitoring agencies commonly use the method of media Content Analysis. The Top Ten Companies in India are weighted by the amount of coverage they get both print and TV news coverage. It is a matter of fact that Big Business supports Media through Advertising .Social Media is on the rise today especially in the BRIC countries. Social Networking sites are highly used and trusted by young opinion elites. This research will aim at how media and corporate communication are dependent on each other which finally facilitate good Corporate Governance, High Corporate Social Responsibility and increase in Brand Quality among giant Corporate Houses.

Key Words - **Corporate Governance, Corporate Social Responsibility, Brand Quality, Corporate Houses, Video and Idea boxes, corporate communication**

I. INTRODUCTION

Media today have become all –pervasive. A free media can sustain itself only in Indian Democracy, whenever the government has encroached on its freedom, The Indian Media has stood up and fought it valiantly .At present Communities and Big Firms are connecting through the Media as never before. Today Organisations are proactive in constantly sharing information especially in times of crisis they should respond to the information needs of media quickly and honestly. Media has revolutionized Corporate Communications. Media marketing allows companies to communicate directly and instantly with their stakeholders, marking a shift from the traditional one-way output of Corporate Communications, to an expanded dialogue between Company and Consumer. Corporate communication practitioner should work on the Troika namely audience, message and medium which act as nucleus of relationship between media and corporate houses. At now Print Readership is on decline all over the world because of dozens of TV channels have beamed into people's homes through cable network which has resulted in changing ownership patterns among gigantic firms.

TV industry in India has seen phenomenal growth and expansion; Indians have been exposed to 24*7 entertainment channels in Hindi and other languages. Corporate clients are advertising on all and sundry channels which has helped to increase fragmented viewership scenario. After liberalisation of Radio Sector Private Frequency Modulation players are performing a key role in the return off the medium of Radio. Currently more than 150 FM channels are operational, and the industry estimates that in next 5 years India will have more than 800 FM Channels. These channels are entertainment driven and generally cater to the young and the mobile population. Employee Communication in a big corporate firm can be only possible through various forms of media such as magazines, blogs, video conferencing, brainstorming, events, idea boxes, and host of other channels.

The Telecom Regulatory of Authority of India has recommended to the government to allow news on private FM channels. Internet the Fundamental Part of Media connects the world to reach Transcending Geographical boundaries. The so-called Social Media has become a prominent tool for the Youth. However the increasing use of media by corporate houses has expanded its role and finally has become Brand Communication tool. India has one of the largest numbers of Internet Surfers in the world which is estimated about 60 million regular users. When Nano was launched, the company used Social Media Strategy by setting up groups on Facebook and Orkut, hoping to target numerous Official Nano Centric Groups which parked themselves on the site. The company engaged with such groups to respond to their queries and concerns. The real empowerment of Social Media has come to the common man who is utilising these sites to fulfil their needs and interests. Media offers new options for corporate relations practitioners for every aspect of the corporate communications process. From research to evaluation, Media tools can be utilized to create and distribute meaningful content to wider audiences. Since the advent of the Media revolution, Public Relations has widely become the

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department responsible for organizing and maintaining a company's social media presence, leading marketing and other departments in the adoption of these tools.

According to the 2009 Digital Readiness Report based on the survey responses of 278 public relations, marketing and human resources professionals with hiring responsibilities, "Public relations is leading the Media revolution inside organizations of all types and sizes" (Schwartzman, Smith, Spetner, & McDonald, 2009).

According to the report

- PR leads marketing in the management of all social media communications channels. In 51% of organizations, PR leads digital communications.
- PR is responsible for blogging at 49% of all organizations and is responsible for social networking at 48% of all organizations.
- PR is responsible for micro-blogging at 52% of all organizations. (Schwartzman, Smith, Spetner, & McDonald, 2009).

According to Social Media and Public Relations theorist Jason Falls, "PR has taken on an entirely new role in the organization over the last two to three years. It's the most dramatic shift in the industry since the invention of email, but is happening faster and more dramatically" (Falls, 2009).

The media scene is changing very fast and hence it is important for communication practitioner to keep pace with the changes, draw lessons, and understand the changing trends in Media. The ever changing media has brought so much convenience, so much joy, so much connectively in an average communication professional's life that future innovation seems just a blink away. The world may be unipolar or bipolar varying political structure but there will be always multiple cultures and diverse engagements with Media. Knowledge about Mass Media reach and access is imperative for a corporate practitioner. In India almost all Public Relation and Corporate Communication Firms that work on behalf of various clients do Media content analysis quantitatively. It is not uncommon to count the number of Press clippings and the cumulative column cum centimetres by the Corporate Communication Managers for their management's consumptions. Media is now seen as brands that are being positioning themselves as competing brands and are often considered the bottom line for the success and failures of Corporate Ventures.

One of the contemporary and an ardent critics of media's growing power and manipulative techniques , Noam Chomsky , Professor at the MIT, US, along with Edward S. Herman Professor emeritus at Wharton University , has propounded the Theory of Propaganda in media in their widely read and critiqued book Manufacturing Consent – The Political Economy of the Mass Media.

The book created ripples in the world of media, which would ordinarily like people to believe that they are the true watchdogs of society and reflectors of public opinion. The authors question this premise and argue that the media catered to the interests of the corporate sectors for which they aimed at the articulation of interests of 20 percent of the elite who are relevant to the media; the rest are engaged in inane programmes such as soaps and sports, which have become a world up to this class. Chomsky and Herman argue that the major decisions over investments, productions, distribution and so on are in the hands of a relatively concentrated network of major corporations and conglomerates and investment firms. Mass media aims at mobilizing public support for the special interests that dominates the government and the private sector.

II. SIGNIFICANCE OF THE STUDY (AIMS AND OBJECTIVES)

Corporate Advertisers are no longer happy to buy plain conventional units of column centimetres of advertising space. Reputation management among firms has acquired newer dimensions in the past decade or so. At the time and age when millions of people are connected through the Net, it is not uncommon that celebrities, businessmen, politicians and organisations are discussed, debated, and criticised through media. New age media has necessitated the need for managing reputations more vigorously than ever before. In order to be successful organisations have to rely on external research and perception mapping to constantly monitor and improve their reputation. Media has made the world of giant corporate houses flat which has enabled interaction among global communities, cutting across artificial boundaries, and creating a seamless public opinion on varying issues.

Today companies can ignore the power of Media but only at their risk and costs. What **blogger Lee Oden** says make a lot of sense in the age of digital reputation management, "Any Company publishing content online or which has customers engaging with content online is a candidate for an online reputation management effort. That covers just about every company in Business." He recommends that listening to dissenters and evangelizing customers is the first step before they have a major impact. Social Monitoring through any of the tools such as Google Alerts, Trackur and Radian 6 is worth the effort .The process of listening qualifying and engaging opinionating customer's. Online customers present a tremendous learning opportunity for companies that want to champion communicating on the social web.

A research without purpose is hollow. In order to give research an accurate path and to attain the feasible result, it should be goal oriented, following are main aims and objective of research study.

1. To study how Big Corporate Houses take help of various media tools for promotion of their brand and protection of their reputation.
2. To throw light on how Corporate Communication Practitioner exploits mass media tools to have knowledge about mass media reach and accessibility.
3. To understand how Media and Corporate houses unite together to achieve firms overall goals.

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III. LITERATURE REVIEW

A number of research studies have been conducted to examine the relation between media and corporate communication. The majority of these studies aimed to answer a common set of questions regarding the use of media for corporate communications, involving the most common forms of media marketing, the time commitment involved for media marketers, the benefits of media marketing, the audiences being reached by media marketers, how the effectiveness of communications are measured in media marketing and the impact that l media marketing will have in the future. Corporate Communication is a platform for assessing both kinds of sources of information for the Media. Media relations are set to be the proverbial "**Achilles heal** "for many Corporate Communication Professionals. Effective media relations are challenging, if not possible to maintain .A bad media report on a particular day means that they have to answer to the management for something that was not their doing anyway. Media provides a very important bridge between an organisation and its various stake holders. Hence there can be no avoiding or evading the media by corporate houses. As a first step ,it has become very important to create a media cell among Corporate houses .A reporter can only file a story in credible manner if he is provided with proper facts, figures ,arguments, logic from Corporate professional.

An online survey of 880 participants was conducted in March of 2009 by social media marketer Michael Stelzner. Most of the participants use social media marketing an important tool of mass media to some extent, and the study sought to uncover the "who, what, when, where and why" of social media marketing (Stelzner, 2009). In the report titled Social Media Marketing Industry Report: How Marketers Are Using Social Media to Grow Their Businesses, Stelzner examines the top 10 social media questions being asked by public relations practitioners, the time commitment and benefits of social media marketing, the most commonly used social media tools, the social media tools practitioners want to learn more about and additional analyses of demographic information (Stelzner, 2009).

IV. DISCUSSION

Media revolution has had a resounding impact on the Corporate Communication Industry. It offers new opportunities and new requirements for successful public relations and communication practices. The pressing need for Media has led to the creation of new careers, and practitioners must be aware of how media and its tools can be used for corporate communications. Advertising and Sales Promotion is an extremely effective tool for the Giant industries, as it offers new channels for the necessary communication between an organization and its publics, and new opportunities for this communication to be meaningful and mutually beneficial.

In the Indian context many big Firms use both Internet and Intranet to connect thousand of their employees scattered in various continents and countries. Corporate Communication, which is an offshoot of public relations and public affairs, is best suited to report as high as possible in the management as it is a top management function. Corporate communication is a staff function and media lends aid and advice to management on issues related to communication. The success of the firm impinges on the support and understanding which it receives from electronic media. As marketing is important tool of media which is done for both products and consumers, Firms should work in harmony with media and should not try to tread on each other toes. Media offers opportunities for interactive news releases that can be pitched on the Web, to bloggers, rather than journalists. Evaluation has changed as well, with Media tools offering new opportunities for measuring the effectiveness of communications.

The success of a public relations campaign or program is no longer measured solely by the weight of newspaper clippings it achieved, but by the number of blog posts, conversations, comments, re-tweets, bookmarks, etc. that it garnered online. In India at present major multinational corporations having starting owning their own media stations and outlets. Moreover, even as numbers of media outlets increase, the ownership is becoming ever more concentrated as mega mergers take hold. At the same time, vertical integration gives the big players even more avenues to cross-sell and cross-market their products for even more amazing profits. An effect of this though is a reduction in diversity and depth of content that the public can get, while increasing the political and economic power of corporations and advertisers.

As advertising becomes more important for businesses, larger companies are able to spend more and more on sophisticated ways to make us buy their products. Advertisers also exert direct and indirect influence on the media companies and their content in order to foster moods and cultures where consumers are more likely to buy their products. As a consequence, dumping down of content is not uncommon. Media companies sell consumers to their customers, the advertisers, who bring in the money that allows media companies to survive. Media giants are significant beneficiaries of the current social structure around the world and provide full potential for corporate communications industry to strive for its ideal, through transparent, honest practices. Media also provides these giant firms opportunities to implement successful campaigns and reverse negative stereotypes.

Media believes that smart corporate professionals use the facts of media in such a manner that they are able to create a 'world of make believe ' that traps the stake holders into believing what may be farther from truth. Traits like Honesty, Integrity, Sense of fair play and respect for others are vital for long term success in the 21st century business world says Ludwig, Author of Power Selling : Seven Strategies for cracking the sales code . He says that it is very important for companies to know who they are and the areas in which they can bring about important .The new age media has brought about a paradigm shift in corporate communication. Many corporate companies also use the supremacy of digital media to connect with their employees and their share holders.

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V. CONCLUSION

The speed with which Media and its tools are utilised by corporate communication practitioner has led to the speedy race theory and has adopted a shift occurring to a split within the industry, separating early adopters from those who are slow to join the new media age Corporate Social Responsibility, Corporate Branding, and financial Communication are some imperative issues which fall today in realm of corporate Communication. How companies are responding to the media insurrection is an indicator of future success. Companies that are too slow to adopt these new technologies and practices are going to be left behind. Consumers are communicating with one another via new media technologies, even if the companies that are their topics of discussion are late to join the media game.

Media is going to continue to develop and change, and corporate communications practices are going to change with it. Social networking sites have provided like minded people that are industry holders particularly in Amritsar an interactive forum to discuss various issues that affect their working. Media, being in business itself, is perceived to be friendly to business in general, as its substance rest on ad revenues, but obliquely, it also harms business when it exposes scams and frauds, and publishes stories on the extravagance of top businessmen in Amritsar. Media has already proven an invaluable tool to the industry, and the future holds a wider teaching and implementation of these tools. The advent of Different tools of media has resulted in the evolution of corporate communications. From unchanging, traditional practices, the Media industry has evolved rapidly to accommodate constant change and new tools, creating opportunities for meaningful conversations, successful campaigns and realizing industry ideals.

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Indoor Air Pollution-Review

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Abstract - **Air pollution poses health problems throughout the world. It is most often associated with factories and with outdoor air. The massive use of drugs, cigarette smoking, alcohol consumption, use of cosmetics, increasing use of household chemicals in aerosol such as deodorants, air refreshner and cleaners are sources of pollution at indoor places. The greatest source of harmful air pollution is cigarette smoking. Moreover, the health hazards from polluted air inside our home are often worse than that from outdoor air, even in an industrial city. Indoor pollutants can be of greater concern than outdoor pollutants because a large proportion of our time is spent indoors. An attempt has been made to study all possible sources of indoor air pollution in our homes and health affects either acute respiratory or chronic respiratory effects. Chronic effect persists over extended period of time, generally years. It is emphasized that in our homes, material used in construction , paints, glues, plywood, varnishes, oil, coal burning, coal and cotton dust, smoking release harmful chemicals such as hydrocarbon, nitrogen oxides, formaldehyde, sulphur oxides, and particulate matter which cause serious threat to human health. The study concluded that indoor pollution problems though become apparent at ecosystem or community level but all efforts begin at the level of individual. Research and interaction studies must be made at different levels to evaluate the hazard and potential toxicity of indoor pollution.**

Keywords: **Indoor burning, Tobacco, Consumer products, Construction material, Reduction**

1. INTRODUCTION

Indoor air pollution is described as physical, chemical or biological contamination in air indoor, more hazardous than outdoor air. Exposure to air pollutants cause adverse effects on health. Low or high level of exposure depends upon various factors such as individual behavior and activities, pollutant sources and location. These factors largely varied and exposure level also becomes unregulated. No doubt, exposure of burning fuel combustion causes chronic respiratory illness such as chronic obstructive pulmonary disease (COPD), asthma, allergies. Many of young children in India suffer from asthma because of high concentration of dust present in air especially during crop harvesting season or some paint work at home. There are many sources such as ingression of outdoor air pollution, cooking emission, tobacco smoking, cleaning and consumer product emission or emission from heating system[1] The adverse effect are more pronounced in developing countries because of major difference in housing, heating, ventilation, cooking appliance and fuel used. There is need to focus on research on this particular areas in homes and emphasis on its health burden.

At homes, burning of fuel is potential factor in polluting air contamination at indoor environment.

Primary sources or Indoor air pollution:

Attic:
- Asbestos
- Insulation
- Fiberglass

Bed room:
- Dust and dust mites
- Allergens, pet hair and dander
- Carpets

Living room:
- Fireplace
- Allergens
- second hand smoke
- carpet
- Pet hair

Bathroom:
- Humidity
- Personal hygiene products

Kitchen:
- Bacteria
- Unpleasant dour and smoke
- Cooking pollutants

Home office:
- Melamine furniture having volatile organic compound(VOC)
- Printer, photocopier having VOC

Garage:
- CO
- Solvent
- Pesticides and herbicides
- Dust
- Paints
- Cleaning agent

2. SOURCES OF INDOOR AIR POLLUTION

There are five major sources of pollution in the home. These are listed as follows and also summarized in fig.1

1. Burning fuel indoor for cooking
2. Consumer products
3. Tobacco smoking
4. Building construction material
5. Pollution under soil

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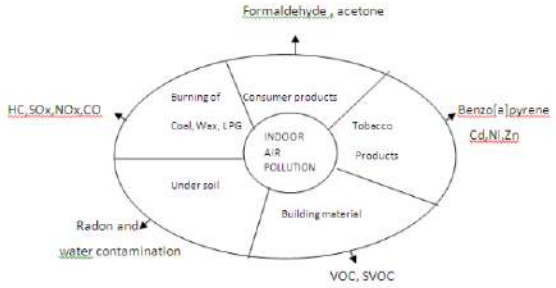

Figure1 Sources of air pollution in home

2.1 Burning Fuel Indoor:

Burning fuel for cooking and heating purpose is most prominent source of indoor air pollution. In India, at homes, Liquefied petroleum gas (LPG) which contain mainly butane, propane when undergo burned produce harmful toxic gases such as NO_x and CO along with other combustion products. If wood is used, in place of natural gas for cooking (as happened in most of world), then not only NO_x and CO but also release harmful hydrocarbon and particulate matter. The hazardous hydrocarbon i.e. most toxic Benzo[a]pyrene is released at indoor environment which has adverse effect and believed to be potent carcinogens. Burning of coal or oil produces NO_2 , CO, Hydrocarbon and most hazardous SO_2 gas. In many of the countries, coal is widely used for burning and poses a serious threat to health. In developing countries, there is serious threat due to poorly vented stoves and fireplace. The fuel used by people is solid or non sold fuel.

- Solid Fuel: Cow dung; Wood; Coal
- Non solid Fuel: Kerosene; LPG; Electricity

In south East Asia, almost 78% population depends on solid fuel for cooking. According to WHO report, approximately, 374000 death in children under five and 185000 death in adults [2]. It is observed that small particles with diameter less than 10 micron can easily penetrate into the lungs but diameter up to 2.5 micron have adverse effect on health. As far as increasing development and prosperity, there is more cleanliness, efficient cost, decreasing health impact.

2.2 Consumer Products:

Another major source of Indoor air pollutant is the use of natural and synthetic material in carpeting, wall covering, texture paint, fiber sheet, PVC paneling. These products release toxic chemical such as cyclohene.

- Latex carpet is rich source of cyclohene.
- Glue used in plywood gives off formaldehyde.
- Asbestos is widely used in building material because of heat resistance properties is also major source of indoor air pollutants.
- In homes and in offices, computer printer and photocopier is common need for everyone but also release toxic substances such as toluene.
- In offices, people suffer from Sick building syndrome at workplaces where eye irritation and headache are very common because of poor ventilated air quality.
- Many other sources such as furniture, polishes, glues, cleaning agent, deodorizer, pesticides in home contribute toxicity in indoor air.
- Cosmetics products having toxic chemical such as ester and ether vapours polluting our indoor environment.
- Solvents such as acetone which act as nail polish has also adverse effect on health and polluting indoor air.
- Long exposure of acetone cause fingernail to dry and split. Inhalation of high concentration can depress Central nervous system (CNS), cause dizziness, weakness and loss of consciousness.
- Carbon tetrachloride solvent used in oil, varnishes, paint. Overexposure of CCL_4 also leads to dizziness, vertigo abdominal pain, and vomiting, mental confusion is common symptoms.
- Ethylene glycol is used as a coolant in automobile radiator in cars placed in garage. Its vapours enter bloodstream and cause health effects.
- Microwave dinners release toxin substances called Dioxin, causes cancer and birth defects.
-

2.3 Tobacco Smoking:

It is serious indoor air pollutant in homes. It not only increase the risk of illness to affected active smokers but it also affect to those persons who live with a active smokers. Cigarette smoking is major cause of death in our society. Tobacco smoking causes death due to lung cancer. Smokers generally have coronary heart disease or may cause bronchitis, emphysema and arthrosclerosis. In India, young boys and girls aged from 17 to 30 years of age higher rate of smoking habits [3]. Less educated people smoke more in our country at home. At home, tobacco chewing is very common in uneducated people. The disease such as stroke, vascular disease, cancer of larynx chronic obstructive pulmonary disease, low birth weight babies are most commonly occurring in cigarette smoking people. In tobacco smoke, there is long list of carcinogens found such as:

- Nitrosamines
- Benzo[a]pyrene
- Cd, Ni, Zn, Nitrogen oxides
- Particulate matter

The families where people smoke exhale toxic substances in air. These toxic substances enter to non-smoker person (passive smoking) also pose serious threat to health. Involuntary exposure to women in the home affect developing embryos and affect still birth, miscarriage, premature birth, low birth weight and retarded development. Studies on smoker homes show that high concentration of endotoxin compound. This biological component of particulate matter derived from cell wall of bacteria which is potent mediator of

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airway inflammation and cause respiratory disease. In India, Tobacco use and particular smoking is major cause of death. Bidi, leaf rolled cigarette made from sun-curved tobacco is dominant form of cigarette products in most of the northern parts of India. Bidis are consumed at more rate than even cigarette. Report says that over the last 100 years nealy 100 million premature deaths are reported due to somehow tobacco using products at indoor environment [4].

2.4 Building Construction Material:

No doubt, many household items such as furniture, cabinet, paint, wall paper, glues are source of indoor air pollution. Building material in the indoor air especially may be called as "off-gassing". Deteriorating building materials emit dust into the air and cause adverse effect on health [5].

- Building material containing asbestos
- Paint containing lead
- Formaldehyde from various building material
- Low exposure of formaldehyde is comes from pressed wood product that use glue such as hardwood, plywood paneling or fiberboard.
- Volatile organic compound (VOC) also emitted from paints, varnishes, floor finishes.
- Wall paper, cardboard, or paper products are potential source of formaldehyde.
- Some VOC such as phthalate can also be emitted from a variety of sources in home such as flooring adhesive, air borne particles and house dust [6].

In addition to primary source, there is secondary emission due to microbiological or chemical reaction in adhesive. For example, decomposition of flooring adhesive due to presence of moisture has been found to source of secondary emission of SVOC. It has been observed that concentration of VOC levels in newly constructed building is 0.5-19 mg/m^3 but in old building, it range from 0.2-1.7 mg/m^3. It is believed to be emission of VOC at indoor places result in headache, eye or nose irritation, respiratory tract irritation [7]. Therefore, the use of low VOC emitting product and material during renovation of building and avoiding discomfort for the occupant.

2.5 Pollution From Under Soil:

The houses just near chemical waste dump area are more prone to suffer from toxic gases leaking upward released under the soil to living areas of home. Since radioactive element has ability to release harmful radiation. Many radioactive gases such as Radon enter the house through leaking. Radon is one of three most dangerous air pollutants along with cigarette smoke and formaldehyde. Radon is second leading cause of lung cancer after smoking. The house just near the garbage water flowing nearby, also suffer water contamination because sometimes drinking water mixed with polluted water. So, radioactive elements and pesticides are potential source of pollution in the home.

CONCLUSION

The best way to reduce indoor air pollution from any source can be achieved by increasing the ventilation in the home. No doubt, this strategy makes our homes chiller and become costlier when more electricity bill comes due to heating. Due to higher heating, it may further cause warming of the earth by increasing the surface temperature called Global warming. The other better way to reduce air pollution is use of excessive air infiltration and consequent energy waste. Pollution from synthetic material can be reduced by avoiding their use at home. Indoor air pollution can also be reduced by applying sealant to coat building material to prevent release of harmful substance such as formaldehyde. At indoor places, plants must be grown to reduce polluting gases. For example, spider plants are used to remove CO, aloe versa used to remove formaldehyde and chrysanthemums used to remove carcinogenic benzene vapours. But even all such efforts and methods, the problem of indoor air pollution still remains intact [8]. As we know that burning of wood, wax or LPG produces harmful toxic gases. There is need to think upon alternative source of burning which is renewable i.e. biomass, solar, hydrogen which not only reduce carbon footprints but also act as alternative source of energy in domestic section for producing power. Research and analysis must be laid on pollutant in homes and to find out average hoe many people are affected with respect to different sources and also how much concentration of air pollutant present. There is need to emphasis on study health burden effect. There is need to emphasis on WHO programme on indoor air pollution such as capacity building, research and evaluation and policy making stress be given to epidemiological research and review of existing harmful products at indoor levels. There is need to identify key review on long term exposure to indoor air pollution [9].

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Investigation of Radon Exhalation Rate in Some Commonly Used Building Materials

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Abstract: **Radon gas is the major contributor to the human exposure from natural radiation and can be a causative agent for lung cancer. It is being released from the radium present in soil, rocks, water etc. Building materials are derived from soil and rock, so building materials do contain trace amounts of radium and large amounts of radon may be released from the building materials. Therefore, it is of prime importance to know how much radon is being released from the building materials. In addition to the building materials used in bulk amounts in building construction (e.g. cement, concrete, bricks), materials used in restricted amounts, mainly for decoration or covering purposes, such as granites, marbles or ceramic tiles, have also to be considered as possible sources for radon exposure indoors. This attracted our attention and we collected these samples from the local suppliers. The purpose of this study is to estimate the relative contribution of marbles, granites, bricks and tiles to indoor radon levels. In the present investigations, radon exhalation rate has been measured in different samples of marbles, granites, tiles and bricks using LR-115 type-II plastic track detector (Track Etch Technique). We have found that there is much variation in radon exhalation from one material to the other. One of the granites has shown 90 times more radon exhalation rate as compared to the other one.**

Keywords: **Can technique, building materials, radon exhalation, LR-115.**

1. INTRODUCTION

Radon gas is produced during the natural disintegration of radioactive heavy metals uranium and thorium, which are dispersed throughout the earth's crust. The radioactive half-life of ^{238}U is 4.5 billion years and that of ^{232}Th is 14.1 billion years. Their decay chains continuously produce radium, which decays into radon isotopes, ^{222}Rn (most common in homes) and ^{220}Rn (Thoron). Long term exposure to radon increases the risk of developing lung cancer. All building materials derived from rock and soil contain natural radionuclides mainly of the ^{238}U and ^{232}Th series. A study of radon exhalation rate from building materials is important for understanding the relative contribution of individual materials to the total radon content found inside a room. There is considerable public concern about radon exhalation from building materials, especially those used for interior decoration 1,2,3,4,5,6]. In marbles, because of its polished surface and attractive colors, marble is widely used as an ornamental material for lining on walls and floors in dwellings. Granite is a common and widely occurring type of intrusive, felsic and igneous rock. It is massive, hard and tough, and therefore it has gained widespread use as a construction stone. It is also well known that, higher radiation levels are associated with igneous rocks compared with sedimentary ones. Because of this, the activity concentration measurements in granite tiles used in building construction are considered necessary. Although granite is believed to have a higher radon exhalation rate on average [7,8,9,10], other building materials such as roof tiles, floor tiles, bricks and marbles used to cover large surfaces were also considered in this study.

2. MATERIALS AND METHODS

2.1 Collection of Samples and the Present Study

In order to have a better look of their buildings (homes, offices and commercial buildings) and for cleanliness reasons people are using marble, granite and tiles on a large scale. This attracted our attention and we collected samples of marbles, granites, bricks and tiles from the local market of Amritsar. The information regarding their sources of origin is as per discussion with the supplier.

2.2 Experimental apparatus and set up

In the present study we have used the Can Technique [11]. In this technique the building material to be studied is kept closed inside a container, in which a Solid State Nuclear track Detector is placed. Radon gas escaping from the building material accumulates in the container. During its decay it emits alpha-particles. The daughters of radon are also alpha emitters. These alpha particles produce tracks in the Solid State Nuclear Track Detector at atomic level which are then enlarged by chemical treatment. These enlarged tracks are then counted by optical microscope. The track density of so obtained is proportional to the concentration of radon gas inside the container, which in turn is proportional to the radon exhalation rate of the material. So in the present investigations a relative study in terms of the tracks has been carried out for marbles, granites, brick and tiles. These materials were studied in an air tight plastic container of 5L capacity. Such a relative study has been carried out earlier for coal, fly ash and bottom ash [12]. Solid State Nuclear Track Detector (here LR-115 type-II manufactured by

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Kodak Pathe, France) was fixed on a glass slide which was fitted at the top inside the container, the detector facing downwards. The system was kept closed for a period of 3 months so as to get a considerable track density. After the removal of the detectors, etching was carried out in 2.5N NaOH solution at 60°C for 2 hours. The samples were then washed under running tap water for 15-20 minutes and were dried in open air. The detectors were fixed on glass slides. Optical microscope was used to count the number of tracks produced by alpha particles emitted by radon and its daughter products. Tracks were counted at a magnification of 600X.

3. RESULTS AND DISCUSSION

The results for radon exhalation rate from marbles, granites, brick and tiles are given in Table 1. The values are given in terms of track density obtained per unit area of the building material. Radon exhalation rate varies from (124.3 ± 25.1) $\times 10^{-3}$ for black granite to (10408.5 ± 234.6) $\times 10^{-3}$ for red granite, a very large variation of the order of 90 times. In case of marbles the radon exhalation rate varies from one marble to the other. The value is highest, (1802.6 ± 125.1) $\times 10^{-3}$ for
black marble (Kayampur, Rajasthan) and is lowest, (139.9 ± 27.2) $\times 10^{-3}$ for white marble -4 (Dungri, Makrana, Rajsthan). If we compare the values of marbles with that of fired clay brick, then we find that except three marbles of Indian origin the values are comparable to fired clay bricks. The red granite has shown exceptionally high value which may be due to higher radium content.

4. CONCLUSIONS

The radon exhalation rate in these building materials varies appreciably from one material to another. It may be due to the variation of uranium and radium content and porosity of the building material. Out of the different marbles and granites studied, granite black in colour, from Khamam (Andra Pradesh) has shown the minimum exhalation rate and granite red in colour, called Maharaja, from Karnatka has shown the maximum, about 90 times higher, this needs further investigation. Building materials in use for construction and decorative purposes should be tested for their radionuclide contents and for radon exhalation rates in order to avoid unduly exposure to radiation.

TABLE 1. RADON EXHALATION RATE FROM DIFFERENT TYPES OF MARBLES, GRANITES, BRICK AND TILES.

S. No.	Building Material	Track density (Tracks/cm^2) ρ	(Radon exhalation rate) Track density per unit area of the sample (ρ/cm^2) $\times 10^{-3}$
	Marbles		
1	White-1(Morword, Rajnagar, Rajasthan)	285 ± 44	207.9 ± 32.3
2	Black (Kayampur, Rajasthan)	1428 ± 99	1802.6±125.1
3	White -2 (Agriya, Rajnagar, Rajasthan)	264 ± 43	192.9 ± 31.1
4	White-3(Dungri, Makrana, Rajsthan)	230 ± 39	188.5 ± 32.6
5	White-4(Dungri, Makrana, Rajasthan)	181 ± 35	139.9 ± 27.2
6	Green-1(Kota stone, Kota, Rajasthan)	319 ± 47	303.4 ± 44.5
7	Yellow (Jaisalmer, Rajasthan)	746 ± 72	611.2 ± 58.7
8	Green-2 (Kesaria, Udaipur, Rajasthan)	195 ± 37	185.9 ± 34.9
9	Pink (Udaipur, Rajasthan)	319 ± 46	261.2 ± 38.3

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10	White-5,Onex (Pakistan)	251 ± 42	640.0 ± 106.0
	Granites		
11	Blackgranite (Khamam, Andhra Pardesh)	168 ± 34	124.3 ± 25.2
12	Red granite (Karnatka)	14378 ± 309	10408.5 ± 234.6
13	Fired clay brick	161 ± 33	274.9 ± 56.8
14	Roof tiles	1580 ±104	868.8 ± 57.4
15	Floor tiles	423 ± 54	133.4 ± 17.0

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Ion Track Filters as Templates of Micro/Nano Ensembles and its Characterization

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Abstract- Ion Track Filters (ITFs) are defined by independent parameters viz. pore diameter, thickness and areal density of pores and are produced by physico-chemical treatments to thin films of polymers irradiated by heavy ions. One of the most potential and technological use of ion track filters (ITFs) lies in their use in synthesizing micro/nano structures, whiskers, fibrils, tubules, quantum wires and dots. The fabrication of these micro/ nano materials have extensive range of applications in the variety of fields of science and technology including material based technologies, microengineering, powerful electronics and optoelectronic devices, magnetic devices, chemical and biosensors. Inspite of the fact that there exists variety of technique like electron/ion beam lithography, photolithography etc. for growing such ensembles but structures grown through electrodeposition technique is very simple and inexpensive and can generate micro/nanostructures with high aspect ratio and different geometrical shapes of not only metals but also semiconductors or metal-semiconductor junctions.

We have used this technique of electrodeposition involving template growth of (homo and hetero) structures of metal and metal-semiconductor (Cu-Se) through the pores of ITFs of Makrofol. The profile characterization of these microstructures involving metal-semiconductor junctions was studied using XRD and micro/nanophotographs of metal (Cu) were obtained using SEM through Makrofol and Anodic Alumina Membranes (AAM).

Keyword- track-etch membrane, micro/nanotechnology, template synthesis.

I. INTRODUCTION

During the past several years, various new micro porous membranes and filters have been developed for use in the fields of science and technology, viz. health, medicine, air pollution, beverage industries, development of microtubules, material science characterization, etc. These filters are generally made from polymeric materials, ceramics and minerals. The technique that led to the development of etched track membranes was first discovered by Price and Walker[1]. They found that the damage trails in insulating materials caused by the ionization as a result of the passage of travelling charged particles can be revealed by the chemical etching to form the cylindrical pores. They observed the fine pores due to fission fragments in 12 μ m thick layer of synthetic mica. Since 1972, fission fragments from various radioactive sources have been used for the commercial manufacture of nuclear track filters up to 10 μ m track length[2]. Heavy ion accelerators are a promising alternative for generating these filters.

In order to produce ion track filters, thin sheets of plastics are exposed to a collimated beam of particles from an accelerator having different energies. When heavy charged particles pass through these thin foils, they produce continuous damage along their path and thus leave behind a trail of radiation-damaged material. The chemical etching of these irradiated foils leads to the formation of fine hollow channels along the path of the charged particles due to preferential etching along the latent trail. If the thickness of the sheet is less than the particle range in it, the above process leads to the formation of the fine pores in the irradiated sheet.

The porosity of these membranes can be controlled by the flux of the ion beam and pore diameter can be controlled by ion characteristics and etching parameters like etching time, etching temperature, etchant concentration, etc. Filters of diameter from 50 Å to a few microns can be produced by this method in minerals and various plastics. Ion track filters are mainly divided into two categories: (a) Single pore filters and (b) Multi-pore filters. Single pore track filters can be produced from the accelerator by controlling the beam optics and fluence of the heavy ion beam.

II. MATERIALS

The materials used for the production of single and multi-pore ion track filters and their etching conditions are summarized in Table 1.

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Table1. Some ion track recording films with typical etching conditions used for production of ITFs

Table 1. Some ion track recording films with typical etching conditions used for production of ITFs

Material	Etching condition
Makrofol (N, KG, SKG)	5.0–7.0 N NaOH at 40–70°C
Kapton-H and F $[C_{22}H_{10}O_5N_2]_x$	(a) 1.0 N KOH in 80% ethanol and 20% H_2O (b) Sodium hypochlorite (NaOCl)
Polyvinylidene fluoride (PVDF, CH_2CF_2)	(a) 5–10 N NaOH (b) KOH + $KMnO_4$ at 70°C
CR-39 ($C_{12}H_{18}O_7$)	6.25 N NaOH at 70°C
Lexan polycarbonate ($C_{16}H_{14}O_3$)	5.0–7.0 N NaOH at 50–70°C
Muscovite mica	48 vol% HF at 23°C
Cellulose nitrate	2.5–5.0 N NaOH at 40–60°C

Table 2. Activation energies for bulk etching, E_b, for different track recording films

Table 2. Activation energies for bulk etching, E_b, for different track recording films

Film	Etchant	E_b (eV)
Makrofol-KG	6.0 N NaOH	0.61
	6.5 N KOH	0.62
SR-86	6.0 N NaOH	0.67
	6.5 N KOH	0.62
Kapton	NaOCl	0.41
Lexan polycarbonate	6.25 N NaOH	0.68
CR-39	6.25 N NaOH	0.74
	6.5 N KOH	0.76

III. DEVELOPMENT OF ION TRACK FILTERS

Samples of various polymer films have been irradiated by different heavy ion beams from the UNILAC accelerator at GSI, Darmstadt, Germany. Details of ion beams, irradiation and chemical etching parameters are as follows:

Filters in Makrofol-KG

The samples of Makrofol-KG have been irradiated by the ^{132}Xe (14.5 and 5.9 MeV/u), ^{208}Pb (13.6 MeV/u) and ^{238}U (14.0 MeV/u) heavy ions. All the irradiations were made at an angle of 90° with respect to the surface of the detector. The irradiated samples were cut into small pieces and etched in 6.0 N NaOH solution at various temperatures, viz. 40, 50, 60 and 70°C. The etched samples were dried in the folds of a tissue paper. The etched and dried samples were scanned under a Carl Zeiss optical microscope. The bulk etch rate (V_b) of the film is determined by using the thickness measurement technique[3]. The bulk etch rate V_b has an exponential dependence on the temperature of the etching solution as given by the relation[4]

$$V_b = A_b e^{-Eb/kT}$$

where, A_b is the pre-exponential constant, E_b the activation energy for the bulk etching, k the Boltzmann constant and T the temperature of the etchant. The value of activation energy for the bulk etching, E_b, is calculated (Figure 1) by plotting ln(V_b) vs 1000/T (K^{-1}). The activation energies for SR-86, lexan polycarbonate, CR-39 and Kapton have been determined by a similar way (Table 2). All the films were etched at different temperatures of 40, 50, 60 and 70°C in different recommended solutions. The photomicrograph of the observed ion (^{132}Xe) track pores in Makrofol-KG is shown in Figure 2. The variation of pore diameter (for ^{132}Xe heavy ion) with etching time at different temperatures is shown in Figure 3.

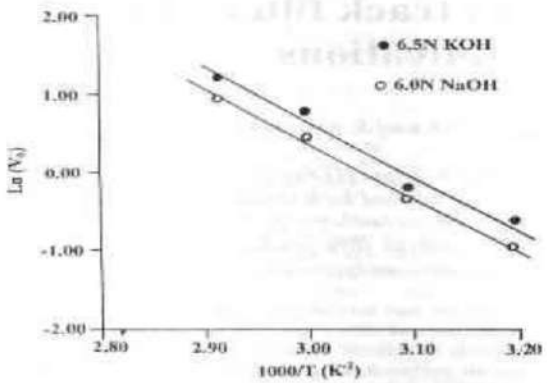

Figure 1. Variation of ln(V_A) versus 1000/T (K^{-1}) for Makrofol-KG.

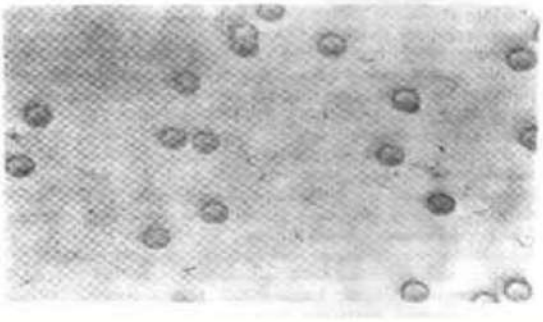

Fig.1 Variation of ln (V_A) versus 1000/T(K^{-1}) for Makrofol-KG.

Fig.2 Photomicrograph of ^{132}Xe (14.5 MeV/u) ion track pores (~13.3 μm) in Makrofol-KG.

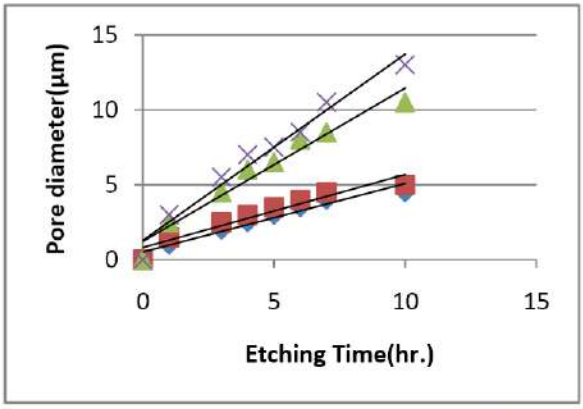

Fig. 3 Variation of pore diameter with etching time for ^{132}Xe (14.5 MeV/u) at various temperatures of etching solution in Makrofol- KG.

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IV. DEVELOPMENT OF METAL METAL-SEMICONDUCTOR MICROSTRUCTURES

Fabrication of microstructures is being considered a potential technology not only for use in micromechanics and microelectronics but also in the studies pertaining to behaviour of materials at micro and nano levels. Microstructures comprising microdimensional devices, dots, fibrils, wires, cones, tubules and whiskers have invited attention for use in multidisciplinary areas[5]. There are different techniques for the development of microstructures[6] but template growth through the etched pores considered to be very simple and microstructures with extraordinary low dimensions have been reported by Wu and Bein[7]. The methodology of the development of microstructures is based upon the earlier work of Possin[8] and Penner and Martin[9] producing thin metal wires, etc. This simple and well known underlying concept of electrodeposition of metals is described as an electrochemical process in which metallic ions in supporting solution are reduced to the metallic state at the cathode if it is covered by an ion track membrane, and thus would lead to the formation of growth of plated film as embodiment of micro and nano-structures[11-14]. After chemical dissolution or peeling off the polymer film from the metal substrate, the free metallic whiskers are obtained.

In the present work, we describe the simple method of electrodeposition of copper into the etched pores of polymeric ITFs by using an electrochemical cell[10]. The electrolyte used here is $CuSO_4.5H_2O$ acidic solution in high resistivity ion-free water + 25% vol. H_2SO_4. A current of 0.05 A/cm^2 was applied for 20 min. After the electrodeposition was over, the electrolyte was drained out and the copper electrode was detached from the copper substrate. After drying, the Makrofol-KG thin film was removed from the microstructure substrate by dissolving in chloroform ($CHCl_3$) followed by rinsing with water and ethanol. The developed microstructures were coated with gold by the sputtering method and then scanned under scanning electron microscope (SEM) (Jeol, JSM-6100) for morphological and structural studies. The microstructures of copper (Cu) grown through the single and multipore ITFs of Makrofol-KG are shown in Figures 4 and 5 respectively. The metallic needles developed by this technique have various possible applications, e.g. field ion emitters, as a stylus in STM, cantilever of AFM, etc. For template synthesis of metal-semiconductor heterostructures, the synthesis is accomplished by filling desired metal from one side until the growth has taken place half-way through the pores.The process is interrupted, followed by deposition of required semi-conductor from electrolyte through the other side of the ITF. This process was used for fabrication of micro-diode arrays. The 3-dimensional heterostructure of Cu-Se was grown using electrolytes of $CuSO_4.5H_2O$ + 25% of dilute H_2SO_4 and $Na_2SeO_3.5H_2O$ by template synthesis technique. Fig.6 shows the morphology of Cu-Se ensemble grown recorded by AFM. The X-ray diffraction pattern Fig. 7 clearly shows the peaks due to Cu-Se heterostructure and metallic Cu. Virk has also developed copper nanowires grown on copper foils as shown in Fig.8 having SEM micrographs of electrodeposited copper nanowires of 200 nm diameter and length of a few microns[15].

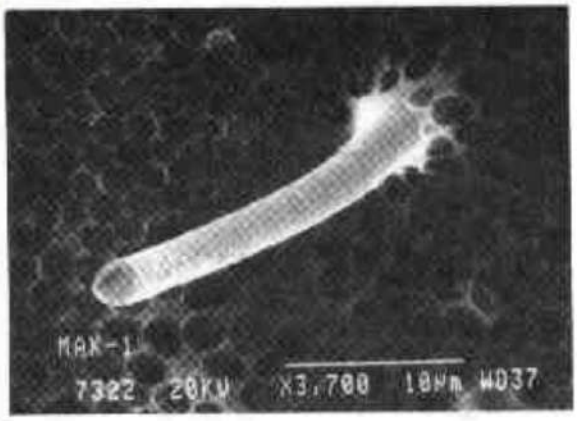

Figure 10. Microstructure (scanned by SEM) ensembles of Cu grown electrochemically through single pore of Makrofol-KG.

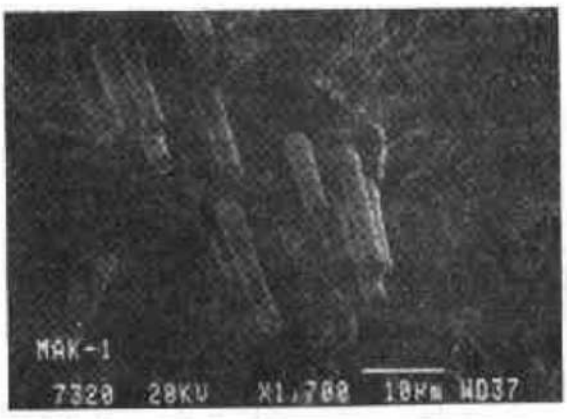

Figure 11. Microstructure (scanned by SEM) ensembles of Cu grown electrochemically through multipore filters of Makrofol-KG.

Fig. 4 Microstructure (scanned by SEM) ensembles of Cu grown electrochemically through single-pore of Makrofol-KG.

Fig.5 Microstructure (scanned by SEM) ensembles of Cu grown electrochemically through multipore filter of Makrofol-KG

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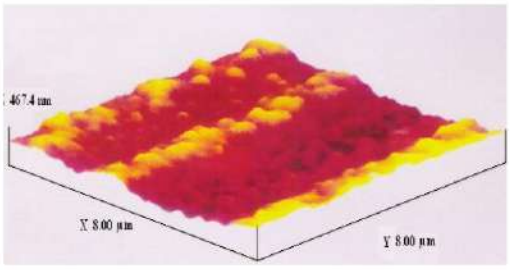

Fig.6AFM image of 3- dimensional ensemble of Cu-Se grown electrochemically using ITFs of Makrofol-KG.

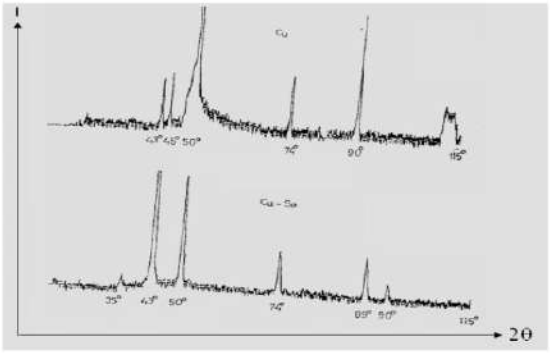

Fig.7 X Ray diffractogram of Cu and Cu-Se heterostructures showing different peaks.

Fig.8 SEM Photograph of copper nanowires of 200nm diameter grown by electrodeposition in AAM[15].

V. CONCLUSION

Morphological and structural studies done through electrochemical methods and replicas of etched tracks in ITFs used as templates has various advantages. Firstly, it provides the finest and critical details of geometry and dimensions of microstructural constituent elements. Secondly, it enables to study the various aspect of interaction of nuclear particle with the given material leading to the formation of tracks in ITFs. It is well known that parameters which control the shapes of track in ITFs include the nature of material, the ion beam and its energy deposition rate, pre and post- irradiation storage, environment and etch conditions. The metallic structures reveal the finer details of constituents of the etched pores of ITFs viz. diameter, length, shape (cylinder, conical etc.) were used for track profile studies.

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Lessons to be Learnt from Fukushima Nuclear Disaster

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***Abstract*—This The Great East Japan Earthquake (magnitude 9) on 11 March 2011 generated a number of large tsunami waves that struck the east coast of Japan, the highest being 38.9 m at Aneyoshi, Miyako. The earthquake and tsunami waves that followed it, caused widespread devastation across a large part of Japan, with 15,391 lives lost. In addition to this, 8, 171 people still remain missing. Many more have been displaced from their homes as towns and villages were destroyed. Many aspects of Japan's infrastructure were ruined by this devastation and loss. Several nuclear power facilities were affected by the earthquake and large multiple tsunami waves: Tokai Dai-ni, Higashi Dori, Onagawa, and TEPCO`s Fukushima Dai-ichi and Dai-ni.The present paper traces the progression of the accident at Fukushima Dai-ichi Nuclear Power Station and the author enumerates the lessons that the international nuclear community needs to learn from this accident.**

***Index Terms*—Fukushima Dai-ichi Nuclear Power Station, large tsunami waves.**

I. Introduction

All The Great East Japan Earthquake on 11 March 2011, a magnitude 9 earthquake, generated a series of large tsunami waves that struck the east coast of Japan, the highest being 38.9 m at Aneyoshi, Miyako[1]. Several nuclear power facilities were affected by the severe ground motions and large multiple tsunami waves including TEPCO's Fukushima Dai-ichi. The operational units at this facility were successfully shutdown by the automatic systems installed as part of the design of the nuclear power plants to detect earthquakes. However, the large tsunami waves caused serious consequences at Fukushima Dai-ichi. Although all off-site power was lost when the earthquake occurred, the automatic systems at Fukushima Dai-ichi successfully inserted all the control rods into its three operational reactors upon detection of the earthquake, and all available emergency diesel generator power systems were in operation, as designed. The first of a series of large tsunami waves reached the Fukushima Dai-ichi site about 46 minutes after the earthquake. These tsunami waves overwhelmed the defences of the Fukushima Dai-ichi facility, which were only designed to withstand tsunami waves of a maximum of 5.7 m high. The larger waves that impacted this facility on that day were estimated to be over 14 m high. The tsunami waves reached areas deep within the units, causing the loss of all power sources except for one emergency diesel generator (6B), with no other significant power source available on or off the site, and little hope of outside assistance. The station blackout at Fukushima Dai-ichi and the impact of the tsunami caused the loss of all instrumentation and control systems at reactors 1–4, with emergency diesel 6B providing emergency power to be shared between Units 5 and 6. The tsunami and associated large debris caused widespread destruction of many buildings, doors, roads, tanks and other site infrastructure at Fukushima Dai-ichi, including loss of heat sinks. The operators were faced with a catastrophic, unprecedented emergency scenario with no power, reactor control or instrumentation, and in addition, severely affected communications systems both within and external to the site. They had to work in darkness with almost no instrumentation and control systems to secure the safety of six reactors, six nuclear fuel pools, a common fuel pool and dry cask storage facilities. With no means to confirm the parameters of the plant or cool the reactor units, the three reactor units at Fukushima Dai-ichi that were operational up to the time of the earthquake quickly heated up due to the usual reactor decay heating. Despite the brave and sometimes novel attempts of the operational staff to restore control and cool the reactors and spent fuel, there was severe damage to the fuel and a series of explosions occurred. These explosions caused further destruction at the site, making the scene faced by the operators even more demanding and dangerous. Moreover, radiological contamination spread into the environment .These events are provisionally determined to be of the highest rating on the International Nuclear Event Scale.

II. Fukushima Daiichi Nuclear Power Station

Fukushima Daiichi Nuclear Power Station (hereinafter referred to as NPS) is located in Okuma Town and Futaba Town, Futaba County, Fukushima Prefecture. It is facing the Pacific Ocean on the east side. The shape of the site is half oval with the long axis along the coastline and the site area is approximately 3.5 million square meters. This is the first nuclear power station constructed and operated by the Tokyo Electric Power Company, Incorporated (hereinafter referred to as TEPCO). Since the commissioning of the Unit 1 in March 1971, five additional reactors have been constructed and there are in total six reactors now.

Power Generating Facilities of Fukushima Daiichi NPS Table I [2]

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TABLE I. TABLE POWER GENERATING FACILITIES OF FUKUSHIMA DAIICHI NPS [2]

	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6
Electric Output (10,000 kW)	78.4	110.0	46.0	78.4	78.4	78.4
Start of Construction	Sep. 1967	May 1969	Oct. 1970	Sep. 1972	Dec. 1971	May 1973
Month of Commissioning	Mar. 1971	Jul. 1974	Mar. 1976	Oct. 1978	Apr. 1978	Oct. 1979
Reactor type	BWR-3	BWR-4				BWR-5
Containment type	MARK-I	MARK-I				MARK-II
Number of fuel assemblies	400	548	548	548	548	764
Number of control rods	97	137	137	137	137	185

TABLE II. TABLE POWER THE FUKUSHIMA NPSS ON THE DAY BEFORE THE EARTHQUAKE [1]

Unit 1	Reactor	In operation (400 fuel assemblies)
	Spent fuel pool	392 fuel assemblies (including 100 new ones)
Unit 2	Reactor	In operation (548 fuel assemblies)
	Spent fuel pool	615 fuel assemblies (including 28 new ones)
Unit 3	Reactor	In operation (548 fuel assemblies, including 32 MOX fuel assemblies)
	Spent fuel pool	566 fuel assemblies (including 52 new ones; no MOX fuel assembly)
Unit 4	Reactor	Undergoing a periodic inspection (disconnection from the grid on November 29, 2010; all fuel assemblies were removed; the pool gate closed; and the reactor well filled with water)
	Spent fuel pool	1,535 fuel assemblies (including 204 new ones)
Unit 5	Reactor	Undergoing a periodic inspection (disconnection from the grid on January2, 2011; RPV pressure tests under way; and the RPV head put in place)
	Spent fuel pool	994 fuel assemblies (including 48 new ones)
Unit 6	Reactor	Undergoing a periodic inspection (disconnection from the grid on August 13, 2010 and the RPV head put in place)
	Spent fuel pool	940 fuel assemblies (including 64 new ones)
Common pool		6,375 fuel assemblies (stored in each Unit's pool for 19 months or more)

III. OCCURRENCE AND PROGRESSION OF THE ACCIDENT AT THE FUKUSHIMA DAI-ICHI NPS

A. March 11, 2011[3]

1) 14:46: The earthquake which occurred on March 11, 2011 brought all of the Fukushima Daiichi NPS Units 1 through 3, which were in operation, to an automatic shutdown due to the high earthquake acceleration. Due to the trip of the power generators that followed the automatic shutdown of the reactors, the station power supply was switched to the offsite power supply. The Nuclear Power Station (NPS) was unable to receive electricity from offsite power transmission lines mainly because some of the steel towers for power transmission outside the NPS site collapsed due to the earthquake. For this reason, the emergency diesel generators (hereinafter referred as DGs) for each Unit were automatically started up to maintain the function for cooling the reactors and the spent fuel pools. Later, all the emergency DGs except one for Unit 6 stopped because the emergency DGs, seawater systems that cooled the emergency DGs, and metal-clad switchgears were submerged due to the tsunami that followed the earthquake, and the result was that all Alternate Current (hereinafter referred to as AC) power supply was lost at Units 1 to 5.

2) 15:42: TEPCO determined that this condition fell under the category of specific initial events defined in Article 10 of the Act on Special Measures Concerning Nuclear Emergency Preparedness (hereinafter referred to as Nuclear Emergency Preparedness Act) and notified the Japanese national government, local governments, and other parties concerned.

3) 16:36: TEPCO found the inability to monitor the water level in the reactors of Units 1 and 2, and determined that the conditions of Unit 1 and 2 fell under the category of an event that is — unable to inject water by the emergency core cooling system as defined in Article 15 of the Nuclear Emergency Preparedness Act.

4) *16:45:* The Company notified Nuclear and Industrial Safety Agency (hereinafter referred as NISA) and other parties concerned of this information. TEPCO opened the valve of the Isolation Condenser (hereinafter referred as IC) System A of Unit 1 IC, and in an effort to maintain the functions of the IC, it continued to operate it mainly by injecting fresh water into its shell side. Immediately after the tsunami, TEPCO could not confirm the operation of the Reactor Core Isolation Cooling (hereinafter referred to as RCIC) system of Unit 2, but confirmed about 3:00 on March 12 that it was operating properly. Unit 3 was cooled using its RCIC system, and as a result, the Primary Containment Vessel (hereinafter referred to as PCV) pressure and water levels remained stable. In order to recover the power supply, TEPCO took emergency measures such as making arrangements for power supply vehicles while working with the government, but its efforts were going rough.

5) 23:00: Later, it was confirmed that the radiation level in the turbine building of Unit 1 was increasing.

B. March 12, 2011

1) *0:49 :* TEPCO confirmed that there was a possibility that the PCV pressure of the Unit 1 had exceeded the maximum operating pressure and determined that the event corresponded to the event -abnormal increase in the pressure in the primary containment vessel' as defined in the provisions of Article 15 of the Nuclear Emergency Preparedness Act. For this reason, in accordance with Article

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64, Paragraph 3 of the Reactor Regulation Act, the Minister of Economy, Trade and Industry ordered TEPCO to reduce the PCV pressure of Units 1 and 2.

2) *5:46:* The Company began alternative water injection (fresh water) for Unit 1 using fire engines. In addition, TEPCO began preparations for PCV venting because the PCV pressure was high, but the work ran into trouble because the radiation level in the reactor building was already high.

3) 11:36: Meanwhile, the RCIC system of Unit 3 stopped. But later, the High Pressure Coolant Injection (hereinafter referred to as HPCI) system was automatically activated, which continued to maintain the water level in the reactor at a certain level.

4) 14:30: A decrease in the PCV pressure level in Unit 1 was actually confirmed.

5) 15:36: Subsequently, an explosion considered as a hydrogen explosion, occurred in the upper part of the Unit 1 reactor building.

C. March 13, 2011

1) 2:42: It was confirmed that the HPCI system of Unit 3 had stopped. After the HPCI system stopped, TEPCO performed wet venting to decrease the PCV pressure.

2) 9:25: Fire engines began alternative water injection (fresh water) into the reactor of Unit 3. In addition, PCV venting was performed several times. As the PCV pressure increased, PCV venting was performed several times. As a result, the PCV pressure was decreased.

3) 11:00: The wet venting line configuration had been completed in Unit 2.

D. March 14, 2011

1) *11:01:* An explosion that was considered as a hydrogen explosion occurred in the upper part of the reactor building in Unit 3.

2) 13:25: TEPCO determined that the RCIC system of Unit 2 had stopped because the reactor water level was decreasing, and began to reduce the Reactor Pressure Vessel (hereinafter referred to as RPV) pressure and inject seawater into the reactor using fire-extinguishing system lines. TEPCO continued to cool the reactor core using the fire pumps loaned by a fire department.

E. March 15, 2011

1) 6.00: Even though the wet venting line configuration had been completed in Unit 2 by 11.00 on March 13, but the PCV pressure exceeded the maximum operating pressure. An impulsive sound that could be attributed to a hydrogen explosion was confirmed near the suppression chamber (hereinafter referred to as S/C), and later, the S/C pressure decreased sharply.

2) *6.00:* The total AC power supply for Unit 4 was also lost due to the earthquake and tsunami, and therefore, the functions of cooling and supplying water to the spent fuel pool were lost. Around on March 15, an explosion that was considered as a hydrogen explosion occurred in the reactor building, damaging part of the building severely.

3) 22:00: In accordance with Article 64, Paragraph 3 of the Reactor Regulation Act, the Minister of Economy, Trade and Industry ordered TEPCO to inject water into the spent fuel pool of Unit 4.

F. March 17, 2011

A Self-Defense Forces helicopter sprayed seawater into the spent fuel pool of Unit 3 from the air. Later, seawater was sprayed into the pool using high-pressure water-cannon trucks of the National Police Agency's riot police and fire engines of the Self-Defense Forces.

G. From March 19, 2011 to March 25, 2011

Tokyo Fire Department, Osaka City Fire Bureau and Kawasaki City Fire Bureau, that were dispatched as Emergency Fire Response Teams, sprayed seawater in Unit 3 for five times by using seawater supply system against fire and squirt fire engines. In addition, Yokohama City Fire Bureau, Nagoya City Fire Bureau, Kyoto City Fire Bureau and Kobe City Fire Bureau dispatched their fire engines to Fukushima Daiichi NPS or in readiness. Niigata City Fire Bureau and Hamamatsu City Fire Bureau assisted to set up large-scale decontamination system.

H. March 20, 2011

1) 14.30: The total AC power supply for Unit 5 was also lost due to the earthquake and tsunami, resulting in a loss of the ultimate heat sink. As a result, the reactor pressure continued to increase, but TEPCO managed to maintain the water level and pressure by injecting water into the reactor by injecting water into the reactor by operating Make-Up Condensing Water Pump after the power was supplied from Unit 6. Later, the company activated a temporary seawater pump, bringing the reactor to a cold shutdown condition at 14:30 on March 20.

2) *19:27:* One of the emergency DGs for Unit 6 had been installed at a relative high location, and as a result, its functions were not lost even when the NPS was hit by the tsunami, but the seawater pump lost all functionality. TEPCO installed a temporary seawater pump while controlling the reactor water level and pressure by injecting water into the reactor and reducing the reactor pressure on a continuous basis. By doing this, the company recovered the cooling functions of the reactor, thus bringing the reactor to a cold shutdown condition at 19:27 on March 20

I. March 20, 2011 and March 21, 2011

Fresh water was sprayed into the spent fuel pool of Unit 4.

J. March 22, 2011

A concrete pump truck started to spray seawater onto the spent fuel pool of Unit 4.

K. March 27, 2011

Later, the concrete pump truck started to spray seawater into the spent fuel pool of Unit 3

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L. March 30, 2011

The spraying of freshwater instead of seawater started in Unit 4.

M. March 31, 2011

- The concrete pump truck started to spray seawater into the spent fuel pool of Unit 1
- After the accident, seawater was used for cooling the reactors and the spent fuel pools for a certain period of time, but the coolant has been switched from seawater to fresh water with consideration given to the influence of salinity.

TABLE III. ESTIMATED AMOUNT OF RADIONUCLIDE RELEASED INTO THE AIR DUE TO THE ACCIDENT [2]

	Released Amount (PBq)			
	Rare Gas	**^{131}I**	**^{134}Cs**	**^{137}Cs**
TEPCO	About 500	About 500	About 10	About 10
JAEA Nuclear Safety Commission 12th April 2011		150		13
NISA (Nuclear and Industrial Safety Agency) 12th April 2011		130		6.1
IRSN(Institut de Radioprotection et de Surete Nucleaire)	2000	200		
Accident at Chernobyl Nuclear Power Plant[1]	6500	1800		85

IV. MAIN FACTORS THAT DEVELOPED THE EVENTS OF ACCIDENT

This accident caused serious core damage in Units 1 through 3 of Fukushima-Daiichi NPS.The estimated amount of radionuclide released into the air due to the accident is given in Table III. But Units 5 and 6 of Fukushima-Daiichi NPS succeeded in cold shutdown without causing core damage. If any disturbance occurs in a plant during power operation, such as an event of loss of off-site power supply, the following three functions are required to shift the plant into the cold shutdown state; reactor sub-criticality maintenance, core cooling, and removal of decay heat from PCV.The main factors that hindered reaching cold shutdown were:

A. AC power was not recovered early because:

1) It was impossible to interchange electricity because of simultaneous loss of AC power for neighboring units

2) Metal-clad switchgear and other accessory equipment were inundated due to tsunami

3) Off-site power supply and emergency DG was not recovered early

B. Due to accident management carried out at the time of total AC power loss, core cooling was maintained for some time but was not sustained up until recovery of power supply.

C. The tsunami caused loss of functions of the system of transporting heat to the sea, which is the ultimate heat sink.

D. There was no sufficient means to substitute for the function

V. LESSONS TO BE LEARNT FROM THE FUKUSHIMA NUCLEAR DISASTER

A. It should be ensured while considering external natural hazards:

1) The site and the design of nuclear plants should have sufficient protection against infrequent but possible complex combinations of external events .These should be included in the plant safety analysis – especially those events that can cause site flooding and which may have long term impact.

2) The plant layout should be based on ensuring a 'dry site concept'. This is a defence measure against site flooding as well as physical separation and diversity of critical safety systems.

3) It is highly imperative to consider common cause failure for multiple unit sites and multiple sites

4) Any changes in external hazards or understanding of them should be periodically reviewed for their impact on the current plant configuration

5) An active tsunami warning system should be put in place with the provision for immediate operator action.

B. For a severe accident scenario which include as total loss of off-site power or loss of all heat sinks or the engineering safety systems, the necessary equipment such as mobile power, compressed air and water supplies should be provided for accident management.

C. For a severe accident scenario which include as total loss of off-site power or loss of all heat sinks or the engineering safety systems, the necessary equipment such as mobile power, compressed air and water supplies should be provided for accident management.

D. The provisions given in Lesson 2 should be kept at a safe place and the plant operators should be given training to use them. Thus centralized stores (for storing the emergency equipment) and the means to rapidly transfer the necessary equipment to the affected site should be put in place.

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E. Emergency Response Centres should have available as far as practicable essential safety related parameters based on hardened instrumentation and lines such as coolant levels, containment status, pressure, etc., and have sufficient secure communication lines to control rooms and other places on-site and off-site.

F. Severe Accident Management Guidelines and associated procedures should take account of the potential unavailability of instruments, lighting, power and abnormal conditions including plant state and high radiation fields.

G. External events have a potential of affecting several plants and several units at the plants at the same time. This requires a sufficiently large resource in terms of trained experienced people, equipment, supplies and external support. An adequate pool of experienced personnel who can deal with each type of unit and can be called upon to support the affected sites should be ensured.

H. The risk and implications of hydrogen explosions should be revisited and necessary mitigating systems should be implemented.

I. Particularly in relation to preventing loss of safety functionality, the robustness of defence-in-depth against common cause failure should be based on providing adequate diversity (as well as redundancy and physical separation) for essential safety functions.

J. Greater consideration should be given to providing hardened systems, communications and sources of monitoring equipment for providing essential information for on-site and off-site responses, especially for severe accidents.

K. The use of IAEA Safety Requirements and related guides on threat categorization, event classification and countermeasures, as well as Operational Intervention Levels, could make the off-site emergency preparedness and response even more effective in particular circumstances.

L. The use of long term sheltering is not an effective approach and has been abandoned and concepts of 'deliberate evacuation' and 'evacuation-prepared area' were introduced for effective long term counter measures using guidelines of the International Commission on Radiological Protection (ICRP) and International Atomic Energy Agency (hereinafter referred as IAEA).

M. The international nuclear community should take advantage of the data and information generated from the Fukushima accident to improve and refine the existing methods and models to determine the source term involved in a nuclear accident and refine emergency planning arrangements.

N. Large scale radiation protection for workers on sites under severe accident conditions can be effective if appropriately organized and with well led and suitable trained staff.

O. Exercises and drills for on-site workers and external responders in order to establish effective on-site radiological protection in severe accident conditions would benefit from taking account of the experiences at Fukushima.

P. Nuclear regulatory systems should ensure that regulatory independence and clarity of roles are preserved in all circumstances in line with IAEA Safety Standards.

VI. Conclusion

The site and the design of nuclear plants should have sufficient protection against infrequent but possible complex combinations of external events. The necessary equipment such as mobile power, compressed air and water supplies should be provided for accident management. Severe Accident Management Guidelines and associated procedures should take account of the potential unavailability of instruments, lighting, power and abnormal conditions including plant state and high radiation fields. Precaution should be taken to prevent hydrogen explosion.

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Nutraceuticals: Microbiology & Biotechnology

Biotechnology in the Production of Nutraceuticals

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Abstract— **Nutraceuticals are the natural bioactive, chemical compounds that have health promoting, disease preventing or medicinal properties. Consumers are deeply concerned about how their health care is managed, administered and proceed. They are frustrated with the expensive, high tech, disease treatment approach prominent in modern medicine, the consumer is seeking complementary or alternative beneficial products and the red tape of managed care makes nutraceuticals particularly appealing. Nutraceuticals may range from isolated nutrients herbal products, dietary supplements and diets to genetically engineered "designs" foods and processed products such as cereals, soups and beverages.**

Key words— **Bioprocess Engineering, Microbial production, Neutraceutics**

I. Introduction

It was defined as "a food or part of food", that provides medical or health benefits including the prevention and treatment of disease (Bieselskl *et al*., 2001). The term "Nutraceutical" was first coined by Dr. Stephen L. Defelice as "a product isolated or purified from foods and sold in medicinal forms. They have physiological benefit. Nutraceutical is a combination of 2 words i.e. Nutrition and Pharmaceutical.

Nutraceuticals are the products that provide health as well as medical benefits; including the prevention and treatment of disease. Phytochemicals and antioxidants are two specific types of nutraceuticals. Research has proved that foods with phytochemicals may help to provide protection from diseases such as cancer, diabetes, heart disease, and hypertension, e.g. carotenoids found in carrots (Naguib, 2000). Antioxidants may be helpful in avoiding chronic diseases, by preventing oxidative damage in our body. Over the last 20 years, numbers of Nutraceuticals are available for selfmedication or for sale. There has been a boom in sale of Nutraceutical because of following 3 main points.

- Adverse effects of pharmaceuticals
- Increased tendency of patients for self-medication
- Aging population e.g. - arthritis

Presently over 470 nutraceutical and functional food products are available with documented health benefits (Andlauer and Furst, 2002). Nutraceuticals sometimes referred as "functional foods", have caused heated debate because they blur the traditional dividing line between food and medicine. When food is being cooked or prepared using "scientific intelligence" with or without the knowledge of how or why it is being used, then the food is called as "functional food." Thus, functional food provides the body with the required amount of vitamins, fats, proteins, carbohydrates necessary for healthy survival. When functional food aids in the prevention and/or treatment of disease(s)/disorder(s) other than deficiency conditions like anemia it is called a "nutraceutical" (Since most of the functional foods act in some way or the other as antianemic, the exception to anemia is considered so as to have a clear distinction between the two terms, functional food and nutraceuticals. (Bratman and Krol, 1999). As mentioned earlier functional foods contain larger profit margins than conventional foods (30 to 500% higher).The global market size is estimated between 30 and 60billion US$, with Japan, US, and Europe occupying the biggest share. By 2010, the nutraceutical demand is forecast to touch $197 billion.. Examples of nutraceuticals include fortified dairy products (milk as such is a nutrient and its product casein is a pharmaceutical) and citrus fruits (its constituent ascorbic acid is a pharmaceutical) (Satoh *et al*., 2009).

The use of nutraceuticals, as an attempt to accomplish desirable therapeutic outcomes with reduced side effects, as compared with other therapeutic agents has met with great monetary success. The preference for the discovery and production of nutraceuticals over pharmaceuticals is well appreciated by the pharmaceutical and biotechnology companies. There is, thus, a proliferation of these value-added products aimed at not only keeping oneself healthy but also prevention/treatment of various ailments ranging from heart diseases to cancer

II. The Present Status

Nutraceuticals are gaining acceptance worldwide because of their ability to address several diseases. An increasing demand for health-promoting food products as well as non-food products containing the active principles present in these health-promoting foods among the consumers has been shown by various marketing surveys carried out by different industries. Vitamins, minerals and nutrients constitute about 85% of the global market while antioxidants and related products account for about 10%. The other segments such as herbal extracts occupy 5% of the market.

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The US has been the major market for nutraceuticals with India and China emerging as the fastest growing markets. Traditional medicine is also finding its place in the present healthcare system in the form of herbal dietary supplements. Many known and also some novel bioactive phytochemicals have been isolated from the various herbal medicines used in Traditional Chinese Medicine and Ayurvedic Medicine. Several phytochemicals present in the edible plant materials and plant extracts used in traditional medicine or in dietary supplements are freely available to the public e.g. isoflavones present in soyabeans and different phytosterols in Cissus quadrangularis (Giri *et al*., 2004). The role of traditional soy-food in disease prevention and treatment has gained worldwide recognition because of its antidiarhoeal, hypolipidaemic, anticancerogenic and antiosteoporotic effects. Isoflavone phytoestrogens in soy, such as daidzein and genistein, are known to be responsible for the biological activities (Andlauer and Furst , 2002). High soy food consumption has been linked with lower risk of breast and prostate cancer and is believed to improve bone mineral content.

Another area which has received considerable attention in the recent times is that of the prebiotics and polyunsaturated fatty acids (PUFAs). PUFA are fatty acids that contain more than one double bond, which are separated from each other by a single methylene group. Diets rich in PUFAs have been shown to positively influence immune function (Bell and Goodricke, 2005), blood pressure, cholesterol and triglycerides levels, and cardiovascular function in animals and human. Prebiotics are non-digestible food ingredients, which beneficially affect the host by stimulating growth, activity or both of specific intestinal bacteria. The possible beneficial effects of prebiotics include the control intestinal transit of time and bowel habits, and reduction of risk of atherosclerosis, osteoporosis, obesity, type-2 diabetes, cancer, infections and allergies, although their effectiveness in humans is still controversial (Roberfroid, 2007).

III. Categories of Nutraceuticals

Nutraceuticals are non-specific biological therapies used to promote wellness, prevent malignant processes and control symptoms. These can be grouped into the following three broad categories. (Harel and Clayton, 2004)

A. Nutrients

B. Herbals

C. Dietary supplements

A. Nutrients

The substances with established nutritional functions, such as vitamins, minerals, amino acids and fatty acids are known as nutrients. The most commonly known nutrients are antioxidant, water and fat-soluble vitamins. Many potential benefits have been attributed to antioxidant use in the form of dietary intake or supplementation. Antioxidants, in general, may be useful in the prevention of cancer and cerebrovascular disease. High dietary intake of vitamin E may prevent Parkinson's disease. (Klein, *et al*., 2000). The oxidized form of vitamin C, dehydro-ascorbic acid readily crosses the blood brain barrier.These findings have implication for increasing the uptake of antioxidant in the central nervous system thus some feel that this has potential for improving the treatment of Alzheimer's disease. Vitamin E, C and Beta carotene has been useful in reducing low density lipoprotein oxidation and subsequent atherosclerosis..The genetically predisposed to pancreatic cancer have low serum level of selenium thus it is assumed that supplementation with selenium many help to prevent this conditions .Zinc is an essential components of more than hundred enzymes involving digestion, metabolism and wound healing. L- Arginine is semi-essential amino acid that is a substrate for nitric oxide production.

TABLE I. COMMON NUTRIENTS ASSOCIATED WITH HEALTH

S.No.	Bioactive molecules	Health Benefits
1.	Vitamin A	Antioxidants, essential for growth and development, maintain healthy vision, mucous membrane
2.	Vitamin K	Essential for blood clotting
3.	Vitamin B12	Help in growth and reproduction of cell
4.	Calcium	Essential for building bones, teeth and maintaining bone's strength, important in functioning of muscles, nerves and glandular functions
5.	Iron	Helps in energy metabolism, Oxygen transporting agent
6.	Chromium	Coordinates with insulin for carbohydrate metabolism to produce energy
7.	Cobalt	Essential component of vitamin B12

B. Herbals

The products which are obtained from herbs or botanical substances as concentrates and extracts are known as herbals. The knowledge of herbals has accumulated over thousands of years and today we have many effective means of ensuring health care. Numerous nutraceuticals are present in medicinal herbs as key components, been given to discover the link between dietary nutrients and disease prevention. Large number of herbs, which had been in use since ancient time, has been shown to play a crucial role in the prevention of disease. In addition to the macro and micro nutrients such as proteins, fats, carbohydrates, vitamins or minerals necessary for normal metabolism, a plant based diet contains numerous nonnutritive photo-constituents which may also play role in health enhancement (Marrazzi *et al*., 2011).

The Nutraceuticals market comprises two principal segments: Functional Foods and Dietary Supplements. Given in the table is a list of Nutraceutical herbal plants, and the information on specified organs of these plants that serve as source of material that can be used directly or in the form of processed products. The table also mentions the conditions for which the plant materials have proved useful. There is need

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for domestication and cultivar development for cultivated production of these plants. The post-harvest processing technologies that will allow material to remain active and hygienic also need to be worked out for a large majority of these plants.

TABLE II. COMMON HERBALS AND THEIR USES

S.No.	Plant Species Used	Common Name	Disease for which used	Form Used
1.	*Agave americana*	Ramban	Sepsis	Leave's sap
2.	*Allium sativum*	Garlic	Chemo – prevention of cancer, cholesterol, arteriosclerosis	Fresh or dried
3.	*Amaranthus* sp.	Chaulai	Cardiovascular disease	Oil from seeds
4.	*Asparagus* sp.	Shatavari	Nervine tonic	Astringent roots
5.	*Berberis asiatica*	Berberry	Treating ulcer, ophthalmia, UT Infection	Roots and berries

C. Dietary supplements

A dietary supplement is a product taken by mouth that contains a "dietary ingredient" intended to supplement the diet. The "dietary ingredients" in these products may include: vitamins, minerals, herbs or other botanicals, amino acids, and substances such as enzymes, organ tissues, glandular, and metabolites.

They are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination. (Bhagwan, 2002). Dietary supplements contain all products that can be purchased by the consumer without a prescription. Many potential benefits have been attributed to antioxidant use in the form of dietary intake or supplementation. Antioxidants, in general, may be useful in the prevention of cancer and cerebro-vascular disease. (Brouns *et al*., 2002). Dietary supplements are not classified as drugs. The main difference is that they do not have approved therapeutic claims unlike in the case of drugs. Moreover, dietary supplements could either contain vitamins, minerals, herbals, or amino acids, all aimed to add to or supplement the diet of an individual. They are not intended to be taken alone as a substitute to any food or medicine.

The two nutraceuticals namely glucosamine sulfate and Chondrotin sulfate are effective and safer to alleviate symptoms of osteoarthritis Immune milk products are promising examples of health promoting nutraceuticals. Numerous casein and whey protein derived angiotensin -1-converting enzyme inhibitory peptides/ hydrolysate have been identified. These peptides/ hydrolysate may be classified as nutraceuticals due to their ability to provide health benefits (Shibata *et al*., 2003)

IV. TYPES OF NUTRACEUTICALS

A. Plant based nutraceuticals

B. Micro-organism based nutraceuticals

A. Plant based nutraceuticals

Plant based nutraceuticals are those nutraceuticals which are produced from plants. These are mainly processed foods, dietary supplements etc. which contain products like cereals, soups, soya foods and beverages (Spiller and Dewell, 2003). There are many nutraceutical companies which deal with plant derived products; the main companies involved in pharmaceutical and major food companies. Some common companies are Kellogg, Heinz, Quaker Oats, Unilever, Cargill, Hormel, Glaxo - SmithKline, Warner-Lambert, Johnson & Johnson and Wyeth. Plant derived nutraceuticals are of great importance in present system of Medicine and Healthcare. Nutraceutical professionals and regulatory bodies need to play a major role for safety maintenance and advances of nutraceuticals. Future demand of nutraceutical depends upon consumer perception of mankind and the relationship between diet and disease. The mainly used nutraceutical products which are derived from plants contain some chemical compounds and they are used as nutraceuticals. These common compounds are listed as under

TABLE III. COMMON PLANT BASED NEUTRACEUTICALS

S.No.	Chemical Compd & source	Properties
1.	Betaine, Trimethyl Glycine, obtained from green vegetables and germinating grains	Reduces toxic build up of homocysteine
2.	Bromelain from *Ananas* sp. Used to prevent heart disease, aging, inflammation	The pineapple protease has medicinal properties
3.	Ellagic acid of Raspberry & strawberry	Anticancer & Antiaging

B. Micro-organism based nutraceuticals

Micro-organism nutraceuticals are those nutraceuticals which are produced from microbes vioz. algae, bacteria, fungi and yeast and virus. Bacteria, yeast, fungi and microalgae can act as producers (or catalysts for the production) of food ingredients, enzymes and nutraceuticals. With the current trend towards the use of natural ingredients in foods, there is renewed interest in microbial flavours and colours, food bioprocessing using enzymes and food biopreservation using bacteriocins. Microbial production of substances such as organic acids and hydrocolloids also remains an important and fast-changing area of research.

1) Nutraceuticals production by Bacteria

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Bacterial Nutraceuticals have been documented physiological benefit on human health. Consumption of nutraceuticals has been claimed to reduce the risk of certain chronic diseases e.g. diabetes, hypertension, immune-regulatory diseases etc. Generally, the major nutrient constituents in bacterial nutraceuticals are antioxidants, which are known to be efficacious in the treatment and prevention of a wide range of chronic illnesses. Examples are phenolics or more accurately described as polyphenolics such as tocopherols and tocotrienols. Polyphenol antioxidants are generally believed to be instrumental in combating oxidative stress in humans, a process associated with some neurodegenerative diseases and some cardiovascular diseases. Typically, nutraceutical compositions are formulated in various forms depending on intended application e.g. solutions, colloidal dispersions, oil-in-water or water-in-oil suspensions, creams, gels, lotions, powders, foams, mousses, suppository etc. The tocotrienol containing powder of US-372 mainly comprises an oil containing tocotrienol, cellulose, lecithin, an emulsifying agent (gelatin, casein sodium, arabic gum or modified starch), and a powdery substance as an oil absorbent .The food product that reportedly provides health and medical benefits, including the prevention and treatment of disease is nutraceutical. Bacteria such as lactic acid bacteria (LAB) are used all over the world in a large variety of industrial food fermentations (Chelule *et al.,* 2010). Their contribution in these fermentation processes primarily consists of the formation of lactic acid from the available carbon source resulting in a rapid acidification of the food raw-material, which is a critical parameter in the preservation of these products. However, besides their lactic acid forming capacity, LAB also have the ability to contribute to other product characteristics like flavour, texture and nutrition. Examples are the yoghurt bacterium *Streptococcus thermophilus* and the cheese and butter (milk) bacterium *Lactococcus lactis*. This property offers the possibility to fortify fermented dairy products with folate by natural means, i.e. without the addition of food supplements. Some lactic acid bacteria, such as *Lactococcus lactis*, are able to produce and excrete riboflavin into the surrounding medium. *Lactobacillus reuteri*, some interesting observations were made on the production of a nutraceutical which is a cobalamin-like substance, especially in the presence of glycerol which is converted in this organisms to propanediol (and to hydroxypropionaldehyde, reuterin) through a cobalamin dependent enzymatic step.

Heterofermentative lactic acid bacteria such as *Leuconostoc mesenteroides* are known for their ability to produce mannitol in the fermentation of fructose. These bacteria convert part of the fructose for energy generation via the usual heterofermentative pathway while the other part of fructose is reduced directly to mannitol, high yield of mannitol is found, especially when fructose is supplied with glucose. Also, considerable sorbitol production, another important nutraceutical has been observed in *Lactobacillus plantarum* strains. The use of lactic acid bacteria could, very well, be an attractive alternative in the production of tagatose.

2) Nutraceutical production by Yeast

Yeast are eukaryotic microorganisms. These are unicellular species and its size vary from 3- 4 µm ,although some species of yeast can reach over 40 µm. Most of the yeast produces asexually by mitosis. Yeast play important role in nutraceutical production. The yeast *Saccharomyces cerevisiae* is the best known microorganism and therefore widely used in many branches of industry .It aims to investigate the accumulation of three inorganic zinc salts.The research depends on ability of this yeast to absorb zinc from liquid medium and such enriched biomass use as a potential source of microelements in animal and/or human nutrition *Saccharomyces cerevisiae* is well-studied organism, which can serve as model system for the metals accumulation in fairly high concentrations; thus it is widely used in many branches of industry, i.e. biosorption, as a cost-effective biotechnology (Chen and Wang. 2007), or in other part of industry (feed and food) because it is a high quality protein source rich in B-vitamins, amino acids and other various elements, i.e. Ca, Co, Fe, K and Na (Swanson and Fahey. 2004). A very large number of proteins require metals for catalytic activity and/or for maintaining protein structure More than 300 zinc enzymes are known, in which zinc play a regulatory role or is required for structure or catalytic activity. The uptake and accumulation of zinc by yeast is biphasic and consists of a metabolism-independent and a metabolism dependent stage. This study aims to investigate the influence of Zn^{2+} on the yield of *Saccharomyces cerevisiae* biomass and presents the ability of zinc absorption into the cells.The study confirmed the suitability of yeast as a supplement in nutrition for their nutraceutical or health-promoting attributes.

3) Nutraceutical production by Fungi

Fungi are eukaryotic organism that develop from the reproductive bodies called **Spores** They are normally single or multicellular and they tend to lack of chlorophyll. It include mushrooms, molds, yeast and toadstools Fungi play important role in producing nutraceuticals .Research on mushroom as a potential source of nutraceuticals . Mushrooms are highly nutritive, low-calorie food with good quality proteins, vitamins and minerals. Mushrooms are an important natural source of foods and medicines. Mushrooms have become attractive as a functional food and as a source for the development of drugs and nutraceuticals responsible with their antioxidant, antitumor (Jones and Janardhanan, 2000) and antimicrobial properties. Besides their pharmacological features, mushrooms are becoming more important in our diet due to their nutritional value, related to high protein and low fat / energy contents. *Trametes versicolor* (L.) Lioyd has been considered among the 25 major medicinal macrofungi worldwide, mainly due to its traditional usage. Interesting polysaccharopeptides have been purified from this species, showing experimental immunomodulatory and anti-cancer effect (Bielselski, 2001). A native strain of *Trametes versicolor* (Coriolaceae) was isolated and cultivated under laboratory conditions. Mushroom is an excellent source of

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folic acid, the blood building vitamin that prevents anaemia. Mushroom protein is comparable to muscle protein in terms of nutritive value. The species that have been properly analysed for medicinal value are: *Ganoderma lucidum* (Reishi), *Lentinus edodes* (Shiitake), *Grifola frondosa* (Maitake), *Agaricus blazei* (Hime-matsutake), *Cordyceps militaris* (Caterpillar fungus), *Pleurotus ostreatus* (Oyster mushroom) and *Hericium erinaceous* (Lions mane). There are many more species of cultivated and wild edible and non-edible mushrooms that have been analysed for both their nutritional and nutraceuticals components. The active constituents found in mushrooms are polysaccharides, dietary fibres, oligosaccharides, triterpenoids, peptides and proteins, alcohols and phenols, and mineral elements such as zinc, copper, iodine, selenium and iron, vitamins, amino acids etc. These have been found to boost the immune system, have anti-cancerous properties, act as anti-hypercholesterolemia and hepato-protective agents, show anti-HIV activity and anti-viral activity, and ameliorate the toxic effect of chemo- and radiotherapy. Many of the species are known to be aphrodisiacs. Oxidation is essential for all living organisms for the production of energy to fuel biological processes.

4) Nutraceutical production by Algae

Algae are a diverse group of autotrophic organisms that have the ability to grow rapidly, efficiently use light energy, fix atmospheric CO_2, and produce more biomass per acre than vascular plants. Algae have been used as a food source and for treatment of various ailments for over two thousand years .Algae can form numerous compounds that are currently present in nutraceuticals and have the potential to become more intensively exploited. Different types of algae, specifically Microalgae, that could become more prevalent in food supplements and nutraceuticals are *Nostoc*, *Botryococcus*, *Anabaena*, *Chlamydomonas*, *Scenedesmus*, \ *Synechococcus*, *Parietochloris,* and *Porphyridium* etc. due to the capability of producing necessary vitamins including: A (Retinol), B_1 (Thiamine), B_2 (Riboflavin), B_3 (Niacin), B_6 (Pyridoxine), B_9 (Folic acid), B_{12} (Cobalamin), C (L-Ascorbic acid), D, E (Tocopherol), and H (Biotin). Also, these organisms concentrate essential elements including: Potassium, Zinc, Iodine, Selenium, Iron, Manganese, Copper, Phosphorus, Sodium, Nitrogen, Magnesium, Cobalt, Molybdenum, Sulfur and Calcium. Algae are also high producers of essential amino acids and Omega 6 (Arachidonic acid) and Omega 3 (docosahexaenoic acid, eicosapentaenoic acid) fatty acids. Due to their abundant production of beneficial compounds and nutritive contents, the market for increased algae production for nutraceuticals is lucrative and imminent.

Microalgae are an enormous biological resource, representing one of the most promising sources for new products and applications (Abdulqadar *et al*., 2000). They can be used to enhance the nutritional value of food and animal feed, due to their well-balanced chemical composition. Moreover, they are cultivated as a source of highly valuable molecules such as polyunsaturated fatty acids, pigments, antioxidants, pharmaceuticals and other biologically active compounds. The application of microalgae biomass and/or metabolites is an interesting and innovative approach for the development of healthier food products. Microalgae biotechnology is similar to conventional agriculture, but has received quite a lot of attention over the last decades, because they can reach substantially higher productivities than traditional crops and can be extended into areas and climates unsuitable for agricultural purposes (e.g. desert and seashore lands). Microalgae production is an important natural mechanism to reduce the excess of atmospheric CO_2 by bio-fixation and recycling of fixed C in products, ensuring a lower greenhouse effect, reducing the global environmental heating and climate changes. Microalgae cultivation also presents less or no seasonality, are important as feed to aquaculture and life-support systems, and can effectively remove nutrients (or pollutants e.g nitrogen and phosphorus) from water. Microalgae systems for sunlight driven environmental and production applications can clearly contribute to sustainable development and improved management of natural resources. Lately, microalgae have been seen with a great potential as a sustainable feedstock for biodiesel production, in substitution for oil from vegetable crop and also for hydrogen production (Cetrik and Shimizu, 1999). The main applications of microalgae in feed and food products focusing the authors'work on this subject, for the last years. Microalgae use by indigenous populations has occurred for centuries. However, the cultivation of microalgae is only a few decades old and among the 30000 species that are believed to exist only a few thousands strains are kept in collections, a few hundred are investigated for chemical content and just a handful are cultivated in industrial quantities (Miyamoto et al., 2006). Some of the most biotechnologically relevant microalgae are the green algae (Chlorophycea) *Chlorella vulgaris*, *Haematococcus pluvialis*, *Dunaliella salina* and the Cyanobacteria *Spirulina maxima* which are already widely commercialized and used, mainly as nutritional supplements for humans and as animal feed additives (Guzman et al., 2003, Kittaka *et al*., 2002, Lorenz and Cysewski, 2000, Raja *et al*., 2007, Sansawa *et al*., 2006)

V. Application of Nutraceuticals

A. Antibacterial activity

Antibacterial activity has been displayed by a number of flavonoids. Quercetin has been reported to completely inhibit the growth of Staphylococcus aureus. Most of the flavonones having no sugar moiety showed antimicrobial activities whereas none of the flavonols and flavonolignans tested showed inhibitory activity on microorganisms.

B. Antifungal activity

A number of flavonoids isolated from the peelings of tangerine orange, when tested for fungistatic activity towards Deuterophoma tracheiphila were found to be active; nobiletin

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an langeritin exhibited strong and weak activities, respectively, while hesperidin could stimulate fungal growth slightly.

C. Hepatoprotective activity

The liver is subject to acute and potentially lethal injury by several substances including phalloidin (the toxic constituent of the mushroom, *Amanita phalloides*), CCl_4, galactosamine, ethanol, and other compounds. Flavonoids have also been found to possess hepatoprotective activity. In a study carried out to investigate the flavonoid derivatives silymarin, apigenin, quercetin, and naringenin, as putative therapeutic agents against microcrystin LR-induced hepatotoxicity, silymarin was found to be the most effective one. The flavonoid, rutin and venoruton, showed regenerative and hepatoprotective effects in experimental cirrhosis.

D. Anti-inflammatory activity

The anti-inflammatory activity of flavonoids in many animal models have been reported. Flavone/flavonol glycosides as well as flavonoid aglycons have been reported to flavones/flavonols kaempferol, quercetin, myricetin, fisetin were reported to possess LO and COX inhibitory activities.

E. Antidiabetic effects

Flavonoids, especially quercetin, has been reported to possess antidiabetic activity. Vessal et al reported that quercetin brings about the regeneration of pancreatic islets and proprably increases insulin release in strptozotocin-induced diabetic rats. Also in another study, Hif and Howell reported that quercetin stimulate insulin release and enhanced Ca^{2+} uptake from isolated islets cell which suggest a place for flavonoids in noninsulin- dependent diabetes (Vessal *et al.*,2003)

VI. ROLE OF BIOTECHNOLOGY IN NUTRACEUTICALS DEVELOPMENT:

Biotechnology has a key role to play in this new area of the food industry focused on the major energy-providing foods. More recently, there has been increased interest in biologically active non-nutritive ingredients (or components) from natural products or foods. Major breakthroughs have occurred and enormous progress has been made during the past decade in all aspects of biotechnological nutraceutical development. It has been given high priority by researchers in the production of probiotics and the extraction of bioactive components by enzyme/fermentation technology as well as genetic engineering technology. Changing values in society, for instance with respect to recombinant DNA, and the growing need to explore all the alternative food sources has made the use of this technique in the production of enzymes and of recombinant microorganisms attractive to the food industry Some of the benefits include increased enzyme or metabolite production from recombinant microorganisms, improvement of thermo-stability of these metabolites and enzymes and their ability to tolerate large pH ranges. Genetic engineering has made it possible to isolate particular genes coding for enzymes or other metabolites of our interest, from organisms of unknown genetics. Using *in vitro* recombination, these genes can be introduced into microorganisms there by getting the desired gene products at a low cost. Genetic engineering methods provide the opportunity to increase gene expression and so affect product yield. For example, it is widely believed that omega-3 fatty acids are beneficial against cardiovascular disease. To-day there are sources of omega-3 fatty acids available to the consumer such as some fish, flax seed and some vegetable oils. Using biotechnology it may be possible in the future to produce a vegetable oil that has ten or twenty times the amount of omega-3 fatty acids compared to present day oils. Such an oil would obviously be very useful to include in the diet of patients prone to heart disease. Conventional plant-breeding methods can also improve nutraceutical quality and production by enhancing both agronomic and medicinal traits.

In vitro propagation or tissue culture of plants holds tremendous potential for the production of high-quality plant-based medicines. This can be achieved through different methods including micropropagation and somaclonal variant production. Besides these, Nutritional genomics is a recent off-shoot of this genetic revolution in the area of nutraceutical development which includes (1) nutrigenomics: the study of interaction of dietary components with the genome and the resulting proteomic and metabolomic changes; and (2) nutrigenetics: understanding the gene-based differences in response to dietary components and developing nutraceuticals that are most compatible with health based on individual genetic makeup.

There are several biotechnology companies involved in investigating and developing nutraceutical products mainly belong to the food (55%) and pharmaceutical (35%) industries through different biotechnological approaches (Tucker *et al.*,2003).

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Phosphate Based Bioactive Glasses: A Perspective

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***Abstract*— The use of biomaterials has revolutionized the biomedical field and has attained the substantial attention during last two decades. Historically the main function of the biomaterials was to replace diseased or damaged tissues. The first generation of biomaterials was bio-inert. The second generation like bioactive glasses creates interfacial bonding between the implant and the host tissue. The third generation of biomaterials deals with tissue regeneration and repair using the gene activation properties. The general trend in biomaterials is to use and employ materials that play an active role in tissue regeneration rather than passive and inert materials. Thus the understanding of how a material interacts with the surrounding environments helps to tailor the materials that promote a specific biological response.**

***Index Terms*—Phosphate Glass, Bioactive Materials, Bone scaffolds, tissue regeneration**

I. Introduction

Biomaterials are artificial or natural materials that are used for replacing lost or diseased tissues so that they can be restored and starts to function again. Thus these materials are helpful in improving the quality and longevity of human life. The main hypothesis of biomaterial was that the human body rejects the metallic and synthetic polymers by forming scar tissue because living tissues are not composed of those materials. As we all know that bone contains a hydroxyapatite ie hydrated calcium phosphate and thus if a material is able to form HA layer in vivo it may not be rejected by the body. One commercially available bioactive glass is Bio-glass 45S5 having composition 45.0 wt % SiO_2, 24.5 wt % CaO, 24.5 wt %Na_2O and 6.0 wt % P_2O_5. Today the 45S5 composition is used as benchmark to compare the performance of new bioactive glasses. These glasses are successful in many clinical applications especially in dental and orthopedic areas. However there is one constraint that these glasses have slow degradation rate i.e. they take normally 2-3 years to disappear from the body. Due to these limitations we have to search for new materials that can repair the bone defects. Phosphate based glasses show unique features like low melting point T_m, and low glass transition temperature T_g and high thermal expansion coefficient α. These glasses can be made to have degradation rates that can be varied from hours to several weeks and they get completely soluble in aqueous medium. The main constituent of phosphate glasses is phosphorus pentoxide P_2O_5 which acts as the primary network former CaO and Na_2O are added to the glass former which acts as network modifier and network intermediator. All these glasses have constituents that are naturally found inside the body. These glasses are synthesised to include the dopants that are able to induce a specific biological function and thus can enhance the biocompatibility. The first part of this paper will present a brief description of the basic structure of phosphate glass followed by an overview of role of dopants like TiO_2 , ZnO and B_2O_3 to improve the physical and biological properties of the glass.

II. Phosphate based glass structure

Phosphate glasses are inorganic polymers based on the tetrahedral phosphate units $[PO_4]^{3-}$, that are interconnected to form 3D network. The phosphate tetrahedra are classified by the number of oxygen atoms they can share with other phosphate tetrahedra. An oxygen atom shared in this way is referred to as the bridging oxygen abbreviated as BO. The various types of tetrahedra that result from this classification are labeled as Q^n terminology where n refers to the number of BOs and can vary from 0 to 3. Vitreous P_2O_5 has Q^3 phosphate tetrahedra which forms the 3D network. However vitreous P_2O_5 is highly hygroscopic and volatile thus we need to add modifying oxides. This results in depolymerisation by the cleavage of P-O-P bonds and the formation of negatively charged non bridging oxygen NBO atoms. The depolymerisation model proposed by Kirkpatrick and Brow predicts that the dominant Q^n species change as Q^3- Q^2- Q^1- Q^0 as the amount of modifiers increases. The glasses of more technological interest are ternary systems such as P_2O_5 – CaO-Na_2O. These glasses have a wide range of applications like sensors, solid state batteries, lasers, achromatic optical devices and many more.

III. Synthesis of Phosphate Glass

Phosphate based glasses can be synthesized by either sol-gel method or melt quenching method. However most of the phosphate based glasses are prepared by melt-quench technique as it is very simple. A mixture of oxide precursors is melted in an electric furnace at temperature of about 1000°C. Once a homogeneous melt is achieved, the melt is then poured onto preheated plates and the glass melt can be moulded in any shape. To remove the internal stress if any the glass is annealed at suitable temperature called as the glass transition temperature. The biggest technological hurdle is the inclusion of P_2O_5 as it is highly hygroscopic and volatile in nature. This problem is resolved by using NaH_2PO_4 as the source of P.

The sol- gel process is beneficial as it involves the reaction of inorganic alkoxides and metal chlorides to form colloids through hydrolysis and polycondensation reactions. The

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subsequent thermal treatment yields a dense, porous glassy material. This method allows the incorporation of some of the active biological ingredients such as proteins and antibiotics into the glass network. The problem with this method is that it takes several weeks to synthesis a glass.

IV. Probing the Structure of Phosphate Based Glass before Immersion in SBF

Powder X- ray diffraction is used to find whether the glass formed is amorphous or crystalline in nature. The absence of any sharp peak in the XRD pattern confirms the amorphous nature of glass. If the glass is heated to a particular temperature called as the crystallization temperature then the glass gets transformed into the glass ceramic and we obtain sharp peaks in the XRD spectra.

FTIR and Raman spectroscopy are used to confirm the various structural units present in the glass. These techniques are based on the absorption and scattering of electromagnetic radiation at different wave numbers awing to resonance vibrations of different chemical groups of a molecule. The basic principle used in these techniques is the absorption of IR radiation that causes transition in the resonant vibrational and rotational states associated with the ground state of a molecule. These resonant modes can be either the stretches (change in bond lengths) or the bends (change in bond angles). Peaks at various wave numbers in an FTIR spectrum corresponds to different chemical groups because each bond or group of atoms has different vibrational energy. In Raman spectroscopy a laser radiation hits a molecule, a part of the scattered photons emerge with slightly different wave numbers. This is attributed to the absorption or emission of the photon energy from or to the laser radiation by the molecule of the glass network. The Raman spectrum of phosphate glasses generally occurs in 600-1500 cm^{-1} range. The addition of TiO_2, ZnO and B_2O_3 upto 10 wt % to the host matrix of phosphate glass only shows a variation in the intensity of various bands.

V. Preparation of SBF (Simulated Body Fluid) and *in vitro* Studies

Kokubo et al developed a cellular simulated body fluid that has inorganic ion concentration similar to those of human extracellular fluid, in order to reproduce the formation of apatite on bioactive materials *in vitro*. This fluid can be used for evaluation the bioactivity of artificial materials in vitro. The pH of SBF is adjusted to 7.25 at 36.5°C. The reagents that are used for the preparation of SBF are NaCl, $NaHCO_3$, KCl, $K_2HPO_4.3H_2O$, $MgCl_2.6H_2O$, $CaCl_2$, HCl, Na_2SO_4, $(CH_2OH)_3CNH_2$. After immersing the glass in SBF for certain predefined time the Hydroxyapatite (HAp) layer appears on the surface of glass. The ratio of surface area immersed of immersed sample to solution volume is highly essential to induce the reaction kinetics. The growth of new layers on the surface of glass after *in vitro* studies was observed using SEM micrographs. XRD analysis also showed the emergence of crystalline phases and standard Joint Committee on Powder Diffraction Standards (JCPDS) data cards is used to identify the phases present.

VI. Medical Applications

A. Controlled Release Glasses (CRG)

CRG form a group of materials that are completely dissolve in aqueous media without leaving any solid residue. They can be produced as powder, granules, fiber, cloth, tube or monoliths of various shapes. They find wide range of applications as feeding of bacteria, controlling parasite infection in water canals, veterinary use or for treating infections in humans.

B. Hard tissue engineering applications

Biodegradable scaffolds, which are replaced by the natural tissue, are desirable for tissue engineering applications. P_2O_5 – CaO- Na_2O glasses have potential that lend them to be used as hard tissue substitutes or as substrates for synthetic orthopedic graft materials. Compositionally they are similar to the inorganic part of bone. Addition of various metal oxides like ZnO, Al_2O_3, Fe_2O_3, TiO_2 into phosphate glass helps in hard tissue engineering applications. Uo et al assessed the cytocompatibility of phosphate glass using the dental pulp cells. Franks et al studied degradation and ion release of these glasses. Salih et al assessed their suitability for potential bone regeneration applications. Abou Neel et al found that 5 mol % TiO_2 doped in phosphate glass has the most favorable cellular response. Salih et al found that addition of ZnO to phosphate glass enhances the osteoblast cell adhesion and improves the potential for use in bone tissue engineering.

C. Antimicrobial Delivery Devices

Phosphate glasses can be used as localized antibacterial delivery system via the glass fibers that can act as a template with muscle cells. Recently it has been reported that the glass fibers can also act as a nerve conduit as they can provide a guide for cell orientation, proliferation and growth. Phosphate glass fibers can be conventionally fabricated by drawing them from high temperature melts. Phosphate glass fiber with Fe_2O_3 can be used for the development of bioabsorbable composites designed for orthopedic applications.

VII. Future Prospects for Phosphate Glasses as Bioactive Materials

Zinc doped phosphate glasses find potential applications for the treatment of chronic inflammatory diseases. Phosphate glass fibres can be used as drug delivery vehicles to inaccessible areas. Phosphate glass fibres can be used as a mesh for the treatment of severe burns or wounds. The can be used to release antimicrobial ions such as Cu2+, Ag+, Ga3+ as they easily get dissolved and help to combat infection.

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Revival and Collapse of the Viberational State Wave Packet for the Diatomic Molecule

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Abstract— **In this paper we present the time evolution of the quantum wave packet, constructed by superimposing the viberational states of HCl molecule. We use the probability density function, auto-correlation function, and the various time scales to explore the revival pattern of this wave packet. We show that the wave packet never collapse and have no revivals,**

Index Terms—**Quantum mechanics, bound wave packets, revivals and collapses.**

I. INTRODUCTION

Classical physics treats objects, including atomic size objects and smaller, as particles. Experiments have shown that this description of matter is incomplete. Whether the object exhibits wave-like or particle-like properties depends on the experimental details and the object's size. In forming a microscopic picture, the quantum mechanical equation of motion- the Schrodinger equation-is solved and the results may be visualized. A way to incorporate both the particle-like and wave-like properties of an object is by modeling the object as a wave packet or pulse of waves. A wave packet has finite extent like a particle but its oscillations provide the observed wave-like properties such as interference. A quantum wave packet can be considered theoretically as a superposition of a set of eigenstates in a system. The eigenstates can be, for instance, electronic states in atoms, vibrational states in molecules and photon-number states in quantum optics. The wave packet provides a bridge between classical and quantum mechanics.

The phenomenon of collapses and revivals of the wave packets was first discussed in [1]. After that many authors have discussed this phenomenon focusing on the infinite square well potential [2-4], harmonic oscillator potential [5--6] and the Rydberg Atoms [7—8]. Certain variants of the infinite square well have also been discussed as the infinte square well with δ potential at the centre [1], asymmetric infinite square well [9] and the finite square well [10]. The united approach of all these authors relevant to the demonstration of the phenomenon of the collapses and revivals of the wave packets is to localize the initial Gaussian wave packet inside the well and then visualize the dynamics of the wave packet with the passage of time. The autocorrelation function has also been plotted by some authors to give the evidence of the collapses and revivals of the wave packet [11].

The study of the time evolution of the bound state wave packet illuminates many features of the wave mechanics . This includes both semi-classical features as well as purely quantum mechanical effects. Initially the wave packet moves along the classical trajectory showing the classical behavior, but afterwards spreads out due to dephasing of the subsidiary waves. Under some conditions the spreading process is reversed due to rephasing and, after long enough time, the wave packet comes back to its initial state nearly completely. This behavior demonstrates the quantum behavior of wave packets. The dynamics of the unbound and bound wave packet have been visualized by many authors .This approach of visualization of the dynamics of the wave packet has facilitated the understanding of many quantum phenomenon like tunneling, scattering, interference and reflection. As a consequence such visualizations have become increasingly relevant as pedagogical tool.

In this work we have constructed a wave packet by superimposing the viberational states of HCl diatomic molecule. Viberational motion of molecules can be treated using the harmonic oscillator model. The properties of these vibrations are critical in interpreting infrared and Raman spectra, for the understanding of chemical dynamics and understanding the heat capacities of gas phase and liquid phase systems. The paper is organized as

II. QUANTUM WAVE PACKETS CONSTRUCTION

Here we construct a quantum wave packet by superimposing the viberatonal states of a diatomic molecule. Since a diatomic molecule is an example of two particles linked by a central force, so this two body problem can be reduced to a single body problem using the concept of reduced mass, i.e.

$$\mu = \frac{m_1 m_2}{m_1 m_2}.$$

The Schrödinger equation for harmonic oscillator is [12]

$$\frac{d^2\Psi}{dx^2} + \frac{2\mu}{h^2}\left(E - \frac{1}{2}kx^2\right)\Psi = 0 \qquad (1)$$

It is convenient to simplify Eq. (1) by introducing the dimensionless quantities. Let us introduce dimensionless variable:

$$\xi = \alpha x,$$

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where α is constant having dimensions of inverse of length.

Thus Eq.(1), takes the form,

$$\frac{d^2\Psi}{d\xi^2}+\frac{2\mu}{\hbar^2}(\varepsilon-\xi^2)\Psi=0,$$

Where

$$\alpha=\left(\frac{m\omega}{\hbar}\right)^{1/2};$$

And

$$\varepsilon=\frac{2E}{\hbar\omega}.$$

The energy eigen values and the normalized wave function are given as,

$$E_v=\left(v+\frac{1}{2}\right)\hbar\omega, \tag{2}$$

$$\Psi_v(\xi)=\left(\frac{1}{\sqrt{\pi}\,2^v v!}\right)^{1/2}H_v(\xi)e^{-\xi^2/2}. \tag{3}$$

Where $H_v(\xi)$ are Hermite polynomials of order v.

The classical turning points are

$$x_0=\pm\sqrt{\frac{2E}{k}}.$$

III. TIME EVOLUTION OF THE QUANTUM WAVE PACKET

The time-dependent wave function for the quantum wave packet formed as a superposition of viberational states is given as [1],

$$\psi(\xi,t)=\sum_v c_v\psi_v(\xi)\exp(-tE_v t). \tag{4}$$

Here the coefficients c_v are the weighting factors in the superposition, which are given in terms of the initial wave function as

$$c_v=\langle\psi_v(\xi,t)|\psi_v(\xi,0)\rangle$$

We model the weighting probabilities as a Gaussian distribution,

$$c_v=\sqrt{\frac{\sqrt{2\pi}}{5}}e^{-(v-\bar{v})^2\pi^2/200}.$$

This model is preferred as it provides a symmetrical distribution in v with mean $\bar{v}$.

The assumption that the weighting probabilities are peaked around a mean value, it is reasonable to suppose that the states with energy near the mean value ,contribute for the formation of wave packet. This allows to expand the energy in a Taylor series in v around the central value $\bar{v}$:

$$E_v\cong E_{\bar{v}}+E_{\bar{v}}'(v-\bar{v})+\frac{1}{2}E_{\bar{v}}''(v-\bar{v})^2+\frac{1}{6}E_{\bar{v}}'''(v-\bar{v})^3+.., \tag{5}$$

where each prime denotes a derivative

The derivative terms in Eq.(4), define the time scales as given below [5]:

$$T_{cl}=\frac{2\pi\hbar}{E_{\bar{v}}'},T_{rev}=\frac{2\pi\hbar}{\frac{1}{2}|E_{\bar{v}}''|},T_{sr}=\frac{2\pi\hbar}{\frac{1}{6}|E_{\bar{v}}'''|}.$$

The first time scale is the classical time period for the shortest closed orbit. It controls the initial behavior of the wave packet. The second time scale is called the revival time. It governs the appearance of the fractional revivals and the full revivals. The third time scale is the superrevival time. It is a larger time scale. In terms of these time scales the Eq. (4) can be expressed as,

$$\psi(r,t)=\sum_v c_v\psi_v(\xi)\exp\left[-2\pi i\left(\frac{(v-\bar{v})t}{T_{cl}}+\frac{(v-\bar{v})^2t}{T_{rev}}+..\right)\right] \tag{6}$$

The expansion (6) shows that the time evolution of wave function is governed by these three time scales, which in turn are controlled by quantum number v. For small values of t, the first term in Eq. (6) dominates. Thus during this interval motion of wave packet is approximately periodic in time with period T_{cl}. As t increases more the second term in phase modulates this behavior, causing the wave packet to spread and collapse. However at time equal to revival time ,the second term in phase equals 2πi and once again the motion is governed by the first term. As a result the wave packet regains its initial shape. This is called a full revival. Similarly at the superrevival time again the contribution of the third term is 2πi , the wave form reforms into a single wave packet that resembles the initial one better than does the full revival at time revival time. This new structure is called a superrevival.

IV. THE PROBABILITY DENSITY FUNCTION AND THE AUTO-CORRELATION FUNCTION

The probability density function is used to plot the shapes of the wave packet at various times. This function is defined as follows,

$$|\psi(\xi,t)|^2=\psi(\xi,t)^*\psi(\xi,t)$$

Similarly the autocorrelation function is defined as [11],

$$A(t)=\psi(\xi,0)^*\psi(\xi,t)$$

Its absolute square gives a measure of the overlap between the wave packet at time t=0 and at later time t.

V. RESULTS AND DISCUSSIONS

Here we choose a weighting factor with central value of 20 and HCL as the an example of diatomic molecule. Now for the molecule HCl the reduced mass , angular frequency, the classical turning points (in terms of the dimensionless variable ξ) and the classical time period are,

$$\mu=1.62661\times10^{-27},$$

$$\omega=5.63212\times10^{14}\,rad/s,$$

$$\xi_0\cong\pm7,$$

$$T_{cl}=5.6\times10^{-16}\,s.$$

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The revival time and the superrevival time are not defined (infinite) for this case.

The following figures are the plots of the probability density function at various instants of time. Fig.(1) is the plot of the probability density function at time t=0. Fig.(2) is plot of the probability density function at time t= $T_{cl}/4$.. Fig.(3) is plot of the probability density function at time t= $T_{cl}/2$. Fig.() is plot of the probability density function at time t= $3T_{cl}/4$.

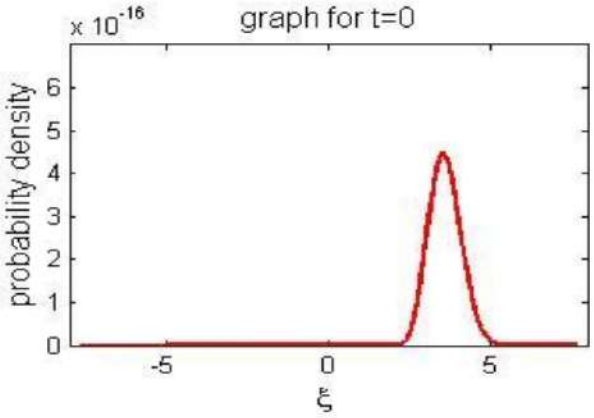

Fig.(1): Probability Density plot at time t=0

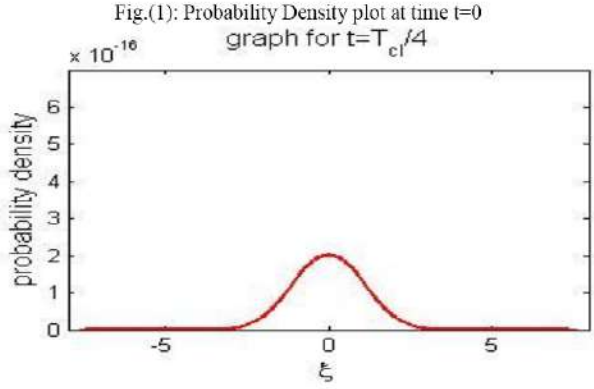

Fig.(2): Probability Density plot at time t= $T_{cl}/4$

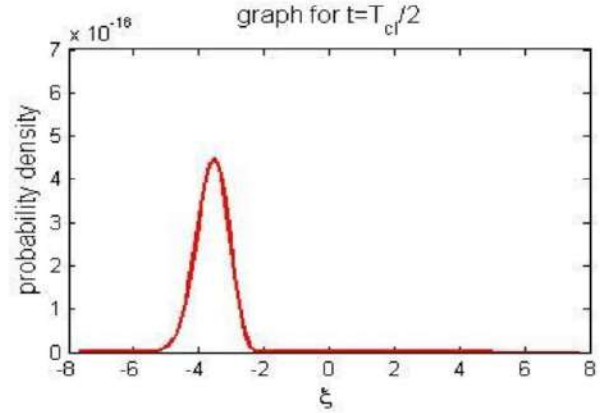

Fig.(3): Probability Density plot at time t= $T_{cl}/2$

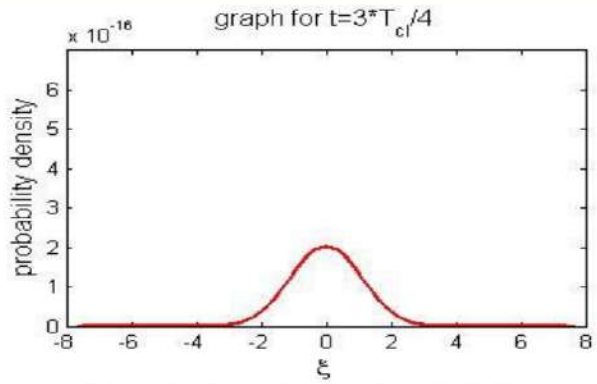

Fig.(4): Probability Density plot at time t= $3*T_{cl}/4$

Figure (5) below is the plot of the absolute square of the autocorrelation function verses reduced classical time (the ratio of the classical time period and the classical time for the primitive path).

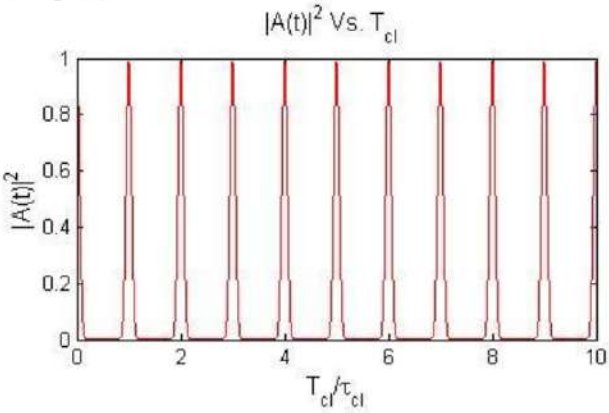

Fig.(5): Autocorrelation function vs. reduced classical time

The absolute square of autocorrelation function numerically varies between 0 and 1. When a wave packet exactly matches initial wave packet the value is 1. For a completely mismatched wave packet the value is 0. From the fig.(5), it is readily seen that the wave packet is perfectly periodic with the classical time period. The wave packet does not collapse and there are no revivals.

CONCLUSION

Quantum wave packet constructed by superimposing the viberational states of the HCL molecule does not collapse and show no revivals.

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Synthesis of Porous Network of Cdo Nanoparticles by Using Urea as a Fuel in Sol Gel Technique

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***Abstract*— A porous network of Cadmium Oxide (CdO) nanoparticles in the form of loose powder was obtained by sol gel auto combustion method using cadmium nitrate as an oxidizing agent and urea as a fuel in the reaction. The thermally decomposed urea based gel has been calcined at 300, 350 and 400˚C temperatures for 4 hours in order to remove the leftover organics in the decomposed gel. The decomposed gel and the calcined samples have been characterized by for their phase analysis by X-ray diffraction technique (XRD) and all samples show characteristic peaks of CdO in calcined samples. The crystallite size in the calcined samples found to lie in the range of 32-34 nm. Scanning electron micrograph (FESEM) of calcined powder indicates randomly distributed porous microstructure composed of round shaped agglomerates. The elemental analysis revealed by the Energy Dispersive X-ray analysis (EDAX) shows oxygen deficiency in all sample.**

***Index Terms*—Semiconducing oxide, sol-gel auto combustion**

I.INTRODUCTION

The nano-particles, wires, rings, combs and tetrapods of semiconducting oxides such as ZnO [1, 2], WO_3 [3–5], TiO_2 [6] and CdO [7–10] are most desired for technological applications. Their novel properties can be tailored significantly by producing them at micro- and nano-scale in different morphologies. Among these, CdO is a unique wide band gap semiconductor (2.4 eV) possessing excellent electrical, mechanical and optical properties. CdO adopts the centro symmetric rock salt structure. It exhibits interesting electronic and optical properties [11]. As an n-type semiconductor, CdO is of interest for low voltage and short wavelength electro-optical devices such as light emitting dioxides and diode laser [12]. It is widely used in field emission flat panel display with the development of various optical devices. It is a promising candidate for optoelectronics, solar cells, phototransistors, photodiodes, transparent electrodes and gas sensors. Dimensional reduction of such materials results to improved non-linearity, controlled by the quantum size effects and other mesoscopic influences. Several techniques have been employed to prepare CdO nano particles including thermal evaporation [13], micro emulsion method [14], spray pyrolysis [15], sputtering [16] and sol gel method [17].

So far pertaining to fine microstructural features, only the randomshaped particles and a limited work on oriented-film growth of CdO are attempted [15, 16]. Unfortunately not much work has been done on CdO due to its toxic nature. Investigations on different scale microstructures, respective morphologies and crystallographic interpretations of ultrafine CdO are still under investigation.

In this paper sol-gel auto combustion technique is used to prepare CdO nanoparticles using urea as a fuel in the reaction mixture. The as prepared powder and CdO calcined at 300, 350 and 400˚C in air for 4 hours have been characterized for phase analysis by X-ray diffraction (XRD), morphological investigations by field enhanced scanning electron microscope (FESEM) and for elemental analysis by taking elemental dispersive X-ray analysis (EDAX).

II.EXPERIMENTAL

Nanocrystalline CdO powder was prepared using metal nitrate/urea based auto combustion method. Cadmium Nitrate ($Cd(NO_3)_2.4H_2O$), urea were used as starting materials. The solution of cadmium nitrate was made by dissolving nitrate salt in deionised distilled water with appropriate dosage of urea so that they have 1:1 molar ratio in solution. The solution was heated at 80˚C in an oven for 30 hours and it turns to yellowish sticky gel. The gel was taken on the pre heated hot plate. A combustion process took place accompanying with the evolution of brown fumes. Finally, a blackish brown fluffy product was obtained. It was then grinded and calcined at 300, 350 and 400˚C for 4 hours in muffle furnace in free supply of air to effectively remove residual nitrate and organic material

III.CHARACTERIZATION TECHNIQUES

Phase identification of calcined powder were performed via X-ray Diffraction analysis using nickel filtered CuKα (wavelength-1.5405 A˚) radiations in the range of 2θ (20-70˚) by Philips diffractrometer. The average crystallite size (D) has been calculated using Scherrer's equation

$$D = \frac{0.9\lambda}{\beta \cos\theta} \quad (1)$$

Where β is the FWHM of the powder, θ the Bragg angle, λ the wavelength of X-ray used. To study the surface topography, compositional analysis of samples, field emission scanning

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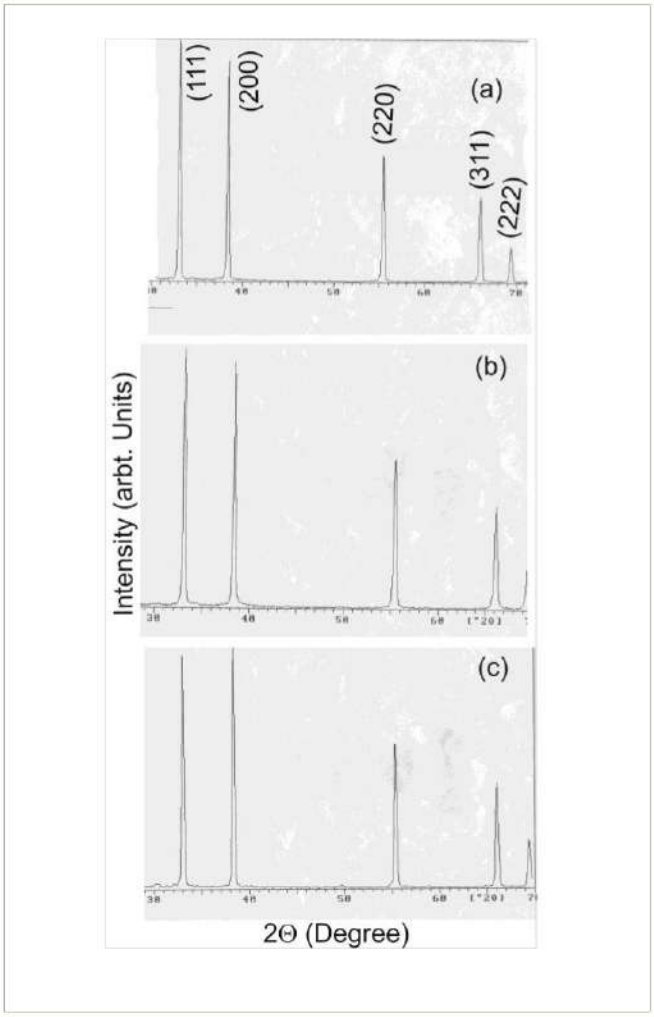


Fig. 1. XRD diffractogram of CdO powder samples calcined at temperature of (a) 300˚, (b) 350˚ and 400˚ C for 4 hours

electron micrographs (FESEM) and energy-dispersive absorption X-ray spectroscopy (EDAX) spectrum respectively were taken on a JEOL JSM-6700F with a beam voltage of 30 kV.

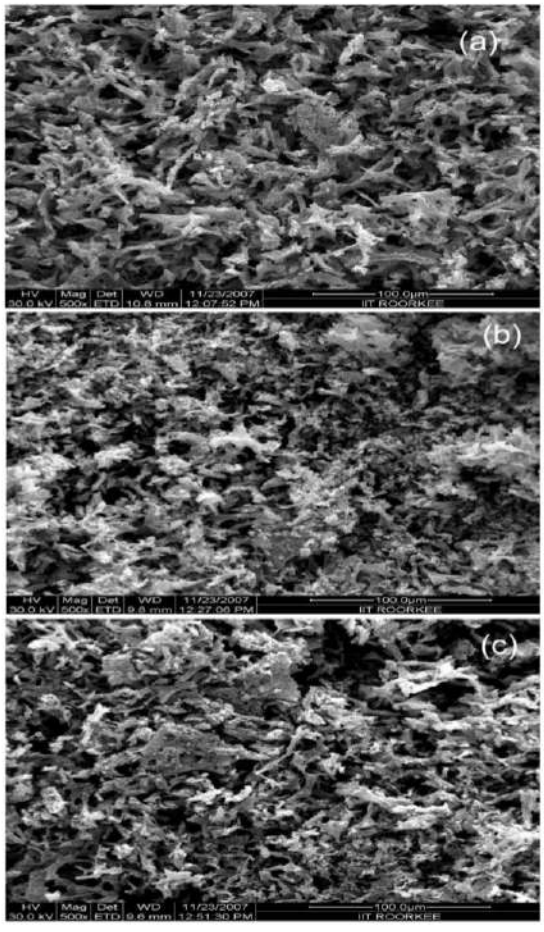
IV.RESULTS AND DISCUSSION

Fig. 1 shows the XRD pattern of CdO samples calcined at temperature of (a) 300, (b) 350 and (c) 300˚C. It has been observed that crystallinity of the calcined powder is comparatively improves with calcinations temperature. No peak corresponding to Cd phase is noticed in all the calcined samples. All the peaks corresponding to reflection from CdO phase have been noticed and obtained due to diffraction from (111), (200), (311) and (222) planes. The intensity of different peaks associated with CdO increases with thermal treatment.

Crystallite size of calcined CdO powder samples for the preferential orientations was calculated using Scherrer's relation.

The crystallite size appears to slightly increase from 32.27 nm to 33.64 nm after the calcination of CdO powder which may be attributed to crystallization of nanoparticles. This will result a decrease in surface to volume ratio which may lead to decrease in defect states this causing better crystallinity of the product [15, 16]. The lattice parameters of the CdO samples have been calculated using the d spacing obtained from the XRD analysis. All the samples have been found to possess the cubic crystal structure with lattice parameter a = 4.69±0.02 Å. This is in agreement with other results [12, 13].

The surface morphology of the CdO powder has been revealed by FESEM images as shown in Fig. 2 delineates the distribution and shape of crystallites. All the calcined powder samples appear to very porous possibly due to gas evolution. In general these micrographs indicate randomly distributed particles. It has been found that the sample calcined at 300˚C show crystallites in some region tangled together to form bundles of CdO rods of varying diameters.



SEM micrograph of CdO powder samples calcined at temperature of (a) 300˚, (b) 350˚ and 400˚ C for 4 hours

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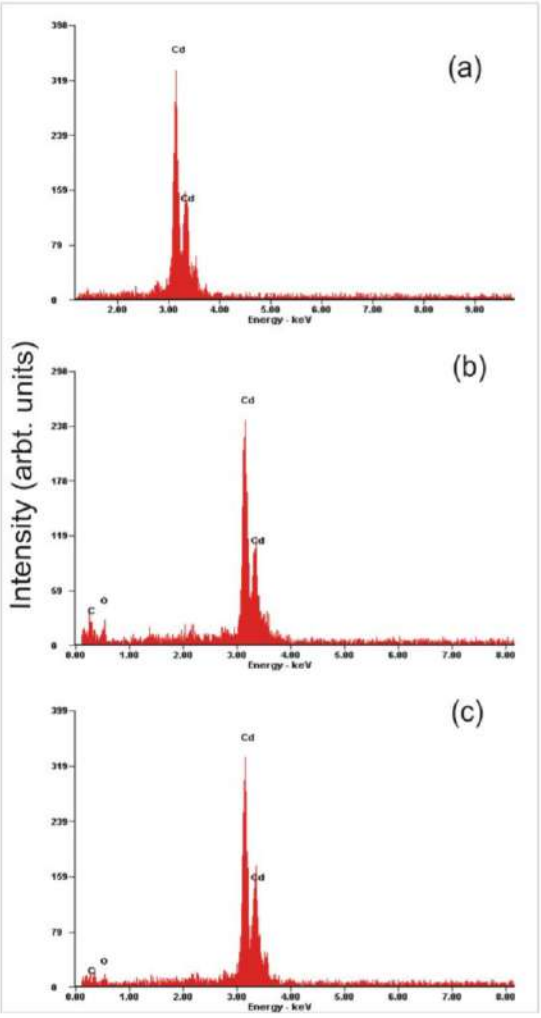

EDAX spectrum of CdO powder samples calcined at temperature of (a) 300°, (b) 350° and 400° C for 4 hours

The elemental analysis of the CdO samples have been revealed by the EDAX spectrums as shown Fig. 3 delineates the distribution Cd and O atoms. All the samples have been found to be oxygen deficit which leads to enhancement in the defects and it suggests that these samples have potential applications in the fields of gas sensors and photovoltaic application.

V.CONCLUSION

CdO nanoparticles of size 33 nm have been successfully synthesized using a citrate-urea sol gel auto combustion process followed by calcination at different temperature for 4 hours. The calcined samples have entangled rods composing porous network of CdOparticles. The samples have been found to possess cubic crystal structure with large number of defects.

ACKNOWLEDGMENT

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Study of Micro-rotational Waves in a Plate

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Abstract - **The propagation of waves in heat-flux dependent micropolar thermoelastic thin plate has been discussed for the plane stress problem. Potential functions have been used to solve the problem. The frequency equations for symmetrical and antisymmetrical motions about the plane of symmetry of the plate have been discussed and the equations governed by cut-off frequencies are deduced. For mixed boundary conditions and insulated edges, the frequency equation is discussed. The additional effect of micropolar and thermal constants on phase velocity is seen. The results have been compared with earlier investigations as particular cases of present investigation.**

Key Words: **Micropolar Generalized thermoelasticity, Couple stress, Rotational inertia, Relaxation time.**

I. INTRODUCTION

Many theories have been proposed to study the microstructural behaviour of the elastic solids. Micropolar theory developed by Eringen [1] is useful in investigating behaviour of materials consisting of bar-like molecules. It explains the behaviour of solid propellant grains, polymeric materials, certain types of rocks and fibre glass for which the classical theory of elasticity is inadequate. Moreover, the micropolar elastic model is more realistic in studying earth science problems.

Several attempts have been made to formulate generalized theory of thermoelasticity. This theory eliminates the paradox of infinite velocity of propagation of thermal signals as predicted by classical theory of thermoelasticity. Because of the experimental evidence available in favour of second sound effects, generalized thermoelasticity theories are of practical interest too. It is speculated that such problems are relevant in analysing effects of very rapid heating, which might occur in fast burnt nuclear reactors, electronic beam accelerators and lasor engineering units. Ackerman and Overton [2] performed experiments on solid helium and concluded that thermal waves propagate with finite, though quite large speeds and frequency range of such thermal excitation is extremely narrow. Chandrasekharaiah (3] formulated generalized theory of micropolar thermoelasticity, based upon Eringen's theory of micropolar elasticity by including heat-flux among constitutive variables. Massalas [4] discussed thermoelastic waves in a thin plate. The purpose of present work is to study the waves in micropolar thermoelastic thin plate under mixed boundary conditions and relaxation time. The plate is in plane stress state and the edges of the plate are insulated. When the boundaries are lubricated, we have a mixed boundary conditions. The results obtained play a very important role in obtaining spectrum of an elastically restrained plate [5].

II. BASIC EQUATIONS

Waves in micropolar thermoelastic thin plate occupying the Cartesian space $-\infty < x_1 < \infty$, $-H \le x_2 \le H$, $-1 \le x_3 \le 1$ have been discussed. We have assumed that the edges $x_3 = \pm 1$ are stress free, couple stress free and thermally insulated and the edges $x_2 = \pm H$ are stress free, couple stress free and isothermal. Then we have

We take boundary conditions as

$$\tau_{3i} = \theta, _3 = m_{32} = 0 \text{ on } x_3 = \pm 1, \quad (2.1)$$

$$\tau_{21} = \theta = m_{13} = \theta, _2 = u_2 = 0 \text{ on } x_2 = \pm H, \quad (2.2)$$

Where τ_{ij} are components of force stress tensor, m_{ij} the components of couple stress tensor, θ the temperature deviation above the uniform temperature $\theta_0 > 0$ and $(\ldots), j = \partial(\ldots)/\partial x_j$

As the plate is thin, we may take

$$\tau_{31} = \theta,3 = m_{32} = 0, \quad (2.3)$$

throughout the plate. Consequently the plate remains in the state of plane stress. Following the usual procedure, the equations of motion for an isotropic, homogeneous, micropolar thermoelastic material proposed by Chandrasekharaiah [6] reduce to the following:

$$\left(\mu + \lambda^*\right)u_{\beta,\alpha\beta} + \lambda_3 u_{\alpha,\beta\beta} - \beta^* \theta_{,a} + k'\varepsilon_{\alpha\beta r}\xi_{r,\beta} = \rho\partial^2 u_\alpha / \partial t^2, \quad (2.4)$$

$$\gamma'\xi_{3,\alpha\alpha} + k'\left(u_{2,1} - u_{1,2}\right) - 2k'\xi_3 = \rho J\partial^2\xi_3 / \partial t^2, \quad (2.5)$$

$$\theta_{,\alpha\alpha} = \theta_0\left(\partial/\partial t + \tau_0\partial^2/\partial t^2\right)\left(c^*\theta + \beta u_{\alpha,\alpha}\right)/k, \quad (2.6)$$

where

$$\vec{\xi} = (0,0,\xi_3), \lambda^* = \lambda\lambda_2/\lambda_1, \beta^* = \beta_T\lambda_2/\lambda_1,$$
$$\beta_T = (\lambda_1 + 2\lambda)a_t, \; c^* = c(1+\varepsilon),$$
$$\varepsilon = \beta^2{}_T/c\lambda_1, \lambda_1 = (\lambda + 2\mu + k'), \lambda_2 = 2\mu + k',$$
$$\lambda_3 = \mu + k', \alpha, \beta = 1,2 \quad (2.7)$$

In these equations u_α are the components of displacement, ξ microrotation vector, λ and μ Lame's constants, α', β', γ', κ' micropolar constants, J rotational inertia, τ_0 relaxation time, ρ density, k thermal conductivity, c the specific heat at the constant strain, a_t the coefficient of linear thermal expansion, $\varepsilon_{\alpha\beta\tau}$ the alternating tensor.

Defining the following dimensionless quantities

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$\zeta_\alpha = (c_1^*/\chi)x_\alpha, \tau = (c_1^{*2}/\chi)t, \nu = \theta/\theta_o, U_\alpha =$
$(c_1^*/\chi)u_\alpha, \chi = k/\theta_o c^*$ (2.8)

where $c_1^{*2} = (\lambda^* + \lambda_2)/\rho, c_2^{\,2} = \lambda_3/\rho$,

and taking $U_1 = \phi_{,1} + \psi_{,2}, U_2 = \phi_{,2} - \psi_{,1}$ (2.9)

where ϕ, ψ and ξ are functions of ζ_1, ζ_2 and τ, equations (2.4) - (2.6) reduce to

$$(\nabla^2 - \partial^2/\partial\tau^2)\phi = b\nu/\gamma^2 \quad (2.10)$$

$$(\nabla^2 - \gamma^2\partial^2/\partial\tau^2)\psi = -\varepsilon_0^*\xi_3/n_1, \quad (2.11)$$

$$[(\nabla^2 - \partial^2/\partial\tau^2)(\nabla^2 - \partial/\partial\tau - m\partial^2/\partial\tau^2) - \varepsilon_0^*\nabla^2(\partial/\partial\tau + m\partial^2/\partial\tau^2)]\phi = 0, \quad (2.12)$$

$$[(\nabla^2 - \gamma^2\partial^2/\partial\tau^2)(\nabla - 2n_1 - n_2\partial^2/\partial\tau^2) + \varepsilon_0^*\nabla^2]\psi = 0, \quad (2.13)$$

Where,

$\nabla^2 = \partial^2/\partial\xi_1\partial\xi_2$, $\varepsilon^* = gb/\gamma^2, \varepsilon_0^*$
$= k' n_1/\lambda_3, \gamma = c_1^*/c_2$,
$b = \beta^*\theta_0/\lambda_3$, $g = \beta^*/c^*\theta_0$,
$m = \tau_0 c_1^{*2}/\chi$
$n_1 = k'\chi^2/\gamma' c_1^{*2}, n_2 = \rho\tau c_1^{*2}/\gamma'$. τ_0 is found to be of order 10^{-4}, thus ε^*, m appear to be of order 10^{-2}. As k' and J are micropolar parameters, which are small in comparison of elastic constants, hence to the first approximation, their squares and products can be neglected.

III. SOLUTION OF THE PROBLEM

We take

$$\phi(\zeta_1, \zeta_2, \tau) = f_1(\zeta_2)\exp[i(\Omega\tau - \eta\zeta_1)],$$
$$\psi(\zeta_1, \zeta_2, \tau) = f_2(\zeta_2)\exp[i(\Omega\tau - \eta\zeta_1)], \quad (3.1)$$

Where $\Omega = \chi\omega/c_1^{*2}$, ω is the angular frequency and $\eta^* = \eta c_1^*/\chi$ is the wave number. The wave speed is given by V = ω/Re(η^*) and the attenuation constant by S* = -Im(η^*), where Re(η^*) and Im(η^*) denote the real and imaginary part of η^* respectively.

From (3.1) and (2.10) - (2.13), we get

$$D^4 f_1 - [2\eta^2 + i\Omega(1+\varepsilon^*) - \Omega^2(1+m+m\varepsilon^*)]D^2 f_1 + [\eta^4 + \eta^2\{i\Omega(1+\varepsilon^*) - \Omega^2(1+m+m\varepsilon^*)\} + \Omega^3\Omega_1]f_1 = 0 \quad (3.2)$$

$$D^4 f_2 + [\gamma^2\Omega^2 - 2\eta^2 + n_2\Omega^2 - 2n_1 + \varepsilon_0^*]D^2 f_2 + [(\gamma^2\Omega^2 - \eta^2)(n_2\Omega^2 - 2n_1 - \eta^2) - \varepsilon_0^*\eta^2]f_2 = 0 \quad (3.3)$$

Where D = d/dζ_2, Ω_1 = mΩ-i

The solution of equations (3.2) and (3.3) is given as

$f_1(\xi_2) = A_1 C_{01} + A_2 S_{01} + A_3 C_{02} + A_4 S_{02}$, (3.4)

$f_2(\xi_2) = A_5 C_{03} + A_6 S_{03} + A_7 C_{04} + A_8 S_{04}$, (3.5)

where A_1, A_2 ---------, A_8 are arbitary constants,
$C_{0p} = \cosh q_p\zeta_2$, $S_{0p} = \sinh q_p\zeta_2$, $q_p^2 = \eta^2 - \delta p^2$,
p = 1, 2, 3, 4
and δ's are roots of equations (3.2) and (3.3).

For ε^*, m<< 1 and without making any restriction on Ω, values of δ's have been obtained to the first approximation.

IV. CHARACTERISTIC OF THE WAVE MOTION

The mixed boundary conditions (2.2) reduce to:

$\tau_{21} = U_2 = m_{13} = \theta_{,2} = 0$ for $\zeta_2 = \pm c_1^* H/\overline{\chi}$ (4.1)

Where

$$\tau_{\alpha\beta} = \lambda^*\delta_{\alpha\beta}U_{k,k} + \mu(U_{\alpha,\beta} + U_{\beta,\alpha}) + k'(U_{\beta,\alpha} - \varepsilon_{\alpha\beta3}\xi_3) - \beta^*\nu\theta_0\delta_{\alpha\beta}, \quad (4.2)$$

$$m_{\alpha\beta} = c_1^*[\alpha'\xi_{r,r}\delta_{\alpha\beta} + \beta'\xi_{a,\beta} + \gamma'\xi_{\beta,\alpha}]/\chi, \quad (4.3)$$

$$\theta/\theta_0 = (\gamma^2/b)(\nabla^2 - \partial^2/\partial\tau^2)\phi, \quad (4.4)$$

$$\xi_3 = -(n_1/\varepsilon_0^*)(\nabla^2 - \gamma^2\partial^2/\partial\tau^2)\psi \quad (4.5)$$

Here $\delta_{\alpha\beta}$ is kronecker delta. We consider two types of response. For symmetrical case A_2, A_4, A_5, A_7 vanish, whereas in the antisymmetrical case A_1, A_3, A_6 and A_8 vanish. From (4.1) we obtain a system of four homogeneous algebraic equations. Equating to zero their determinant, we arrive at the following transcendental equation for symmetrical motion:

(a) Symmetric motion:

$$q_1 q_2 (q_1^2 - q_2^2)(q_3^2 - q_4^2)(\eta^2 - q_3^2) \begin{vmatrix} S_{01} & S_{02} & S_{03} & S_{04} \end{vmatrix} = 0 \quad (4.6)$$

(b) Anti-Symmetric motion:

$$q_1 q_2 (q_1^2 - q_2^2)(q_3^2 - q_4^2)(\eta^2 - q_3^2) \begin{vmatrix} C_{01} & C_{02} & C_{03} & C_{04} \end{vmatrix} = 0$$

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(4.7)

Equations (4.6) and (4.7) are satisfied by

$m_4 = il\pi$, $m_3 = ik\pi$, $m_2 = ir\pi$, $m_1 = in\pi$

(l,k,r,n = 0,1,2,3…) (4.8)

$m_4 = il'\pi/2$, $m_3 = ik'_0\pi/2$, $m_2 = ir'\pi/2$,

$m_1 = in'\pi/2$

(l',k'$_0$,r',n' = 0,1,2,3…) (4.9)

where $m_i = q_i\zeta_2$.

Firstly we consider dilatational waves, we have

$m_j = q_j\zeta_2 = i\,N/2\pi$ (j = 1,2, N = 0,1,2,….).

(4.10)

N is even for symmetric and odd for anti symmetric motions

From (3.6) and (2.23) we get

$$\eta^{*2}_j = \delta^2_j(\Omega,\varepsilon^*,m) - \Gamma,(j=1,2), \quad (4.11)$$

Where $\Gamma = N^2\pi^2\chi^2/\left(4c^{*2}_1 H^2\right)$

The solution (3.1) represents damped oscillations with damped frequency with could be defined as cut-off frequency of a micropolar elastic medium.

V. CONCLUSION

Micropolar nature of the material gives additional microrotational waves, whose cut-off frequency varies directly as velocity of microrotational waves. Hence, cut off frequency varies directly as micropolar constant k' and inversely as microrotational inertia J. As k' increases cut off frequency of S waves increases. Hence, characteristics of waves are effected due to microstructure of the material and this effect is small, which is in agreement with physical phenomenon, because micropolar effects are second order effects. As k' also enters in ξ, hence shape and size of the ellipse will be different from that of generalized thermoelasticity.

The parameter m* depending on τ_0, in the first approximation does not affect phase velocity and attenuation constant. Change in V and S* are small with change in k' for fixed value of Ω^*. This is in agreement with the assumption that micropolar effects are second effects. Frequency equation for following cases can be obtained.

(i) Generalized thermoelasticity, when k' → 0.

(ii) Thermoelasticity when m* → 0, k' → 0

(iii) Classical elasticity when ε_1^* → 0, m* → 0, k' → 0.

Frequency equation of case (i) tally with equation (30) of Massalas, equation of case (iii) coincides to that of Rayleigh waves of classical elasticity.

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A Study of Zinc-Borate Glasses

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***Abstract*— xZnO (99-x)B_2O_3 (x= 19.5, 29.5, 39.5, 49.5 mol %) glasses doped with one mol % of Nd_2O_3 were prepared by conventional melt quenching technique and were characterized by density, molar volume and VIS spectroscopy measurements. It is observed that the optical band gap and molar volume of these glass samples decreases while density increases with increasing content of ZnO (modifier).**

***Index Terms*—Zinc borate, glasses, band gap energy, density**

I. INTRODUCTION

Rare earth ion doped oxide glasses have found wide commercial applications in the fields of electronics, nuclear, solar energy, glass lasers and acoustical optical devices [1-5]. Borates and borosilicate glasses containing boron oxide have been found useful in optical lenses. ZnO-PbO-B_2O_3 glasses are used in glass solders for sealing CTV tubes, IC packages and glass discharge tubes etc [6]

The usefulness of rare earth doped glasses for laser action depends on many factors such as refractive index of host glass, covalency of rare earth ligand bond and energy of emitted radiations. Any change in host glass composition effects the surroundings of rare earth ions and results in change in optical properties of the glass. The optical properties of rare earth ions doped glasses have widely been studied [7,8].

Neodymium belongs to group of rare earth metals. Nd^{+3} doped glasses have found applications for laser and optical wave guides. In the present work an attempt has been made to study optical and physical properties such as density, molar volume and boron-boron separation of neodymium doped zinc borate glasses.

II. EXPERIMENTAL

Sample Prepararion

Glass samples Zn1, Zn2, Zn3 and Zn4 with chemical compositions mentioned in Table I were prepared by melt quench technique. All the chemical reagents obtained from Aldrich Chemical Company, Bangalore, India and used in preparing these glass samples were of high purity (99.9%). Appropriate amounts of chemical reagents were weighed by using an electronic balance having an accuracy of 0.001 g. The weighed samples were thoroughly mixed together and grounded in an agate-mortar pestle. The samples were melted in a porcelain crucible for 30 minutes in a temperature range of 800°-1000°C. The molten liquid was occasionally stirred to ensure homogeneous mixing of all constituents and to obtain bubble-free samples. The melt so formed was poured into a preheated graphite mould which was then kept at a temperature of 300°-350°C. The glass samples were annealed at this temperature for 30 minutes to remove thermal stresses produced by non uniform rapid cooling of melt. The cooled samples were then polished with cesium oxide to obtain maximum flatness.

Table I Composition (mol %) of the Glass Samples

S.No.	*Sample Code*	*Nd_2O_3*	*ZnO*	*B_2O_3*
1.	Zn1	1	19.5	79.5
2.	Zn2	1	29.5	69.5
3.	Zn3	1	39.5	59.5
4.	Zn4	1	49.5	49.5

Density

The densities of samples under investigation were measured at room temperature by the standard principle of Archimedes' using a sensitive microbalance with pure benzene as the immersion fluid (buoyant). The density ρ, was calculated using the following formula

$$\rho = \frac{W_a}{W_a - W_b} \times \rho_b \qquad (1)$$

where W_a is the weight of the sample in air, W_b is the weight of the sample in benzene and ρ_b is density of buoyant at room temperature. All the weight measurements have been made using a digital balance (Sartorius, Model: BP221S, USA). The accuracy in the measurement of weight was ± 0.1 mg. The experiment was repeated for five times to get an accurate value in density.

Molar Volume

The molar volume V_m, which is the ratio of molar mass and the density of glass is given by

$$V_m = \overline{M} / \rho \qquad (2)$$

where ρ is the density of the glass and the molar mass $\overline{M}$ is given by

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$$\overline{M} = \sum_{i=1}^{n} n_i m_i \qquad (3)$$

where n_i and m_i are the mole fraction and the molecular weight of the i^{th} component of glass.

UV/VIS Spectroscopy

Optical measurements were performed using a UV-VIS double-beam spectrophotometer (Shimadzu 160-A, Japan), having a dual light source capable of emitting ultraviolet as well as visible light. Visible absorption spectra of these glasses were recorded in the wavelength range 200-1100 nm at normal incidence. The variation of optical band gap energy with ZnO concentration calculated from optical spectra of several Nd^{+3} doped zinc borate glasses, is listed in Table II.

III. RESULTS AND DISCUSSION

Density and Molar Volume

The study of density and refractive index for transparent materials is very important for measuring piezo and elastic optic properties, electrostriction of dielectric materials and for studying the structure of material. The density of borate glasses depends on fraction of four co-ordinated boron. It is a well known fact that boron atom can have co-ordination number three and/or four [9,10]. Thus boron can have its structure in a triangular and/or tetrahedral form. Tetrahedral groups are more rigid than triangular groups. In pure form of B_2O_3 glasses most of the boron atoms are involved in boroxol rings. The increase in density of xZnO (99-x)B_2O_3 (x= 19.5, 29.5, 39.5, 49.5 mol %) with increase in the content of ZnO (shown in Table II) indicates that the number of atoms going into four co-ordination also increases. It is also an established fact that the separation between BO_4 tetrahedra and neighbouring BO_3 trigonal is less than the separation between adjacent BO_3 triangles. Thus, conversion of three co-ordinated boron to a four co-ordinated boron is the cause of network contraction i.e. decrease in glass volume [11]. The decrease of the molar volume with increasing content of ZnO indicates the increase of BO_4 units (Table II).

Band Gap Energy

The UV/VIS spectra recorded as a function of wavelength for various compositions of Nd^{+3} doped zinc borate glasses show that the absorption edges are not very sharp which indicates amorphous nature of samples. The absorption edge shifts towards longer wavelength with increasing amount of ZnO, which has also been explained by other researchers [12,13]. Absorption coefficient α as function of photon energy is found to obey the relation given by Davis Mott

$$\alpha(\omega) = \beta\left[\hbar\omega - E_{opt}\right]^n / \hbar\omega \qquad (4)$$

where $\hbar\omega$ is the energy of incident photons, β is a constant and E_{opt} is the optical band gap. The values of E_{opt} were calculated by plotting $(\alpha\hbar\omega)^{1/2}$ against $\hbar\omega$ and extrapolating the linear part of the curves to $(\alpha\hbar\omega)^{1/2} = 0$. The values so obtained are listed in Table II and plotted in figure 1. It is

Table II Density, Molar Volume and Band Gap of Glass Samples

S.No.	Sample Code	Density, d (gm/cm^3)	Molar Volume V_m (cm^{-3})	Band Gap, E_{opt} (eV)	Boron-Boron Separation d_{B-B} (nm)
1.	Zn1	3.947	18.896	3.46	0.425
2.	Zn2	4.116	18.405	3.41	0.369
3.	Zn3	4.186	18.379	3.35	0.335
4.	Zn4	4.318	18.089	3.29	0.311

evident from the table and the plot that E_{opt} for glass samples decreases with increase in ZnO contents in the samples and is dependent on the glass composition. A similar trend has been reported by other workers for ZnO-PbO-B_2O_3 [2] and for PbO-Bi_2O_3-B_2O_3 [12,14]. The absorption characteristics of these

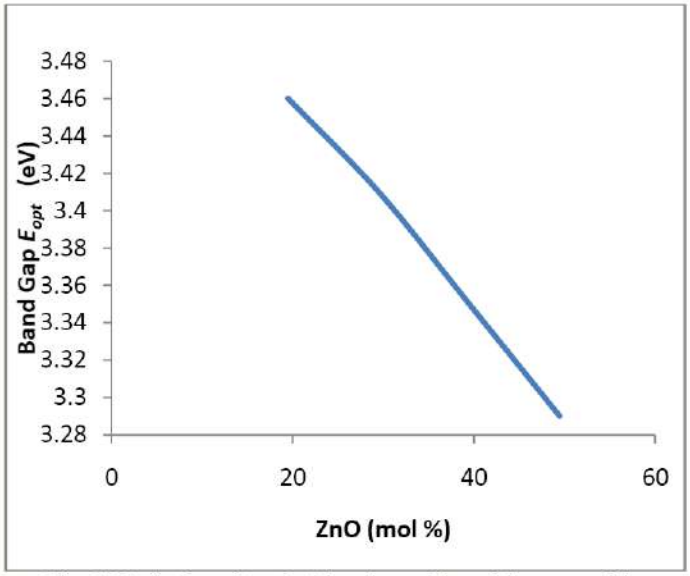

Fig. 1 Variation of optical band gap E_{opt} with composition of ZnO in xZnO (99-x)B_2O_3 glasses

glasses may be described qualitatively on the basis of oxygen bond strength in the glass forming network. The possible reason for decrease in E_{opt} with increase in ZnO content may be due to the increase in the oxygen environment and hence increase in the binding oxygen (BO_4 units) is expected.

Average Boron –Boron Separartion

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The volume of one mole of Boron atom within the glass system is given by

$$V_m^B = V_m / 2(1 - X_B) \quad (4)$$

where X_B is the mole fraction of B_2O_3 oxide.

The average boron-boron separation is calculated by using the following relation:

$$< d_{B-B} >= (V_m^B / N_A)^{1/3} \quad (5)$$

where N_A is the Avogadro's number.

The calculated values of d_{B-B} are shown in Table II. It is evident from the table that d_{B-B} decreases with increase in the content of ZnO. Thus with the addition of ZnO, glass structure becomes more and more compact.

IV. CONCLUSIONS

The increasing content of ZnO causes the breaking of the bonds between the trigonal elements. As a consequence there is a formation of BO_4 units which result in the compactness and hence the increase of density. The E_{opt} decreases with the increasing content of ZnO which may be due to certain structural changes occurring in the material with change in compositions.

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Exception handling in Web Services based on Self healing Architecture and Multi Agent System

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***Abstract*-- Failures during web service execution may depend on a wide variety of causes. One of those is loss of Quality of Service (QoS). Failures during web service execution impose heavy costs on services-oriented architecture (SOA). In this paper, we seek to achieve a self-healing architecture to reduce failures in web services. We believe that failure prediction prevents the occurrence of failures and enhances the performance of SOA.The proposed architecture consists of three agents: Monitoring, Diagnosis and Repair. Monitoring agent measures quality parameters in communication level and predicts future values of quality parameter by Time Series Forecasting (TSF) with the help of Neural Network (NN). Diagnosis agent analyzes current and future QoS parameters values for diagnose web service failures. Based on its algorithm, the Diagnosis agent detects failures and faults in web services executions. Repair agent manages repair actions by using Selection agent.**

Keywords: - Web Service, Self healing Architecture, Failure prediction, Qos prediction, Multiagent System

I. INTRODUCTION

Basically Web Services, which is a distributed computing model based web, is a kind of distributed technology that is loose coupling and independent of specific platform and language. It uses service-oriented architecture (SOA) model as its architecture.With the advantage of web services, web services have becoming an important technology for the development of new software systems. Because of the radily and increasing growth of web services with similar operational functions, QoS (quality of services) parameters have a key role in selecting, detecting and combining web services. Decreasing QoS (quality of services) is one of causes of web services failures. Failures during web services execution impose heavy costs on SOA (Service oriented architecture). Failures during web service execution may also depend on a wide and different variety of causes, such as network faults, server crashes, or application-related errors, such as unavailability and absentency of a requested web service, errors in the orchestration of choreography of applications, missing important data or parameters in an execution flow, or low Quality of Service (QoS). In this paper, propose of SHA (Self healing architecture) to reduce failures in web services is introduced.

In this SOA (Software oriented architecture), client request for appropriate web service is the starting point. Web services providers publish a web service detail in web services repository area. Web services publish a WSDL document. Functionality in Web services are defined, in Universal Description and Discovery Integration (UDDI) method. Web service consumer can find and locate data or information of the web service in UDDI. When a consumer wishes to start communicating with a web service, it search the UDDI registry, retrieves the WSDL document and communicates with the web service using Simple Object Access Protocol (SOAP) message. Web services process are completely hidden, and consumers need no more information about the web Service to accept the knowledge of the WSDL document. Consumer control the web service while if the webservice matching their functional and non-functional needs.Consumer and provider negotiate on QoS parameters values before web service binding. After the negotiations between the customer and the supplier, a contract will be concluded in between and both parties will be obliged to perform the contract's stipulations. It can be seen that selection web services process imposes heavy costs on SOA. I believe that failure prediction prevents the occurrence of failures and enhances the performance of SOA.

The proposed failure-prediction based architecture seeks to achieve self-healing architecture in web services. The

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proposed architecture consists of three agents: Monitoring, Diagnosis and Repair. In order to apply Monitoring methodologies to web services, basically focus on a prediction mechanism. Prediction mechanism implement by TSF with help of NN. In order to apply Diagnosis methodologies to web services, have to focus on faults and failure diagnosis by current and future values of quality parameters. Based on its algorithm, the Diagnosis agent detects failures and faults in web services executions. Repair agent implements possible plan to repair a diagnosed failures by using Selection agent. Repair agent manages repair actions. Self-healing systems are clearly recovery-oriented and require monitoring the system to detect transitions to faulty modes, to diagnose the situation, and to appropriately choose and execute a recovery strategy [1]. The main goal of the repair is to assure that minimum work is lost and the process execution can be continued after a failure. [1]

Multi agent systems (MAS) can be use for implement the architecture. Software agents are defined as autonomous entities that incorporate intelligence and cognitive capabilities, allow them to show agent-oriented pro-active behavior and to establish, either competitive or cooperative, interaction processes with other software entities in order to satisfY their design objectives.Today many researchers view agents either as a coordination framework for web services or as entities that can use web services. Integrating web services and MAS provide a promising computing environment for managing QoS issues efficiently [3].

FAILURE PREDICTION BASED ON SELF-HEALING ARCHITECTURE

The proposed failure-prediction based architecture seeks to achieve self-healing architecture in web services. The proposed architecture consists of three agents: Monitoring, Diagnosis and Repair. During Monitoring phase a prediction mechanism is performed. In this architecture, the creation of service agent that represents the service's interface and quality attributes for service consumer and service provider. Provider agent is registering the quality parameters in the agent directory. When a Consumer agent searches for a service it sends a request to the Selection agent. Selection agent queries the Agent Directory and finds the services that provide consumer functional needs then the Selection agent will fetch the QoS parameters values. The Selection agent initiates the negotiation process after the selection process is done. The selection agent mediate provider and consumer QoS negotiate.

The main components composing the architecture are as follows:

- Monitoring agent
- Diagnosis agent
- Repair agent
- Selection agent

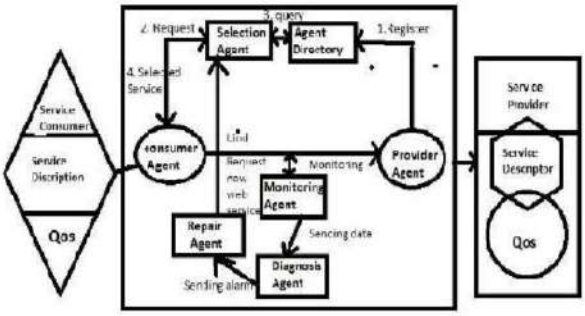

Fig 1. A Self-Healing Architecture for Web Service based on Failure Prediction and a MAS

- **Monitoring Agent:**- Monitoring Agent has two major task, measurement and prediction QoS parameters values. Monitoring Agent measures in communication level by analyzing SOAP message header information while intercepting exchanged SOAP message between consumer and provider.
- **Diagnosis Agent:**- The Diagnosis agent analyzes the data obtained from the monitoring agent. Its task is to detect the failures and faults. Fault happened if quality of parameter values (e.g. Execution Time) higher than a threshold (maximum acceptable value). Failure happened if fault repeat higher than a tolerated quantity. The Diagnosis agent compares the measured and predicted data with that in the negotiated agreement between the customer and the supplier[1].
- **Repair Agent:**- The Repair agent starts working by receIVIng alert message from the Diagnosis agent. Repair Agent manages repair actions. Repair Agent starts substitutes and retries action.Repair Agent sends message Selection Agent.
- **Selection Agent:**- Selection Agent starts working by receiving request message from consumer. Selection Agent searches Agent Directory to find the services that functionality match user's needs. Selection Agent mediate QoS negotiate between Consumer Agent and Provider Agent after the selection process is done.

This purposed Creteria i was studied completely,and some fault prediction came front out of this.This resolvance or fault prediction will be removed or implemented in the implementing part which will be proceed further.

II. PROCESS LEVEL OF SELF-HEALING ARCHITECTURE

Three agents at process level are to be mentioned: Monitoring, Diagnosis and Repair.

Monitoring web service:- The qualitative parameter monitoring measures the actual values of the qualitative parameters so that the customer can make sure that the services provider offers the agreed quality.The presented method consists of 3 components: data collection, prediction and monitoring core. The monitoring core starts issuing the collection command according to the client's request. The data collection measures the values of qualitative parameters

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through analyzing the exchanged messages between the client and the supplier. Thereby, I acquire the current values of qualitative parameters each time the web service is summoned.

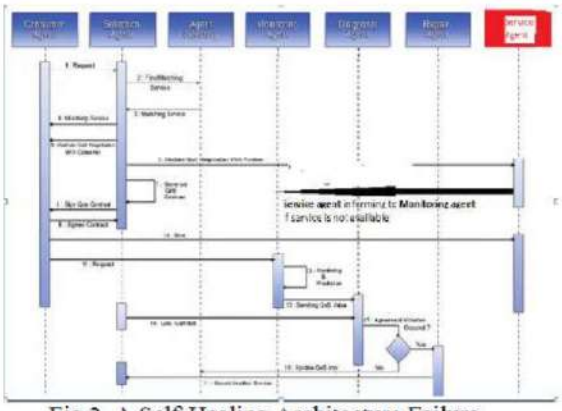

Fig 2. A Self-Healing Architecture Failure Prediction Based Process

When it receives the stop-measurement command from the monitoring core, the data collection component sends the current values to the prediction component to predict. This component predicts the future values of qualitative parameters using time series prediction method through a neural network. The predicted values are sent to the monitoring core and then to the customer. Knowing the future condition of the quality parameters values, the customer decides whether or not to continue its interaction with the services provider. This method along with its benefits is described thoroughly in the mentioned sources.

DIAGNOSIS FAULTS AND FAILURE

Diagnosis agent analyzes received data of Monitoring agent. Diagnosis agent detects faults and failures in web service execution. Fault happened if quality of parameter values (e.g. Execution Time) higher than a threshold (maximum acceptable value), higher than a tolerated quantity. Diagnosis agent compares the current and the future values of quality parameter with quality parameter values negotiated in QoS contract.

The proposed algorithm for fault and failure detection, as illustrated table 1. In this algorithm, the Tolerated Fault is equal to accepted valued in QoS contract (Acc) and Tolerated Value (TV) which is proportional to the standard deviation. It can be pre-computed, on the QoS contract signed by consumerand provider web service.[1]

```
1   begin
2       Acc = Accepted value in QoS contract
3       TV = Acc/10
4       Idle = Receive_fault = 0
5       loop
6           on_New_Monitoring (ET_m, ..., ET_{i-1}, ET_i);
7           on_New_Prediction (ET_i, ET_{i+1}, ..., ET_n);
8           for (i=m; i++; i<n)
9               if (ET_i > Acc + TV) then
10                  Receive_fault++;
11          end for
12              if (Receive_fault > Tolerated_fault) then
13                  Receive_failure = 1;
14                  Send alert message to Repair agent;
15              else if  Receive_failure =0;
16      end loop
17  end
```

Table 1. Fault and Failure Detection Algorithm on Execution Time (ET)

As illustrated in table I, on each measured QoS parameter values (line 6) and forecasted QoS parameter values (line 7), the algorithm increase the number of receive fault (line 10) if the new values higher than accepted valued in QoS contract and Tolerated Value (line 9). In this algorithm, if the number of receive fault higher than tolerated fault the algorithm activate receive failure (line 13). If receive failure = I(lineI3) Diagnosis agent sends alert message to Repair agent for start repair actions (lineI4) else receive failure – 0 (line 15).

Repair actions:- Self-healing systems are clearly repair-oriented. The main goal of failure repair is to assure that minimum data and work is lost and normal execution can be continued. Repair actions executing to prevent web services failures. Possible repair actions at the Web service are retry, substitute or repeat negotiation QoS contract with service provider. I specific retry or substitute actions for Repair Agent in the SHA. The Repair agent chooses either web services replacement or re-summoning from the options ahead. If it decides to replace the services, the Repair agent requests the appropriate services by sending a message to the selection agent. The Repair agent chooses either web service replacement or re-summoning.

However, in durable failures where the supplier is not available for a long time, I use web services replacement. In this case, a message is sent to the selection agent to find the appropriate services. This is the easiest method to implement the Repair approach in self-healing architecture. When a fault is permanent and retry invocations always fail, it is necessary to substitute the failed service. Substitute web service doing by Selection Agent, Selection Agent finds matching web services with consumer functional needs.

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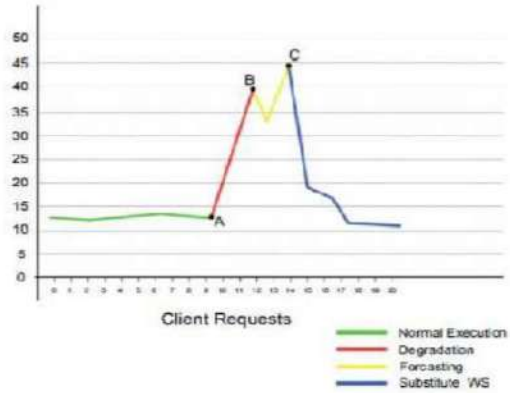


Figure 3. Repair of Degradation

Figure 3 illustrates the whole self-healing cycle. I would like to reach the figure 4 after implementation the architecture. The green curve represents the normal execution. The redcurve represents the degradation. The yellow curve represents the forecasting. The blue curve represents the substitute web service.

IV. PROBLEM TO BE DEFINED

Basically when web service can be introducedthere are lots of fault and failure are to occur and various causes also like Qos(quality of service),because web service is always have a disadvantages when quality of service is fail,so purely quality can matter in web service

So if I haven't so, fault and failure can easily be arrive.to remove that failure self healing creteria can be introduced that is mentioned before.

This can be removed that failure with the help of multiagent enviironment like:

A. Monitoring agent.
B. Diagnosis Agent.
C. Repair Agent
D. Selection Agent.

Main part in this category is diagnose agent.Because if this agent work properly and accurately fault and failue are easily detected.

So the main part of this paper that how problem can arrived

Fault happened if Quality of parameter value(i.e execution time)higher than a threshold value.

In this region,all measured can depend on prediction creteria.

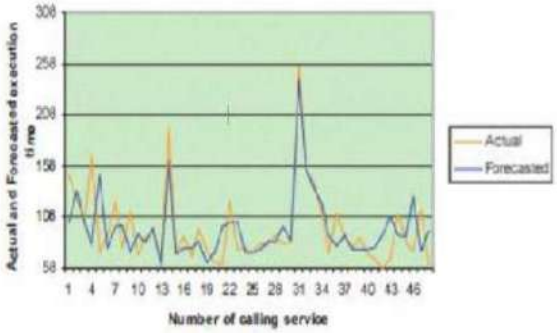


Fig 4. Execution Time with one requester (Experience duration = 5 min) and requests 1-501

An example of qualitative parameters values (Execution Time; defined as the time elapsed for processing a request), which has been measured up to 50 times, can be seen in fig3. I can see a reasonable prediction by the neural network.

To overcome this problem, i would like to introduce an implementation creteria in which such kind of problem to be resolve.

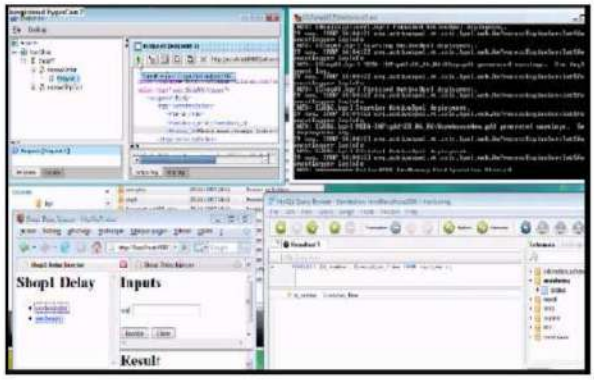
There are some tools which will be quite helpful to do so.

- ✓ Soap UI 4.6.1

:In this tool,various form of coding which will be helpful for implementing the execution process.

- ✓ Tomcat 5.1:
- ✓ My Sql query processor
- ✓ Web browser for giving the output.

An example form of execution process are as follow:-



V. LITERTURE SURVEY

A. Quality Criteria and an Analysis Framework for Self-Healing Systems

The next generation of Web as Semantic Web Services envisions Web Services to be dynamically discovered, composed, invoked and executed. Software agent is a computer system which is capable of flexible autonomous action in a dynamic, unpredictable and open environment. Agent technologies are a natural extension

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of current component based approaches. Software Agents are envisioned as autonomous, proactive software entities that act on behalf its users according to a given agenda of goals. Software Agents have been envisioned as potential user of Semantic Web Services in order to interact with semantic descriptions of SWS to autonomously discover, select, compose, invoke and execute the services based on user requirements. However, there exists a communication gap among the both. The major reason is that Software Agents are not compatible with widely accepted standards of Web Services. This paper provides a solution to make Multi Agent Systems compatible with existing Web Services standards without changing their existing specifications and implementations, with an assumption that it will be helpful for enabling further interoperability between Software Agents and Semantic Web Services. AgentWeb Gateway is an initiative for dynamic and seamless interoperation of Multi Agent Systems and Web Services. I present abstract architecture and detailed design of the proposed system [2].

The goal of this paper is to evaluate and document software architecture of self-managing applications with respect to specific quality attributes. In this context, the evaluation of architecture means to identify key attributes and to verify those attributes with respect to the changes and adaptation over long periods of time.

The technique used in this paper for evaluating the architecture is based on specific individual quality attributes. Our study focuses on the evaluation of self-healing systems as opposed to self-configuring, selfoptimizing, or self-protecting systems. Self-healing systems need to adapt and change over time. Such changes may be due to a change in their designed operating mode, accumulated component and resource faults, adaptations to external environments, component evolution, or changes in system usage. Hence, it is useful to evaluate the architecture of selfhealing applications. To facilitate this evaluation, I developed an analysis and reasoning framework for the architecture of self-healing systems. I use the notion of an attribute-based architectural style (ABAS) as a basis for this evaluation[4].

Over the last years agents have proved to be a powerful mechanism for solving a range of problem sets. In order to fully leverage their power in a multi-agent environment with heterogeneous participants, the establishment of barrier-free communication between different parties is of prime concern. In particular, such an environment may consist of numerous entities, based on different implementations and with different non-functional requirements (NFRs), e.g. encryption key length or latency. Currently, interoperability between the involved parties in multi-agent systems is limited as there is no established way of elaborating a common set of NFRs.

Dynamic Self-Healing for Service Flows with Semantic Web Services

In this paper, I outline a Web services-based architecture addressing this issue of interoperability in multi-agent systems. Furthermore, I introduce a soft constraints-based approach for modeling and reconciling the NFRs. In particular, Web services serve as a tool for establishing an open system providing reliable communication between a variety of agent implementations and possible non-agent based entities while lacking the limitations of Agent Communication Languages (ACLs), which are asynchronous in nature and closed in implementation. In this way, Web services enable the desired level of openness and robustness needed for maximum interoperability.

Adding a soft constraints-based approach to the Web services agent layer provides an extensible and flexible mechanism for the reconciliation of interdependent NFRs. I present a prototype implementation of an open, Web services-based framework optimizing unary soft constraints in a pareto optimal way and therefore enabling barrier-free communication in a multi-agent scenario. Due to its open nature, the framework is applicable to any heterogeneous environment in need of reconciling NFRs. To illustrate its functioning, i briefly demonstrate the framework in the potential use case of a Demand Driven Supply Network (DDSN). In order to meet the requirements of cooperation and information sharing with different layers among someheterogeneous subsystems in power system, a wide-area cooperation multi-agent platform is proposed based on web service and agent technology. The wide-area cooperation model is discussed firstly; the principles of the framework implementing the platform are expatiated. Some key technologies are studied, such as the design pattern of diagnostic agent, the implementation of web service components, and the negotiation mechanisms based on business event and publish/subscribe.

The design and implementation of the prototype for wide-area backupprotection in power system illustrate that the platform can provide bidirectional communication for wide-area cooperation agents and greatly improve the intelligence and flexibility of distributed system evaluation of the system and analysis of results[5].

With an increasing complexity of business processes, self-healing capability is becoming an important issue in order to support robust service flow execution. In this paper, a dynamic self-healing mechanism is proposed, which can dynamically identify suitable alternatives and replace faulty services such that a service flow can be performed successfully despite of unexpected exceptions. This mechanism explicitly utilizes Semantic Web services for service matching and selection of a composite service in business service flow, and Semantic web services are equipped with rich business rules in a domain-dependent manner. I explore the self-healing mechanism for supporting self-healable service flow execution which is modeled in BPEL4WS. A demo system of self-healing capable Service Flow Execution is built to validate its effectiveness by a concrete scenario, PC manufacturing application[5].

Self-healing in fault tolerant multi-agent systems is the system ability to automatically detect, diagnose, and repair the faults. However, most of the available solutions are fragile in incomplete, uncertain, and dynamic situations. This paper proposes a novel economically

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inspired self-healing model for fault tolerant Multi-Agent Systems where the agents are self-interested autonomic elements collaborate to achieve fault tolerance as a given high-level objective of the system.

It is an effective solution for dynamic situations with a high possibility of uncertainty. The proposed model is in fact towar responding the challenge of negotiation theory for autonomic systems introduced by IBM. In particular, it is an inspiration of general explanation of Communism, Socialism, and Capitalism. Extensive experiments illustrate the effectiveness of the proposed social approach in comparison to the cases of no help situation, using purely redundant components, and helping without using a social value.[6].

VI. CONCLUSION

In this paper, looking for a strategy through which I can use prediction approach to develop a self-healing architecture in web services. I presented an architecture which consisted of Monitoring, Diagnosis, Repair and Selection agents. I will implemented the prediction approach using time series prediction which is based on a neural network. I presented a self-healing architecture for Web service-based applications that deal with reparations to sustain the QoS level. I aimed to reduce the web services failures in SOA and i believe that failures can be avoided by prediction in the presented architecture. My future work is to implement the proposed architecture. Moreover, I plan to apply our proposed self-healing approach to the composition level by looking into the combination of the respective self-healing mechanisms of component Web services.

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MAC PROTOCOLS IN WSNs

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ABSTRACT
Wireless sensor networks (WSNs) have become an active research area for the researchers. The sensor nodes are generally unattended after their deployment in hazardous, hostile or remote areas. These nodes have to work with their limited and non replenish able energy resources. Energy efficiency is one of the main design objectives for these sensor networks. This paper, firstly present ALOHA Protocols that simulates both ALOHA and Slotted ALOHA protocols. ALOHA is a random (or contention) access protocol developed at the University of Hawaii for sharing broadcast channel access among a number of users with relatively low throughput demand.Secondly it presents energy efficient medium access control (MAC) protocols for the wireless sensor network, a new real-Time MAC protocol is presented that is based on a general purpose MAC protocol, called S-MAC. In the last this paper presents Tone-Propagated MAC (TP-MAC), a novel MAC protocol for Wireless Sensor Networks (WSN)s, specially suited for early warning and tracking applications, where the traffic generated by sensor nodes (mainly alert messages) is sporadic but has stringent latency requirements. This protocol aims to maximize energy-efficiency while minimizing latency in source-to-sink and sink-to-source communication. The results show that TP-MAC is able to achieve better target latencies even when its duty-cycle is lower during periods of inactivity. The results also show that the advantage of using TP-MAC increases with the hop-distance between source and sink.

Keywords: Energy Efficiency, MAC, Wireless Sensor Network, Early Warning and Tracking, Scheduled Channel Polling.

I. INTRODUCTION

Wireless Sensor Networks (WSNs) have emerged as one of the dominant technology trends of this decade (2000-2012) that has potential usage in defence and scientific applications [1]. A typical node in the WSN consists of a sensor, embedded processor, moderate amount of memory and transmitter/receiver circuitry. These sensor nodes are normally battery powered and they coordinate among themselves to perform a common task. The sensor node's radio in the WSNs consumes a significant amount of energy. Medium access control (MAC) is an important technique that ensures the successful operation of the network. One of the main functions of the MAC protocol is to avoid collisions from interfering nodes. The classical IEEE 802.11MAC protocol for wireless local area network wastes a lot of energy because of idle listening. Designing power efficient MAC protocol is one of the ways to prolong the life time of the network.

A. An overview of 802.11 standard protocol

Like any 802.x protocol, the 802.11 protocol covers the MAC and physical layers. The standard currently defines a single MAC which interacts with three PHYs (all of them running at 1 and 2Mb/s) as follows: frequency hopping spread spectrum in the 2.4 GHz band, direct sequence spread spectrum in the 2.4 GHz band, and infrared. The MAC layer defines two different access methods, the distributed coordination function (DCF) and point coordination function (PCF). CSMA protocols are well known in the industry, the most popular being the Ethernet, which is a CSMA with collision detection (CSMA/CD) protocol. These kinds of protocols are very effective when the medium is not heavily loaded, since it allows stations to transmit with minimum delay. But there is always a chance of stations simultaneously sensing the medium as free and transmitting at the same time, causing a collision. In order to overcome the collision problem, the 802.11 uses a CA mechanism coupled with a positive acknowledge scheme, as follows:

- A station wanting to transmit senses the medium. If the medium is busy, it defers. If the medium is free for a specified time, called the distributed interframe space (DIFS) in the standard, the station is allowed to transmit.
- The receiving station checks the cyclic redundancy check (CRC) of the received packet and sends an acknowledgment packet.

To distinguish this MAC layer ACK from upper layer acknowledgments, it is designated as M-ACK. Receipt of the M-ACK indicates to the transmitter that no collision occurred. If the sender does not receive the M-ACK, it retransmits the frame until it receives an M-ACK or throws it away after a given

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number of retransmissions. According to the standard, a maximum of seven retransmissions are allowed before the frame is dropped. In order to reduce the probability of two stations colliding due to not hearing each other, the well known "hidden node problem". This mechanism reduces the probability of the receiver area collision caused by a station that is "hidden'' from the transmitter during RTS transmission, because the station overhears the CTS and "reserves'' the medium as busy until the end of the transaction. Besides the hidden node problem, wireless packet networks also face the exposed node problem. A hidden node is one that is within the interfering range of the intended destination but out of the sensing range of the sender. Hidden nodes can cause collisions on data transmission. Exposed nodes are complementary to hidden nodes. An exposed node is one that is within the sensing range of the sender but out of the interfering range of the destination. If exposed nodes are not minimized, the available bandwidth is underutilized. However, in the 802.11 MAC layer protocol, there is almost no scheme to deal with this problem. This might cause a serious problem when it is used in multihop wireless networks. [2]

II.LITERATURE SURVEY

A. Attributes of a Good MAC Protocol

To design a good MAC protocol for the wireless sensor networks, the following attributes are to be considered

a) *Energy Efficiency*- The first is the energy efficiency. The sensor nodes are battery powered and it is often very difficult to change or recharge batteries for these sensor nodes. Sometimes it is beneficial to replace the sensor node rather than recharging them.

b) *Latency*- The second is latency. Latency requirement basically depends on the application. In the sensor network applications, the detected events must be reported to the sink node in real time so that the appropriate action could be taken immediately.

c) Throughput- Throughput requirement also varies with different applications. Some of the sensor network application requires to sample the information with fine temporal resolution. In such sensor applications it is better that sink node receives more data.

d) Fairness- In many sensor network applications when bandwidth is limited, it is necessary to ensure that the sink node receives information from all sensor nodes fairly. However among all of the above aspects the energy efficiency and throughput are the major aspects. Energy efficiency can be increased by minimizing the energy wastage.[3]

B. MAC Performance Matrices

In order to evaluate and compare the performance of energy conscious MAC protocols, the following matrices are being used by the research community.

a) Energy Consumption per bit- The energy efficiency of the sensor nodes can be defined as the total energy consumed / total bits transmitted. The unit of energy efficiency is joules/bit. The lesser the number, the better is the efficiency of a protocol in transmitting the information in the network.

b) Average Delivery Ratio- The average packet delivery ratio is the number of packets received to the number of packets sent averaged over all the nodes.

c) Average Packet Latency- The average packet latency is the average time taken by the packets to reach to the sink node.

d) Network Throughput-The network throughput is defined as the total number of packets delivered at the sink node per time unit.

III. CLASSIFICATION OF MAC PROTOCOL

The medium access control protocols for the wireless sensor networks can be classified broadly into two categories:

A. SCHEDULE BASED MAC PROTOCOLS

The schedule based protocol can avoid collisions, overhearing and idle listening by scheduling transmit & listen periods but have strict time synchronization requirements. Schedule can be fixed or computed on demand. These protocols are based on Time Division Multiple Access (TDMA) technique.

B. CONTENTION BASED PROTOCOLS

The contention based protocols on the other hand relax time synchronization requirements and can easily adjust to the topology changes as some new nodes may join and others may die few years after deployment. These protocols are based on Carrier Sense Multiple Access (CSMA) technique and have higher costs for message collisions, overhearing and idle listening. These can be used as random.

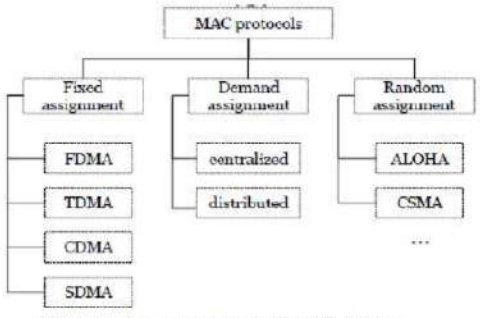

Figure 1. Mac protocol classification

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a) Fixed Assignment

The available resources are allocated between the nodes; no competition…

i. FDMA: It is Frequency Division Multiple Access, used by radio systems to share the (radio) spectrum. It requires frequency synchronization.

ii. TDMA: It is Time Division Multiple Access, a digital technology that uses a single frequency channel.

iii. CDMA: spread spectrum based scheme that allows multiple nodes to transmit simultaneously.

iv. SDMA: spatial separation of the nodes is used to separate their transmissions.

b) Demand Assignment

To improve channel utilization by allocating the channel to contending nodes (near) optimally. It needs a control mechanism to arbitrate access. These are of two types:

a) Centralized (polling): a master control devices queries each slave node in a predetermined order.

b) Distributed (reservation and token):

i. Set a time slot for reservation messages

ii. Token holder can transmit.

c) Random Assignment

Address the short comings of fixed (static) assignment schemes. It is originally developed for long radio links and satellite communications. Types of Random Assignments are as follows:

i. ALOHA- pure, slotted

ii. CSMA- CD, CA

- Carrier Sensing→ Contention
- Non-persistent CSMA, persistent CSMA, backoff
- Busy-tone, RTS/CT

Some of the MAC protocols are explained as follows:

A. ALOHA

The history of wireless communication can be traced back to ALOHA [1]. Aloha was designed by Abramson in 1970 [1] for linking the various Hawaiian Islands. It is a very simple protocol in which a station sends data whenever it has data to send. The receipt of an acknowledgement (which might be implicit) assures the sender that data has been delivered successfully, else it is sent again after a random time gap. It can be easily shown using simple traffic load assumptions that peak Aloha performance is only 18 %. Subsequent variations like slotted ALOHA and reservation ALOHA significantly improve the performance.

Two Types:

a) Pure ALOHA

b) Slotted ALOHA

a) Pure ALOHA: The Protocol allows the users transmit whenever they have data to be sent. There will be collisions, of course, and the colliding frames will be damaged. However, de to the feedback property of broadcasting, a sender can always find out whether its frame was destroyed by listening to the channel, the same way others users do. With a LAN, the feedback is immediate; with a satellite, there is a delay of 270 msec before the sender knows if the transmission was successful. If listening while transmitting is not possible for some reason, acknowledgements are needed. If the frame was destroyed, the sender just waits a random amount of time and sends it again. The waiting time must be random or the same frames will collide over and over, in lockstep.

Assumptions:

• Stations also re-generate collided frames

• G is old plus new frames and N Mean number of new frames per frame time

• Throughput per frame time is G time's probability of frame having zero collisions: $S = G P_0$

Ex: G=0.5, P_0=0.5 so S = 0.25

Frame Collisions

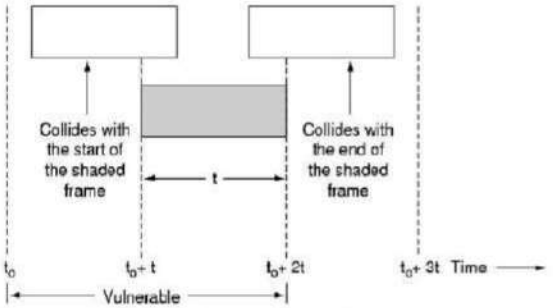

Figure 2. Frames collisions Probability k frames generated per frame time

$\Pr[K] = \frac{e^{-G}G^k}{k!}$

$\Pr[0] = e^{-G}$

• Need two frame times empty, 2G generated

– For two slots, $\Pr[0] = e^{-2G}$

• Throughput per frame time

$S = Ge^{-2G}$

ii. Slotted ALOHA: Roberts suggested a method, which has come to known as slotted ALOHA, in contrast to Abramson's pure ALOHA. According to this protocol a computer is not permitted to send whenever a carriage return is typed. Instead, it is required to wait for the beginning of the next slot. Thus, the continuous pure ALOHA is turned into a discrete one.

Assumptions:

1. Divide time into intervals, one for each frame.
2. Users transmit only at beginning of slot.
3. Need one frame time to be empty, G generated for one slot, $\Pr[0] = e^{-2G}$
4. Throughput $S = Ge^{-2G}$

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5. Max efficiency of 36% is achieved for G=0.5 [all users' frames / frame-time]
6. Best (G = 1):
– 37% empty
– 37% success
– 26% collisions

B. S-MAC PROTOCOL

Sensor S-MAC [3] a contention based MAC protocol is modification of IEEE 802.11 protocol specially designed for the wireless sensor network in 2002. This Protocol also has good scalability and collision avoidance capability. It achieves good scalability and collision avoidance by utilizing a combined scheduling and contention scheme. Following major sources of energy waste.

i. Collision: When a transmitted packet is corrupted it has to be discarded, and the follow-on retransmissions increase energy consumption. Collision increases latency as well.

ii. Overhearing: meaning that a node picks up packets that are destined to other nodes.

iii. Control packet overhead: Sending and receiving control packets consumes energy too, and less useful data packets can be transmitted.

iv. Idle listening: listening to receive possible traffic that is not sent. This is especially true in many sensor network applications. If nothing is sensed, nodes are in idle mode for most of the time.

However, in many MAC protocols such as IEEE 802.11 or CDMA nodes must listen to the channel to receive possible traffic. Many measurements have shown that idle listening consumes 50–100% of the energy required for receiving. S-MAC tries to reduce the waste of energy from all the above sources. In this medium access control protocol sensor node periodically goes to the fixed listen/sleep cycle.

Figure3: Periodic listen and sleep

A time frame in S-MAC is divided into to parts: one for a listening session and the other for a sleeping session.

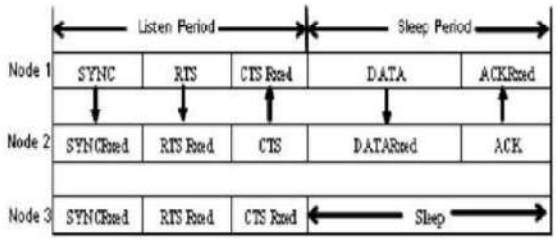

Figure4: Basic S-MAC Scheme, Node 1 Transmits Data to Node

Only for a listen period, sensor nodes are able to communicate with other nodes and send some control packets such as SYNC, RTS (Request to send), CTS (Clear to Send) and ACK (Acknowledgement).

a) PROBLEM ANALYSIS

S-MAC can work with or without periodic sleeping. However, continuous ON mode of operation in S-MAC is intended mainly for protocol evaluation purpose. S-MAC uses contention and back-off schemes for wireless medium access. It also uses RTS/CTS exchange method to avoid hidden terminal problem of wireless communication.

However, in general, it's not known a priori as to which wireless sensor node will win contention in a neighborhood. Therefore, it's not possible to predict about data transmission pattern in the network. For example, Figure shows one of such possible data packet transfer pattern in S-MAC protocol. In this figure, if node N0 has four packets to send to sink node N10, then N0 starts contending for medium at t1 and wins contention.[5]

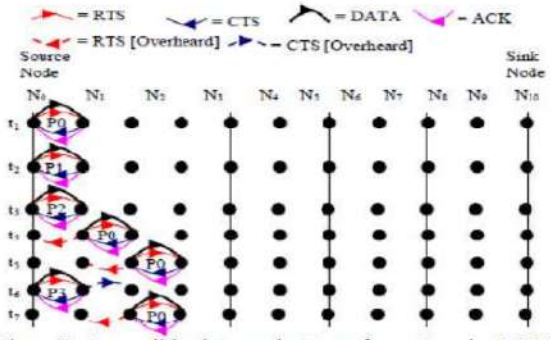

Figure5: A possible data packet transfer pattern in S-MAC protocol

Thus, N0 send first packet P0 to N1 node. At t2, both N0 and N1 contend for medium. Now, if N0 again wins contention, then it sends second packet P1 to N1. However, from real-time point of view, it is desired that as P0 appears first in the network (which could be an alarm for an event), then node N1 should have won contention and should have forwarded P0 to N2 node, instead of loosing contention to N0 node and receiving next packet P1.As we see between time t3 to t7, it's totally unpredictable as to which node is wining contention. To remove this uncertainty, we introduced a feedback control packet, called Clear Channel (CC), in S-MAC.

b) Results

The complete S-MAC protocol, which includes all pieces of our new protocol, is denoted as 'SMAC'.

Figure 6 is the measured average energy consumption from these two nodes. The traffic is heavy when the message inter-arrival time is less than 4s. In this case, 802.11 MAC uses more than twice the energy used

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by S-MAC. In this case, the complete S-MAC protocol has the best energy property, and far outperforms 802.11 MAC Message passing with overhearing avoidance also performs better than 802.11 MAC. The energy consumption of S-MAC is relatively independent of the traffic pattern.

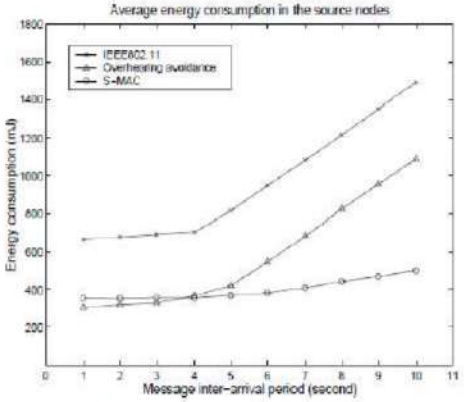

Figure6: Measured energy consumption in the source nodes.

Compared with 802.11, message passing with overhearing avoidance saves almost the same amount of energy under all traffic conditions. This result is due to overhearing avoidance among neighboring nodes A, B and C. The numbers of packets to be sent by each of them are the same in all traffic conditions. .One reason is that S-MAC has synchronization overhead of sending and receiving SYNC packets. Another reason is that S-MAC introduces more latency and actually uses more time to pass the same amount of data.

C. T-Mac Protocol:

Tone-Propagated MAC (TP-MAC), a novel MAC protocol for Wireless Sensor Networks (WSNs), specially suited for early warning and tracking applications, where the traffic generated by sensor nodes (mainly alert messages) is sporadic but has stringent latency requirements. This protocol aims to maximize energy-efficiency while minimizing latency in source-to-sink and sink-to-source communication. This difficult objective is achieved integrating scheduled channel polling (i.e. synchronized low power listening) with rapid fast path establishment based on the propagation of short wake-up tones. [5]

The basic idea of T-MAC, which mainly differentiates it from S-MAC, is that active time duration is not fixed, but finishes when no activation events (i.e., communication activity) in the media occur for a chosen timeout. However, T-MAC suffers from the early sleeping problem: briefly, in a chain of four nodes, if the first node wants to communicate till the fourth, through the second and the third, the third node can still ear the first communication (between the first and the second), and remain active, but the fourth node goes too early to sleep state. This is a major drawback, because in WSNs the communication is mainly oriented to the sinks, in chain communication patterns. Consequently, T-MAC seems to have a latency problem.

In order to achieve low duty cycle, the proposed TP-MAC protocol inherits some features from other MAC protocols, namely synchronized wake-up periods (S-MAC, SCP-MAC), and synchronized wake-up-tone announcement of data availability associated with scheduled channel polling (SCP-MAC).

However, in TP-MAC the wake-up-tones are propagated across the WSN so that the nodes in the path from source to destination are woken-up as quickly as possible, before the arrival of the heralded data packets. In this way, TP-MAC is able to achieve low delivery latency even if the WSN node duty-cycle is extremely low, preventing or at least ameliorating the early-sleeping problem. TP-MAC is based on the convergecast communication paradigm, assuming that the WSN is organized in a logical tree topology, associated with one sink, which corresponds to the root node. This imposes some cross-layer constraints on the network (i.e. routing) layer, which is not a real limitation, since most typical WSN scenarios require convergecast of sensor data towards sink nodes. Although there are several options to support more than one sink in TP-MAC.

TP-MAC nodes only poll the media for a number slightly above two times per cycle (two polls, respectively for upstream and downstream propagated tones in each super-frame, and more seldom for the synchronization/re-synchronization tone), propagating the wake-up tones fast and deeply through the network (and thus opening fast data transmission paths). In this way it is possible to achieve low latencies simultaneously with low duty cycles.

One side effect of the TP-MAC protocol is that downlink propagation of wake up tones may result in waking up all nodes of the network. This behavior is an advantage when downstream data has to be broadcasted, and a handicap for other downstream traffic patterns. Nevertheless, if the applications do not demand stringent latency requirements for downstream traffic, the downstream tone propagation window can be eliminated and the synchronization slot can be also used for data announcements. This behavior can cause some energy inefficiency. However, it is compensated by the ultra-low duty cycle required to achieve the intended delivery latencies. [5]

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It should also be recalled that in both situations the nodes only stay awaken for a pre-defined time interval, switching back to normal channel polling if no traffic arrives. This also limits the impact of waking-up extra nodes.

a) Results:

An analytical model was developed to compare TP-MAC with SCP-MAC, under the assumption that SCP-MAC is used by TP-MAC for data transmission. This model addresses the relationship between duty-cycle during periods of no traffic, and the minimum latency that can be achieved once the first packet of an active stream is generated. Fig. 2 shows the ratio between the duty cycles of TP-MAC and SCP-MAC as a percentage, for different numbers of hops, and different sizes of the wake-up tone propagation window. Other TP-MAC parameters are the following: number of transmission slots: 10; synchronization tone period: 5 cycles.

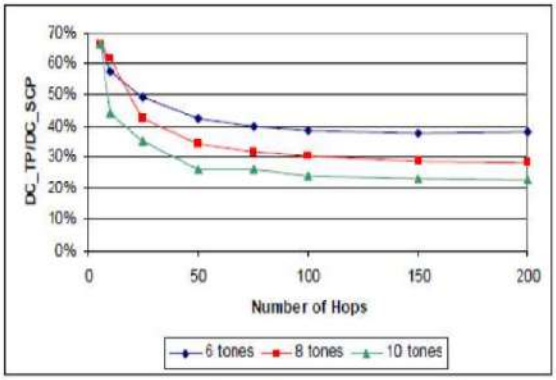

Figure8: Ratio between the duty cycles of TP-MAC and SCP-MAC as a function of the number of hops and the size of the wake-up-tone propagation window.

It is worth to note that TP-MAC duty cycle decreases with increasing number of hops, but its energy efficiency gain with respect to SCP-MAC stabilizes for high numbers of hops. It is also shown that higher number of tones can give higher energy efficiency gain. For instance, for 10 tones, we can obtain a duty cycle as low as 22% of the SCP-MAC duty cycle, for large network sizes.

Conclusion

Recently several medium access control protocols for the wireless sensor network have been proposed by the researchers. However, no protocol is accepted as standard. This is because the MAC protocol in general will be application specific. Therefore, there will not be one standard MAC protocol for the WSNs. ALOHA protocols are often used in satellite communications systems and cellular radio systems and are a precursor to the popular Ethernet protocol. Due to the energy efficiency problems S-Mac protocol is developed .It has very good energy conserving properties comparing with IEEE 802.11. Another interesting property of the protocol is that it has the ability to make trade-offs between energy and latency according to traffic conditions. The protocol has been implemented on our testbed nodes, which shows its effectiveness. Tone-Propagated MAC (TP-MAC), a novel MAC protocol for WSNs, specially suited for early warning applications, where the traffic generated by sensor nodes (mainly alert messages) is sporadic and has stringent latency requirement. It is the advance version of S-Mac.TP-MAC uses a multicast/convergecast tree WSN topology, which is used for fast data path establishment, propagating short wake-up-tones upstream and/or downstream between adjacent tree levels. Unlike other fast-path establishment mechanisms, TP-MAC tone propagation does not incur on latency penalty for the transmission of the first packet of a stream. It provides some degree of decoupling between latency and duty-cycle, i.e. it allows TP-MAC to achieve lower duty-cycles in periods of inactivity without compromising the target latency.

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Performance Prediction Approaches of Component-based System

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Abstract: **Performance predictions of component assemblies and obtaining performance properties from these predictions are a crucial success factor for component based systems. The number of methods and tools has been developed that analyze the performance of software systems. These methods and tools aim at helping software engineers by providing them with the capability to understand design trade-offs, optimize their design by identifying performance or predict a systems performance within a specified deployment environment. In this paper, we establish a basis to select an appropriate prediction method and to provide recommendations for future research, which could improve the performance prediction of component-based systems.**

Keywords: **Component-based system, quantitative approach, Performance, Prediction.**

I. INTRODUCTION

During the last ten years, researchers have proposed many approaches for evaluating the performance of component-based software systems. Component-Based System (CBS) is an approach to build applications from deployed software parts or components. Developing software applications using CBS has many advantages such as; the efficiency, reliability, maintainability. CBSD enables software architect to reason on the composed structure. This is not only essential for the functional properties but also for none functional properties. Performance is an important functional property that must be considered when building such applications. Software performance is a significant factor for software quality [1]. It is responsible to determine the system's effectiveness and the productivity of its users. Performance is referring to how extend the system or component has satisfied the predefined requirements of specific factors such as accuracy, memory usage. However, performance is a major problem with CBS applications. The failure of performance means a financial loss, increased expenses of hardware, higher cost of software development, and harder than that, the loss of relationships with consumers. However, best solution for that is the avoidance of late performance evaluation. The German police has developed a system called "Impol-Neu", which was published in mass media, that proves the significance of performance evaluation before deployment [2]. The performance of this system was evaluated lately after development. So, the resulted performance did not satisfied performance requirements. For that reason, they failed to implement the system in spring 2001 as it planned; instead the system was implemented in 18th August 2003. Consequently, performance is a key success factor in software production. Ideally, to develop performance predictable software with minimal performance problem, performance should be addressed early at development stage. Whenever, performance issues are addressed at implementation or integration time, correction of problems will impact the cost, schedule, and quality of the software. The goal of this paper is to classify the performance prediction and measurement approaches for component-based software systems proposed during the last ten years. These approaches introduce specialized modelling languages for the performance of software components and aim at an understanding of the performance of a designed architecture instead of code-centric performance fixes. In the future, software architects shall predict the performance of application designs based on the component performance specifications by component developers. This approach is more cost-effective than fixing late lifecycle performance problems [18]. Although many approaches have been proposed, they use different component notions aim at different life-cycle stages.), target different technical domains, and offer different degrees of tool support. Therefore, this paper presents a survey of the proposed approaches to help selecting an appropriate approach for a given scenario.

II. FACTORS INFLUENCING COMPONENT PERFORMANCE

Factors influencing the performance of software components are [13]:

a) Component implementation: Component developers can implement the functionality specified by an interface in different ways.

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b) Required services: The overall execution time of a component service depends on the execution time of required services.
c) Deployment platform: Different software architects deploy a software component to different platforms. A deployment platform may include several software layers and hardware.
d) Usage profile: Clients can invoke component services with different input parameters. The execution time of a service can change depending on the values of the input parameters.
e) Resource contention: A software component typically does not execute as a single process in isolation on a given platform. The induced waiting times for accessing limited resources add up to the execution time of a software component.

III. MAIN APPROACHES TO PERFORMANCE PREDICTION

The main objective of software performance prediction is to improve the performance of software. We are interested to address quantitative approach in this paper as it is an essential element for our proposed framework. The reason behind the selection is that quantitative approach employs numerical indices related to performance rather than symbols and words. Three types of approaches are resulted from the study are measurement approach, model-based approach, and mixed approach.

A. *Measurement Approach*

Measurement approach refers to a software performance engineering process aims to evaluate software application focusing on the performance quality features such as response time and throughput. These features are analyzed using special analysis tools which enable the monitoring of execution. Hence, the analysis tools provide feedback about the weak conditions and areas that need to be modified. The approach could be efficiently used for implemented application or application with known features. The approach uses existing systems or prototypes to measure performance properties and calibrate performance models with the results. Performance analysts may use the models to analyze the results of changed workloads or the use of faster hardware with low effort which uses test-cases to adjust measurement from reused components [6]. In measurement approach, performance evaluation methods and techniques are highly dependent on the features of the software system to be evaluated. Most measurement approaches such as [5] depend on middleware and specific platform. They support use of J2EE application with EJB. In [5] a discussion is given about how component-based system properties may influence the selection of methods and tools used to obtain and analyze performance measures. Then, a method is proposed for the measurement of performance distinguishing between application-specific metrics (e.g., execution time of various functions) and platform-specific metrics (e.g., resource utilization). The automation of the process of gathering and analyzing data for these performance metrics is also discussed. The major drawbacks of this approach are that it is only suitable for already implemented systems and the obtained results do not show general applicability of the approach. Recently Jiang [18] has proposed measurement approaches based on testing validation to ensure quality of system that composed from black-box components. The approach uses the previous testing information of reused component to help in reducing the effort of testing. The main problem with this approach to CBS is; the approach commonly related to a single setting and far from generalization and there is need for implanted application to enable the analysis of the effects of changed workloads.

B. *Model Based Approach*

Generally, model-based approaches depend on the Model Driven Development (MDD) technique which enables developer to efficiently evaluate and assess the system requirements and execution by using a set of models. Besides having good input models and accurate analysis models, performance prediction for component-based systems adds an additional level of complexity by the introduction of the development roles. As these developers roles may be different persons most likely belonging to different organizations, the information needed for conducting a performance evaluation is spread among the developer roles [8]. The component developer knows for example how the component is realized while the software architect knows how the system is assembled of components. Taking into account the identified influence factors on the performance of a component-based system, a relationship between the developer roles and the influence factors becomes clear[8]:

i. Component developers posses the information on the implementation details.
ii. Software architects know about the system's assembly from which the destination of external service calls can be derived by following the assembly connectors.
iii. Deployers know about the hard- and software platform and how the components are allocated on the platforms.

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iv. Domain Experts know about the (planned) use of the system.

Becker et al. (2006) surveyed existing Component based performance prediction methods including a discussion on the support for parameterized component performance models.

I. *RESOLVE-P:* Sitaraman et al. (2001) take the usage of the components into their predictions by using an extended Big-O Notations to specify the time and memory consumption of software components depending on the input parameters passed to service calls. Additionally, composing services is supported on an abstract level by composing the specified Big-O demands [17]. RESOLVE specifies the functionality of a component with a list of service signatures and a pre- and post-condition for each service. The components of RESOLVE do not declare required interfaces. The authors point out the limitations of classical big-O notations for generic software components with polymorphic data types. Therefore, they augment the functional RESOLVE specifications with an adapted big-O notation for execution time and memory consumption. These specifications are more refined, because they take the structure of input parameters into account. However, the specification does not distinguish between different processing resource (e.g., CPU and hard disk), does not include calls to required services, and also does not deal with passive resources. This approach targets a fundamental theory of performance specification and do not deal with prediction or measurement frameworks.

II. *PACT*: Hissam et al. (2002) give a conceptual framework for a so called" Predictable Assembly or Prediction Enabled Component Technology". Such an assembly consists of certified components whose properties are combined according to a composition theory. The framework takes component properties and their assembly into account [9]. However, as it is only a conceptual framework it depends on the actual method used whether further influence factors are respected. CCL is used for architectural description. It supports synchronous and asynchronous communication with required services. CCL also allows specifying component behaviour with state charts. Resource demands, which can be constants or distribution functions, are attached to the CCL components using annotations. CCL supports composite components but not memory consumption. For analysis, tools transform CCL models into a so-called intermediate constructive model (ICM), which focuses on parts relevant for performance analysis and eases the implementation of further transformations. PECT mainly targets analyzing real-time properties of component-based embedded systems. From the ICM, tools generate models for rate monotonic analysis (RMA) or simulation using the MAST tool.

III. *CB-SPE:* (Smith and Williams 2002) Software Performance Engineering (SPE) is a method that focuses on software performance early in the software life cycle. In addition to the process itself, which uses quantitative methods to evaluate designs, SPE also provides principles, patterns, models, and tips to help performance engineering. SPE is used throughout the project life cycle, to predict and to manage software performance [7]. The CB-SPE approach by Bertolino and Mirandola uses UML extended with the SPT profile as design model and queuing networks as analysis model. The modelling approach is divided into a component layer and an application layer [14]. On the component layer, developers model the schedulable resource demands of individual performance services in dependence to environment parameters. There are no guidelines on how to obtain these values. The parameterization does not involve service input or output parameters or explicit required service calls. There is no support for analyzing memory consumptions. In the application layer, software architects pre-select components performance models and compose them into architecture models. SPE-Meta model is designed for object-oriented software systems.

Bertolino and Mirandola (2004) apply the SPE method to component-based systems by separating component performance models and assembly models. In so doing, external service calls and the execution environment become parameterized. However, the software architect has to specify a performance critical scenario in analogy to the SPE method. As he should not posse's information on the component internals, this is a drawback of the method. Furthermore, the method does not take input parameters into account.

IV. *CBML:* Wu and Woodside (2004) use LQN models of components to build parameterized component models. LQNs model the behaviour and resource demands of software entities with so-called 'tasks'. Resource demands are specified as mean values of exponential distribution functions, but there is no support for memory consumption. For each component an LQN model specifying its provided and required interfaces as well as the control flow and resource usage dependencies. These single component LQN models are combined according to an assembly model into a system LQN model which gets evaluated [17]. Wu and Woodside (2004) also consider inserting components which they call

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completions (Woodside et al., 2002) for environmental services like middleware services into the system model automatically to increase the prediction accuracy of the environmental influence. There is an XML schema to define CBML components, but there are no graphical editors for CBML models.

V. *CB-APPEAR*: Eskenazi et al. (2004) present a method for the performance prediction of existing components which undergo evolution. A parametric performance model is derived for these components by putting them into a test bed which figures the dependencies between method invocations and invocations of environmental services out. Depending on the complexity of the parametric dependency, the resulting model is either analytical or simulation based. However, the approach makes strong assumptions which are necessary to derive the performance models by testing [9].

VI. Hamlet: Hamlet et al. (2004) this approach originates from the area of software testing. It was first proposed for reliability prediction of component-based systems, and later extended for performance prediction. The authors use a restricted component definition to reduce the complexity for creating a fundamental theory of software composition. A software component is a mathematical function with single integer value input. Component composition of two software components means that the first component sends all its outputs to the second component in a pipe-and-filter style. The method involves component specification by component developers and performance prediction by software architects. This approach executes the components and measure how the component usage propagates requests in orders to gain accurate performance predictions. However, their component model is limited as in their model components are simple functional transformations having only a single service. The approach does not consider concurrency, passive resources, or scheduling. However, it considers the influence of the internal state of components to performance in a restricted form. This approach assumes a very restricted class of components, there is no validation on an industrial system.

VII. *ROBOCOP*: Bondarev et al. (2005) introduce a prediction method for embedded systems designed using ROBOCOP, in the prediction method associated to the already introduced ROBOCOP component model. The method can deal with implementation details specified by the component developer parameterized by external services, the component's hardware environment, and usage. However, due to its focus on embedded systems, the support for parameterizations of the latter is limited. ROBOCOP components contain a resource specification and a behavioral specification as well as the executable implementation of the component. Component developers specify ROBOCOP components in a parameterized way. Software architects compose these specifications and instantiate parameters by the component developers. Scheduled resource demands of software components are constants in ROBOCOP [17], which also allows limited resource demands for semaphores and memory. The component specification allows only limited control flow. There are no probabilistic attributes in the specification. The so-called Real-Time Integration Environment, which is implemented as a number of Eclipse plugins, supports the whole design and performance prediction process with ROBOCOP. The Support for software layers like operating systems or middleware platforms is outside the scope of this work and the Composite components are also not supported.

VIII. *KLAPER:* Grassi et al(2007) This method for performance prediction of component-based software systems is so-called kernel modelling language called KLAPER. The language is implemented in MOF (Meta Object Facility) and aims at easing the implementation of model transformations from different kinds of component system models (e.g., UML) into different kind of performance models (e.g., queueing networks). With KLAPER, it shall be possible to combine component performance models by different component developers based on different notations in a single prediction. It is not the goal that component developers model their components with KLAPER, but they shall implement model transformations from their own proprietary notations into KLAPER. There is no support for composite components. The language includes scheduled and limited resource demands as well as control flow. The authors implemented QVT transformations from KLAPER to EQNs and Markov chains. Because the language shall only be used by model transformations, there are no graphical modelling tools. The language is able to model dynamic software architectures where the connectors between components can change at runtime [12].

IX. Palladio Component Model (PCM): (Becker et al., 2009) PCM is a domain specific modeling language to describe component-based software architectures. Its major aim is to enable performance predictions for software architectures at design time. PCM is aligned with a dedicated component-based software development process, which distinguishes

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between the four roles of developers, architects, deployers, and domain experts. Each role has a limited view on the entire system model and contributes within its responsibility only specific parts to this holistic model. Becker et al. (2007)[15] enhance the model further by introducing a new SEFF concept called Resource Demanding SEFF (RD-SEFF) considering parametric dependencies to input Parameter and the execution environment. For this, an extension to the PCM's meta-model introduced so called stochastic expressions. Component developers can use them for example to specify resource demands depending on characterizations of input parameters. The stochastic expressions replaced the former FSM state annotations. Additionally, the model has been split to reflect the CBSE developer roles. For each role a subset of the whole meta-model's concepts has been defined. Thus, a domain specific language (DSL) for each developer role is introduced. It introduces a model-based simulation tool for predictions[16].

Based on this, Koziolek et al. have added additional concepts to specify return value abstractions for external calls and component configuration parameters. Additionally, the authors introduce a model-driven approach to derive an analytical performance prediction model using model-2-model transformations.

The so-called PCM-Bench tool allows independent graphical modelling for all four developer roles. Further model transformations map the whole model into performance models, which are solved by simulation or numerical analysis.

C. *Mixed Approach*

Mixed approaches are based on the combination of the approaches of measurement and model-based. The mixed approach supposed to benefit from the strengths and avoids the weaknesses of the two approaches. These approaches are ranging from approaches focusing on component specification to approaches consisting of module that support runtime performance information on software components and application execution environment.

In [10] a methodology is presented, which aims for predicting the performance of component oriented distributed systems both during development and after the system have been built. The methodology combines monitoring, modelling and performance prediction. Performance prediction models based on UML models are created dynamically with non-intrusive methods. The application performance is then predicted by generating workloads and simulating the performance models.

In [11] an approach to predict the performance of component-based applications during the design phase is presented. The proposed methodology derives a quantitative performance model for a given application using aspects from the underlying component platform, and from a design description of the application. The results obtained for an EJB application are validated with measurements of different implementations. Using this methodology, it is possible for the software architect to make early decisions between alternative application architectures in terms of their performance and scalability.

IV. PERFORMANCE MODELS

A performance model is an abstract representation of a real system that captures its performance properties, which are mostly related to the quantitative use of resources during runtime behaviour and is capable of reproducing its performance. The model can be used to study the performance of different designs. The evaluation of the performance model is done by analytical methods or by simulating the model. These models mainly focused on accurate modelling of system resources.

A. *Layered Queuing Network Modeling*

The most important thing for performance prediction is likely queuing network theory. In queuing networks, queues and their service centre's represent processing resources which process work packages or jobs queuing for service. Jobs travel through a network of service centers using probabilistic routes. The result of a qeueuing network analysis gives the average response time of the overall system, waiting times for queues, average queue length, and server utilization. For this, the class of extended queuing networks exists which can be solved by iterative methods like the Mean-Value-Analysis. The complexity of a queuing network depends on the characteristics of the service centre's and the assumptions on the jobs. For networks where arrival rates and service times are generally distributed, no analytical solution is known. The only known methods apply simulation techniques [7].

B. *Stochastic Process Algebras*

Based on general process algebras developed by Milner, extensions for performance prediction exist which introduce stochastic time demands for the actions of the algebra. The advantage of using process algebra is the possibility to specify the behavior of the processes. Compared to queuing networks where the routes of the jobs in the network are usually probabilistic, the processes of process algebra behave according to the semantics of the algebra. This also allows formal analysis of additional system properties like deadlock freedom. Early extensions used annotations on the actions of the algebra to denote exponential distributed time

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demands of the actions [7,19]. For an analysis, the process specifications are transformed into Markov chains exploiting the memory less property of the exponential distribution. Models based on general distributions cannot be solved analytically resulting in a need for a simulation based evaluation tool.

C. *Stochastic Petri-Nets*

Enhancements exist for Petri-nets as introduced by Petri which enable performance predictions based on Petri-net models. A Petri-net consists of a set of places and transitions, which are traversed by tokens. Transitions remove and add tokens on places whenever they fire [19]. Transitions are active whenever more tokens are on all places affected by the transition as required by the transition's specification. Among all active transitions one is selected to fire resulting in the final change of the Petri-net's state. Stochastic enhancements add exponential distributed activation times to transitions which specify a minimum time which has to pass at least for the transition to fire again. Additionally, probabilistic routing of the tokens can be specified. Stochastic Petri nets have exact mathematical definition of their execution semantics. It's very hard to understand these mathematical equations so that's why the scope is limited.

TABLE 1

Comparisons of Performance Prediction Approaches

Name	RESOLVE	HAMLET	CB-SPE	CBML	PECT	ROBOCOP	KLAPER	PALLADIO
Target Domain	Generic	Generic	Distributed systems	Distributed Systems	Embedded systems	Embedded systems	Distributed systems	Distributed systems
Component design model	RESOLVE	Simple mathematical functions	Ant/UML diagrams (UML/SPT)	CBML	OCL	ROBOCOP	UML-SPT, KLAPER	PCM
Model transformation	n/a	n/a	n/a	ad hoc (C-code, XMI I/O)	ad hoc	QVT	ad hoc (RTIE tool)	ad hoc(java)
Performance model	n/a	Simple algebra	n/a	Execution Graph+ QN	LQN	QN, RTQT, MAST	Markov chain, EQN	EQN, LQN
Performance model solver	n/a	Analytical	n/a	Analytical	Analytical, Simulation	simulation	Simulation	Analytical+ simulation (LQN), simulation (EQN)
Prediction Feedback into Design model	n/a	n/a	n/a	n/a	n/a	Areas of interests visualizes	Planned	Planned
Tool support	n/a	Modelling, Analysis (CAD tool)	Modeling, analysis (CB-SPE Tool Suites)	Modeling analysis (LQNS), Simulation LQSIM	Modeling Simulation (PACC Starter KIT)	Modeling, simulation (RTIE)	Model transformation (KLAPER QVT)	Modeling, analysis, Simulation-PCMBench

V. CONCLUSION AND FUTURE WORK

In this paper, we have reviewed performance prediction approaches for component based software systems and classified the approaches according to their performance modelling. The area of performance for component-based software engineering has significantly matured over the last decade. By predicting the performance of component based system, the throughput, resource utilization and the response time of the component running on them could also be enhanced to a great extent. Also, there is a great scope of research in this field for performance in component based software system is one of most important issues related with this field.

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Read Only Transactions in Distributed Operating System

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ABSTRACT: ***In this work an efficient scheme for eliminating conflicts between distributed read-only transactions and distributed update transactions, thereby reducing synchronization delays is discussed. Proper management of transactions is required during the arrival, execution or other phases of transactions. Some mechanisms to improve the performance of such a system like synchronizer are used to enforce the serialization order among the arriving and executing transactions. For the transactions held up by one or more locks, a prioritizing mechanism is used to manage the conflicting among them. Some transaction does not need to participate in all the phases, if they don't have any assignment to perform. Details of such transactions are updated in an early notification log file and processing time is saved during each phase of transactions.***

I. INTRODUCTION

Distributed computer systems are potentially very reliable. This is because of the possibility of providing redundant resources on different nodes. However, the distribution of redundant resources also generates some serious problems, such as the lack of global state information, the possibility of partial failure, and the performing of many operations in parallel. For instance there may be several sites participating in the execution of several operations called transactions. The failure of one of these sites, or the failure of a communication link connecting these sites, may result in erroneous computations. These problems imply that it is difficult to maintain data consistency. To overcome these problems the atomic transaction model was invented [6].

But performing atomic transactions obeying the ACID-rules, the demands of a distributed system on synchronization, causes problems. Thus, the atomic transaction model for a monolithic system has to be modified for a distributed system. The concept of a transaction has been used in database systems and operating systems to denote a set of related actions that are performed as a unit; either all of the actions of a transaction are completed or none of them are completed. Transactions in distributed applications have two important properties. First transactions are serializable; the effect of executing a collection of transactions concurrently is the same as if the transaction had been executed sequentially, one at a time. A database system, in processing its transactions, may require services from the file system, i.e., may have to initiate file system transactions. The latter type of transaction is referred as a nested transaction since it is initiated within the scope of a larger transaction. The inner transaction is considered a separate transaction rather than part of the outer transaction since it affects different types of entities and is executed by a process (or processes) that know nothing of the outer transaction [1]. Nested transactions allow a hierarchical relationship between transactions. A nested transaction can be viewed as a tree where the nodes represent transactions. The sub transactions (children in the tree) execute atomically with respect to other transactions in the tree [2].

The Transaction Model

As mentioned above the transaction model originates in the database research. A fundamental aspect is the atomicity of a transaction. An atomic action has four equivalent properties. a) Its process is not aware of any other active process or processes and no other process is aware of its activities. b) Its process doesn't communicate with other processes during its activities. c)Its process cannot detect any state changes except those performed by it and will not show any state changes until the action is completed. d) It is considered to be indivisible and instantaneous, so far other processes are concerned. These properties must be viewed as relative rather than absolute.

A transaction has to fulfill another four properties, which are called ACID rules. In Atomicity changes on the database are atomic. In Consistency the

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database is transferred from a consistent state in another consistent state. In Isolation intermediate results associated with the operations are not accessible from outside. And if there are concurrent transactions, they are controlled as if they were performed sequentially. In Durability correct changes to the database are permanent.

Applying these demands on atomic transactions to operating systems two major features can be outlined. The transaction has to lock an object before accessing it and it has to unlock the object before it completes. These two aspects are important for synchronization and recovery of the transactions.

II. IMPLEMENTING READ ONLY TRANSACTIONS

Most database systems maintain of data objects in order to support transaction recovery and system recovery. These old versions of data objects can be exploited to improve the degree of concurrency that is achievable in the system. A read-only transaction is one that makes no modification to the database. By contrast, an update transaction is one that potentially changes the database. While read-only transactions can be synchronized using general transaction processing techniques, it is desirable to make use of the semantic knowledge that read-only transactions perform no updates in order to permit the use of more efficient processing algorithms [6].

We assume that when a transaction begins, it informs the data base system whether it is a read-only transaction or an update transaction.

A number of concurrency control schemes based on the maintenance of multiple versions of data objects have been proposed [3]. The scheme described in [3] is intended for use in a centralized environment. Its salient features include the following:

1) Conflicts between read-only transactions and update transactions are completely eliminated.

2) Read-only transactions never have to be rolled-back.

3) Update transaction recovery and system recovery are greatly simplified.

4) On-line dumping of the database in support for recovery from media failures is facilitated.

The centralized scheme can also be extended for a distributed environment. This extended scheme is being incorporated in a distributed database management system currently under development at Computer Corporation of America.

A read-only transaction on a multiversion database reads from a set of update transactions if, for each desired data object, it reads the latest version of that object that was created by a member of the set of update transactions in question. Thus, if several update transactions have modified a data object, and if several of these transactions belong to the set from which the read-only transaction is to read, then the read-only transaction will read the output of the most recent update transaction that belongs to the set.

Another basic notion of special importance to distributed transactions is that of atomic commitment. The updates performed by a distributed transaction at multiple sites must be made visible to other transactions in an "all or none" fashion.

In general, protocols for achieving atomic commitment in a distributed environment will have to be carried out in multiple phases. We say that an update transaction precommits at a site when it has completed execution at that site and has informed the site to that effect. For local transactions, precommitment coincides with commitment. For distributed transactions, precommitment occurs when it enters the commit protocol state from which it can either be aborted or committed. Under the scheme described in [7], update transactions synchronize by using two-phase locking. Read-only transactions set no locks: each sees a consistent snapshot of the database by selecting appropriate versions of logical data objects to read. This snapshot is defined by a copy of the completed transaction list (CTL) that is in effect at the time of the read-only transaction's initiation. (The CTL is a compact representation of the identities of all update transactions that have completed execution in the system.) In essence, each read-only transaction sees the state of the database at the time of its initiation, minus changes made by in-progress update transactions. Therefore, an important prerequisite for implementing the multiversion reading algorithm is that it be possible to determine exactly what transactions have completed execution at a given point in time. This is little importance in a centralized environment. For a distributed read-only transaction that performs reading from multiple sites, the problem is more expressive. In [8], it is suggested that a consistent snapshot of the database can be defined for a distributed read-only transaction by atomically reading the CTL's at the sites where the read-only transaction is going to perform retrievals.

When a distributed update transaction commits, its identifier also must be added in an atomic operation to the CTL's at all of its active sites. Thus, read locks and write locks on the CTL's will b-e required; schemes for deadlock detection or avoidance also will be necessary. The main objective is to minimize the synchronization delays on update transactions. A key issue in deadline misses' ratio management with different kinds of resources, e.g. I/O and CPU, is to find out which resource is the bottleneck that causes deadline misses. In RTEDBS, a deadline miss can happen either because of an overload in CPU, or

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both. By properly setting deadlines for each resource request and observing its deadline misses, it can be determined which resource is the bottleneck [7].

A Overview of centralized scheme

In the centralized environment, we assume that the database is organized as a collection of segments. Each segment is a collection of consecutively numbered logical pages. There is a single common pool of pages, called the version pool, which is used for storing the old versions of segment pages potentially needed by in-progress transactions. Update transactions synchronize by using two-phase locking at the segment page level. (Locks are held until the end of transaction.) Before performing in-place update to a segment page, an update transaction is required to first copy the current version of the page to the version pool. Thus, the multiversion mechanism deals with multiple versions of logical pages. Old versions in the version pool serve the dual purposes of rolling back update transactions that have to be aborted and for providing consistent snapshots to read-only transactions.

Consider the example illustrated in Fig. 1. The read-only transaction Tr needs to read logical pages P1 and P2. Tr has read P1 when Tu comes along and updates P2, causing the old version of P2 to be copied to the version pool. When Tr tries to read P2, it still can be made to see a consistent snapshot of the database if it is presented with the old version of P2, instead of the latest version created by Tu.

Fig. 1. Elimination of conflicts.

There are a number of technical problems that must be solved in order to implement any multiversion mechanism efficiently:

1) Locating the various versions of a given data object;

2) Determining the appropriate version of each data object that a given read-only transaction should read

3) Garbage collecting dead objects versions that are no longer needed by ongoing transactions.

In this scheme, a read-only transaction does not necessarily read the latest committed version of a given page. In fact, the particular committed version that it will have to read is determined at the time of its initiation. Before it has a chance to actually read the desired version, any number of (subsequently committed) versions might have been created by other transactions.

Thus, it is inappropriate to keep a fixed number of old versions of each segment page in the version pool. In order to accommodate an arbitrary number of old versions of a page, we simply chain its versions in reverse chronological order [1]. In other words, the latest version of a segment page will always be found within the segment itself. Older versions of the same page may be found in the version pool.

In order to determine the snapshot that a read-only transaction should see, we assign unique identifiers to update transactions, and attach to each read-only transaction a copy of the CTL that is in effect at the time of its initiation. We also label each page version with the identifier of its creating transaction. A previous version pointer is stored with each page version to chain together versions of the same logical page in reverse chronological order. For a version that is in the version pool, we also store an overwriting transaction identifier to indicate the transaction that has created the next newer version. When a read-only transaction desires to read a given logical page, it traverses the version chain and reads the first encountered version created by a transaction that is present in its associated CTL [1].

The solution for reclaiming space occupied by old versions that are no longer needed is to perform automatic garbage collection in the version pool by using it as a ring buffer. We handle the list structure maintenance problem by guaranteeing that a slot in the version pool occupied by a not-yet dead version will not be reused. We can visualize the version pool as being divided into three ranges, as shown in Fig. 2.

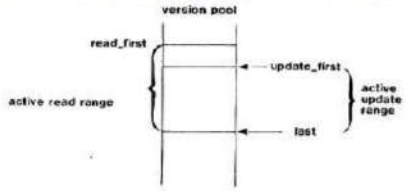

Fig. 2. Ranges of pages in version pool.

The active update range includes all slots that potentially contain before-images of in-progress update transactions. The active read range includes all slots that potentially contain before-images that may have to be read by on-going read-only transactions. Pages outside these two ranges are those that can freely be reused. By always reusing a free page that is adjacent to the end of the update range (which coincides with the end of the read range), storage management in the version pool can be performed with minimal overhead. Essentially, no examination of the page is necessary for determining its reusability. Also, there is no need to modify any linked list when the page is reused.

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B) Difficulty in distributing local algorithm

The difficulty in distributing local algorithm lies in determining the appropriate CTL that should be associated with a read-only transaction. This difficulty arises even if the read-only transaction reads only data local to a single site. Since we make no assumption on the order of delivery of commit messages at a transaction's active sites, there could be a transaction dependency (which is not apparent at the site where the read-only transaction is to perform reading), that will not be reflected in the site's CTL. As a result, the read-only transaction is liable to see partial updates of other transactions [1].

Consider the example in Fig. 3. Two updaters, slow and confusion are to modify a database at Site 1 and Site 2. Slow finishes at sites, precommits at both sites, commits at Site 1, but has not committed at Site 2 because of message delays. In the meantime, after Slow has committed at Site 1, Confusion comes along and reads slow's updates at Site 1.

Confusion finishes work at Site 1 and Site 2, precommits at both sites, and then commits at both sites. A read-only transaction, Truth, now steps into the above situation, trying to read data that is local to Site 2. If Truth is allowed to see the snapshot as defined by the CTL at Site 2, then it will read Confusion's updates but not slows updates, even though Confusion depends on Slow because of its work at Site 1. In other words, the snapshot seen by Truth at Site 2 is not causal!

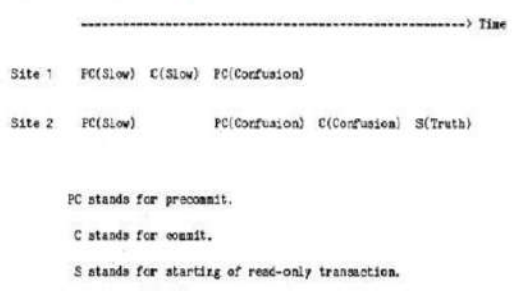

Fig. 3. A noncausality example.

In the above example, the local algorithm fails to generalize because CTL's at individual sites are potentially incomplete with respect to transaction dependencies. That is, an update transaction might be included in a CTL before the transactions that it depends upon are included.

C) Obtaining a globally consistent CTL

The global transaction identifier can be represented as an originating (coordinating) site identifier, along with a chronologically assigned number that is unique within that site. Thus, a global CTL will be made up of a number of sublists. Each sublist is a local CTL representing completion information for transactions that have been initiated from a given site.

A sublist can in general be represented by three components: a base number, an exception list, and a bit-map. The exception list identifies transactions whose numbers are below the base number that are still in-progress. The bit-map identifies completed (i.e., committed or aborted) transactions whose, numbers are above the base number. The sublist information is periodically recomputed by changing the base number. It is assumed that the atomic commitment of distributed update transactions is carried out using a two-phase commit protocol. Update transactions are required to propagate transaction completion information during the execution of the commit protocol. When a site that participates in a distributed transaction precommits locally and sends a "ready to commit" message to the coordinating site, it also sends its local copy of the CTL to the coordinating site.2 The coordinating site then merges the received CTL's with its own, updates its own CTL , and tags the union-CTL onto the "commit" message. After receiving the union-CTL, a participating site must augment its local copy of the CTL with the received union-CTL also. The coordinator of a distributed read-only transaction begins by requesting the local copy of the CTL from each of the retrieval sites. Each retrieval site responds by sending its CTL and guaranteeing that the snapshot defined by the sent CTL is readable (i.e., not garbage collected). The coordinator computes the union of the received CTL's and retransmits the union-CTL to each of the retrieval sites. Each retrieval site then performs multiversion reading using the received union CTL [1].

Note that the propagation of transaction completion information makes the CTL's at individual sites consistent. The anomaly that occurs in the example illustrated in Fig. 3 is corrected because the addition of Confusion to the CTL at Site 2 will cause the addition of Slow to the same CTL at the same time.

III. Consistency Requirements of Read-Only Transactions

A database is a set of data items which supports read and write operations. A transaction is a sequence of read and writes operations. Each transaction must preserve consistency. A transaction, when run alone to completion without interference from other transactions, takes the database from one consistent state to another.

An ROT is a transaction that does not modify any data item. ROTs do not corrupt the eventual database state. However, if no control is imposed on the execution of ROTs together with update transactions, ROTs may read inconsistent data in their executions and produce incorrect results to users.

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A) *Two Consistency Requirements*

The consistency requirement of ROTs comes from the requirement of serializability which is the standard correctness criterion of transaction processing [5]. Under serializability, both update transactions and ROTs are indiscriminately considered as ordinary transactions and required to serialize with each other on the same serialization order of transactions. Moreover, serializability requires ROTs to serialize with each other. This serialization order of ROTs make ROTs read the database states which are produced by the same serialization order of update transactions. Otherwise, serializability will be violated. In other words, all ROTs perceive the same serialization order of update transactions. This requirement is known as strong consistency.

B) *Strong Consistency vs. View Consistency*

To illustrate the difference between the requirements of *strong consistency* and *view consistency*, consider the following

Example 1: Suppose we have two ROTs, Q1 and Q2, and three update transactions U3 and U4 and U5 as follows:

Q1: r(x) r(y) Q2: r(y) r(x)

U3: r(x) w(x) U4: r(y) w(y) U5: r(x) r(y) r(z) w(z)

Consider the following schedule S1 and its serialization graph in Figure 1.

S1: r1(x) r2(y) r3(x) w3(x) c3 r4(y) w4(y) c4 r5(x) r5(y) r5 (z) w5 (z) c5 r1(y) c1 r2(x) c2 where ri(x) and wi(x) denote transaction Ti reads and writes data item x respectively and ci denotes the commitment of Ti.

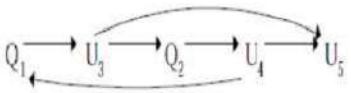

Figure 4: Serialization graph of S1 [3]

In Figure 4, we can easily see that the execution of S1 does not satisfy the requirement of *strong consistency* because of the non-serializable execution of transactions which can be determined by having a cycle among ROTs and update transactions in the serialization graph. In particular, Q1 and Q2 read the database states which cannot be produced by the same serialization order of update transactions. Thus, *strong consistency* does not allow processing Q1 and Q2 in this execution [3].

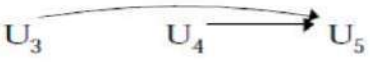

Figure 5: Partial commitment order of U3, U4 and U5 [3]

However, if we consider the partial commitment order of the update transactions only as shown in Figure 2, we can interpret different serialization orders of these update transactions. Two possible serialization orders are {U3 → U4 → U5} and {U4 → U3 → U5}. Therefore, although two possible consistent states can be interpreted on the partial commitment order of S1, strong consistency only allows one of them to be visible to ROTs. Therefore, the consistent states allowed by strong consistency are the subset of those allowed by view consistency.

IV. RESULTS

The study for performance evaluation is done by first developing a base model. A common model of a distributed transaction is that there is one process, called as Master, which is executed at the site where the transaction is submitted, and a set of processes, called Cohorts, which executes on behalf of the transaction at these various sites that are accessed by the transaction [9]. For this study, GPSS (General Purpose Simulation System) World is used as a simulator. The performance metric of the experiments are MissPercent and Response time. The study analyzes the performance of the system under different workload with varying the arrival rate of the transaction and their deadlines.

A) Impact of balancing the load: Some sites (cohorts) might be running very heavily, while other sites are almost free. However there is a possibility that the new works could be assign again to those sites running with heavy loads. This scenario may be change depends on the time. In both ways it will cause performance degradation. Figure 6 shows the combine report of heavy load and normal loads [4].

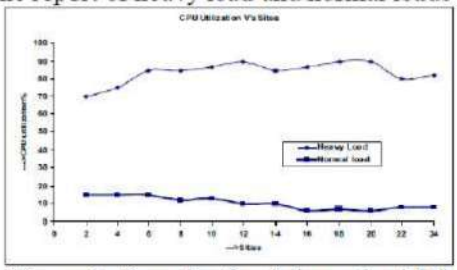

Figure 6: Sample of unbalance load [9]

B) Impact of a synchronizer: A synchronizer is use to enforce the serialization order among the arriving, executing transactions and to submit ready or data conflict free transactions for CPU scheduling. It maintains the serialization order of transactions in the form of a serialization graph that represents the execution order. The benefit of using this synchronizer is the execution orders of transactions is the same as sorted orders of transactions. This helps to reduce the conflict of transaction before and during the execution of transaction giving better results. The

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result is shown in figure 7. The missed percentage or the performance of the system is gradually decreased from mixed mode to fully synchronized mode [9].

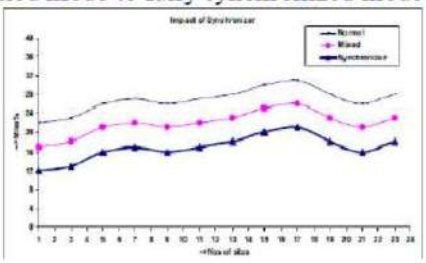

Figure 7: Impact of synchronizer [9]

C) Impact of prioritizing during data contention: A transaction that holds more locks carries a higher risk of conflicting with others. It has possibility to fail sooner or create deadlock to others. One way to reduce such data contention is to assign the degree of priorities based on the number of locks held by the transactions. Assigning a high priority to this transaction can expedite its processing and allow it to complete and release the locks earlier, reducing the probability of conflicts and restarts.

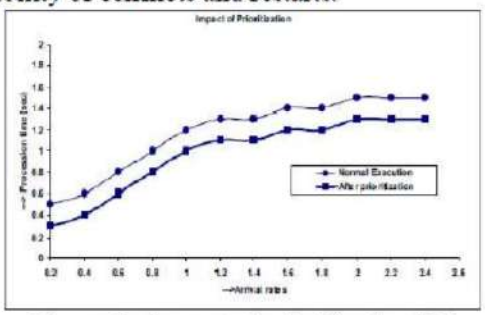

Figure 8: Impact of prioritization [9]

D) Impact of early notification log: An early notification log file is used by coordinator to update the status of each transaction during all phases. There may be numbers of cohorts that has no work to do at commit phase and so does not need a PREPARE, commit or abort message from its coordinator. These sites or cohorts may send early notification message to its coordinator indicating that it is no longer needing to participate in second phase. This may save lots of procession time during sending, receiving messages, voting and waiting etc [4]. The figure 9 shows the impact of considering the early notification mechanism as per the arrival rate of the transactions. In both the cases, this early notification mechanism gives significant improvement of the performance of the system [9]. Out of the above techniques the early notification log is the best as it reduces the mean response time as well as the procession time which in turn gives better performance of the distributed system.

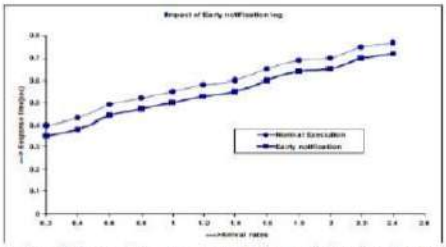

Figure 9: Mean Response Time (Arrival rate) [9]

CONCLUSION

The centralized multiversion concurrency control mechanism can also be extended to a distributed environment. There are various benefits which can be obtained as a result of this extension like conflicts between read-only transactions and update transactions are completely eliminated. The real time distributed processing system has been simulated under different traffic load and different configuration of the system. Not only the proper load management, other dynamically rearrangement of the configuration of the system is also required to improve the performance of the system. That transaction whose order of execution is sorted by synchronizer helps to reduce the conflict among them before and during the execution.

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VANETS: An Emerging Technology in Intelligent Transportation System

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***Abstract*--**Current research trends in communication technologies and technical development in automobile industry had led to the emergence of new class of Wireless Ad-hoc networks called VANETs(Vehicular Ad-hoc Network) .VANET is a sub class of Mobile Ad-hoc networks(MANETs). Like MANETs VANETs possess infrastructure free network but it deploys the concept of continuously varying vehicular motion. Vehicular Ad-hoc network provides a means of communication between vehicles on roads and roadside equipment. This technology had proved a boon for the humanity and saved loss of lives in the hands of roads fatalities. A network of cooperative, fully autonomous vehicles can not only decrease the accident rates, but also help in solving other traffic problems such as time and space inefficiency and waste of fuel due to congestion. VANETs being an emerging area of ad-hoc networks insist new research scholars to make tremendous discovery of its new protocols, along with enhancement in its parameters. This paper gives the brief overview about VANETs that will serve the beginners who choose VANETs as their research area. Along with highlighting the general concept of VANETs, its objectives, characteristics and applications, this paper explains its working principle ,advantages and classification of existing VANETs protocols.

***Index Terms*—Vehicular Ad-hoc Networks, ITS.**

INTRODUCTION

Vehicular Ad-hoc networks is an intelligent way of using infrastructure-less networks, with fully decentralized approach. It provides an Intelligent transportation system(ITS) in which vehicles or mobile nodes are autonomous, self configured and self organized. ITS provides cooperative traffic monitoring, control of traffic flow, blind crossing and collision prevention between vehicles on roads.[7] Intelligent transportation system handle communication of messages and transmission processing. ITS performs four activities:

1.**Sensing**: By sensing through on-board sensors ITS note the position and speed of vehicles with respect to the infrastructure (e.g. rail lines, roadways, bridges, tunnels).

2. **Communicating** – the ability to send and receive information, between vehicles & vehicles and between vehicles & roadside equipments.

3. **Computing** – the ability to process large amounts of data collected and communicated so that conclusions can be drawn and assessments can be made.

4. **Implementing** – the information gathered by ITS is processed using algorithms and computer programs to develop operating strategies for transportation facilities.[4]

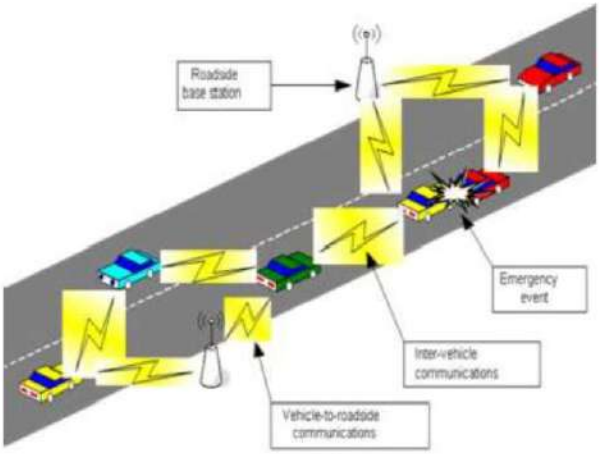

Fig1 [3]

Thus, intelligent transportation systems, assist the vehicles in achieving various degrees of autonomy. In addition to ITS each of the vehicles are equipped with VANET device such as embedded sensors or onboard sensors and GPS or navigation system(approach to identify the location of a particular vehicle). As all vehicles have equal status on network they are free to associate and communicate with any vehicle by

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sending messages. Communication in VANETs can be divided into two categories:

1.Inter-vehicle communication(V-2-V): this communication takes place among vehicles so it is known as Inter-vehicle communication(V-2-V) .

2. Vehicle to roadside communication(V-2-R): it occurs between vehicle and roadside equipments.

Since the use of vehicular network focus mainly on the traffic safety and passenger's comfort. According to previous suvey in 2004, nearby42,800 fatalities, 2.8 Million Injuries on US highways due to road accidents led to $230.6 Billion loss to society. In the EU, around 40,000 people die yearly on the roads and more than 1.5 millions are injured. Traffic jams leads to tremendous waste of time , fuel and lot of noise and air pollution. In such a scenario it become an immediate need to save human life.[8]

CHARACTERISTICS

Though there are various characteristics of MANETs that are mirrored in VANETs (such as no infrastructure support, self organized, distributed networks, etc.)[1] but still there are some distinguishing characteristics in VANETs which takes it one step ahead from other wireless ad-hoc network technologies .These are listed below:

1. High mobility nodes
2. Predictable topology (using digital map)
3. Frequently disconnected network
4. IIighly dynamic topology.
5. Patterned Mobility.
6. Propagation Model.
7. Unlimited Battery Power and Storage.
8. On-board Sensors.
9. Critical latency requirements
10. Slow migration rate

OBJECTIVES:

VANETs involve following objectives to be achieved in support to Intelligent Transportation system:

- Help to achieve best network management as a result of greater information gathering and improved decision making.
- To make travelling more efficient (safer, less polluting, cheaper, better informed travel).
- Simplifying public transport use by providing accurate real time information about services.
- Reducing the effects of air , noise pollution from vehicles by better traffic management.
- Providing information to the drivers on road so as to reduce the number of accidents.
- Help drivers to locate the best route to their destination, and changing the route if maximum incidents occur on it.
- To perk up the security of public transport passengers by providing extra communications.
- CCTV,GPS and Navigation facility.
- To monitor and appraise network performance by automatically collecting and analyzing data.
- To protect the susceptible road users such as children and the disabled.
- Integrating different vehicles by providing a mechanism for sharing information between them and co-ordinating strategy across different lanes and highways.[4]

ADVANTAGES

1.**Safety:** VANETs complemented with ITS can help to reduce injuries and save lives, time and money by making transport safer. It helps the drivers of trucks, buses and cars avoid getting into crashes and maintain safe distance between vehicles. It suggest safe speeds approaching danger spots and also provide information about the work zones, traffic congestion, road conditions, pedestrian crossings and other potential hazards. It also help to select the closest and most appropriate route to avoid traffic and adjust traffic signal to clear the way for emergency vehicles.

2. **Security:** In security aspects, VANETs will help to provide secure transmission of messages between vehicles by avoiding human error or attacks. Security of network is provided by using cryptography technique for secure communication in the presence of third party. Other techniques such as steganography and watermarking are employed to ensure data confidentiality.

3. **Efficiency/Economy:** Use of VANETs not only save time and money for travelers but also deliver fast, accurate and complete route information. Drivers can select and follow safe, efficient routes to their destination and paying tolls without having to stop. ITS enable more reliable and timely commercial vehicle management.

4. Mobility and Access: The future will include a single electronic payment mechanism to pay for fuel, tolls, public transport fares, parking and a variety of other charges. ITS will convey the needs and interest of transport system customers to the people who manage the system , helping to ensure a transport

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system that is responsive to those needs and interests. Management of transport system for safer services and simultaneously available for motorist, cyclists, pedestrians, and users of public transport can be gained with ITS.

5. The Environment: Once VANETs are brought into play it will help to make the transport faster and smoother. It will eliminate unnecessary travel and reduces time caught in traffic congestions. By reducing delays due to congestions and decline in the fuel/energy waste, wear and tear and the pollution caused by stop and go driving is also declined. Thus VANETs shall help vehicles operate more efficiently. It shall provide location specific information about the weather and road conditions using GPS and navigation system.

6. A Transport System for All: Use of VANETs will increase in the future and help to make transport services available and reasonable for everyone. People and goods will get to their destination safely and efficiently. Transportation system will become more environmentally friendly and more secure. People can manage and operate the transport system to provide better, safer and more responsive service to all its users while helping to safeguards the environment. In near future VANETs will surely change the road customs and provide a real difference to society as a whole.

WORKING PRINCIPLE

VANETs network contains two entities: **access points and vehicles**, the access points are fixed and usually connected to the Internet, and they could participate as a distribution point for vehicles [1]. VANET addresses the wireless communication between vehicles (V2V), and between vehicles and infrastructure access point (V2I). Vehicle to vehicle communication (V2V) has two types of communication: one is single- hop communication in which vehicle directly communicate with each other, and another is multi hop communication in which vehicle relies on other vehicles to retransmit.[2]

The vehicular nodes have no predetermined organization of communicating links with other vehicles or with nearby roadside equipment(RSE) they can randomly communicate with any vehicular node.

The vehicles and the associated infrastructure (all nodes) are equipped to gather data, process it to determine present traffic conditions and disseminate it over longer distances and provide other traffic related services related to toll ticketing, monitoring, collision warning, road signal alarms and so on.[6]

Vehicular Ad-hoc networks uses packet flooding for forwarding data to all the moving vehicles on the road. Each VANETs' messages will carry some standardized data about vehicles (e.g. their positions, headings,speeds…) so as to enable innovative on-board services, primarily addressing drivers' safety and comfort, such as advanced driver assistance systems (ADAS), real-time route optimization,traffic management in response to actual congestions, travel-related information systems.[5]

APPLICATIONS

Applications based on vehicular communication range from simple exchange of vehicle status data to highly complex large-scale traffic management .It also includes infrastructure integration. VANETs provide active safety on the roads as well as travel comfort. Table below describes the available Safety as well as Comfort applications :

S. No.	Safety applications
1.	Collision warning, traffic congestion alarm.
2.	Lane-change warning.
3.	Road blockade alarm due to construction works.
4.	Co-operative Collision warning [V-V], co-operative traffic monitoring.
5.	Controlling traffic flow.
6.	Blind crossing prevention
7.	Intersection Collision Warning.
8.	Approaching Emergency Vehicle.
9.	Work Zone Warning [R-V].
10.	Electronic Toll Collection.
11.	Parking Lot Payment.
12.	Traffic Information.

Table1 : Safety Applications of VANETs

S. No.	Comfort related applications
1.	Vehicle users are equipped with Internet and Multimedia connectivity.
2.	VANETs provide ubiquitous computing on roads to mobile users.
3.	While on movement passengers can download music ,send files through emails, play online games and watch online movies.
4.	GPS & navigation system provide traffic reports and helps in identifying fast route.

Table2 : Comfort applications

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CLASSIFICATION OF VANET PROTOCOLS

A routing protocol governs the way of exchanging information involving two communication entities. It includes the procedure in establishing a route, decision forwarding and action in maintaining the route or recovering from routing failure. Table3 illustrates the taxonomy of the VANET routing protocols which can be classified on the basis of routing characteristics, routing strategies, transmission strategies etc. Almost most of the VANETs protocols are same as in MANETs but due to the need for efficient routing, resource saving and dynamic topology changes there are some differences in VANETs protocols from MANETs to fit with different VANET environment.

Parameters	Classification	Protocols
Routing characteristics	Topology based	FSR, DSDV, OLSR, CGSR, WRP, TBRPF, AODV, PGB, DSRZRP, HARP., TORA, and JARR
	Position based	GSR, GPSR, SAR, GPCR, CAR, ASTAR, STBR, CBF, DIR and ROMSGP
	Geocast based	IVG, DG-CASTOR and DRG
	Cluster based	COIN, LORA-CBF, TIBCRPH, and CBDRP
Network structure	Hierarchical routing	FSR,CBRP
	Flat routing	OLSR,DSDV,FSR,STAR ,DREAM
	Position based routing	GSR, GPSR, SAR, GPCR, CAR, ASTAR, STBR, CBF, DIR, ROMSGP
Routing strategies	Proactive	DSDV,RDSDV, Fisheye state routing, CBRP
	Reactive	CBRP,AODV,DSR,TORA,ABR,SSR,LAR,AOMDV
QoS classification	Network topology	Hierarchical, Flat, Position aware routing protocol, GVGRID
	Route discovery	Reactive, Proactive, Hybrid, Predictive
Transmission strategies	Unicast	GPCR,VADD,CARP,DIR,ROMSGP
	Broadcast	BRP, UMB, V-TRADE, DV-CAST
	Multicast	MAODV,ODMRP
	Geocast	IVG, DG-CASTOR, DRG

Table 3:Categorization of protocols

CONCLUSION

In this paper a brief description of Vehicular Ad-hoc Networks is given in support with Intelligent transportation system. It also explains the working principle of operating VANETs stating its distinguished characteristics from MANETs. This paper provides an overview of technically emerging field VANETs. It is a challenging field and needs more exploration for its unearthed facts and there are many more challenges that need to be addressed. The future of VANETs lies is in the hands of research fraternity to explore it ,extend it and make maximum utilization in combination with other technologies.

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Vehicular Ad Hoc Networks: A Security Analysis

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Abstract—**Vehicular Ad hoc Networks (VANET) have emerged as a subset of the Mobile Ad hoc Network (MANET) application; it is considered to be a substantial approach to the Intelligent Transportation System (ITS). VANETs were introduced to support drivers and improve safety issues and driving comfort, as a step towards constructing a safer, cleaner and more intelligent environment. Because information transmitted over a vehicular network is sensitive and can affect important safety decisions, security requirements for VANETs applications prove stringent. The need for a robust VANET networks is strongly dependent on their security and privacy features.**

In this paper a various types of security problems and challenges of VANETs have been analyzed and discussed; we have also discussed a set of solutions presented to solve these challenges and problems.

***Index Terms*—VPKI, RSU, IVC, Cryptosystem, DoS, Authentication**

I. Introduction

In 1999, the Federal Communication Commission (FCC) allocated a frequency spectrum for vehicle-vehicle and vehicle-roadside wireless communication. The Commission then established Dedicated Short Range Communications (DSRC) Service in 2003. DSRC is a communication service that uses the 5.850-5.925 GHz band for the use of public safety and private applications [1]. The allocated frequency and newly developed services enable vehicles and roadside beacons to form Vehicular Ad Hoc Networks (VANETs), in which the nodes can communicate wirelessly with each other without central access point [14]. A VANET is composed of vehicles that are equipped with wireless communication devices, positioning systems, and digital maps. VANETs allow vehicles to connect to roadside units (RSUs), which may be interconnected with each other through a high-capacity mesh network.

Current research trends for VANETs focused on developing applications that can be grouped into the following two classes:

1) Improving the safety level on the road
2) Providing commercial and entertainment services.

To enable such applications, vehicles and RSUs will be equipped with onboard processing and wireless communication modules. Then, vehicle-to-vehicle and vehicle-to-infrastructure (V2I) communications will directly be possible when in range or across multiple hops. RSUs are usually connected to the Internet and allow users to download maps, traffic data, and multimedia files and check emails and news[6].In recent years, many new projects have been launched, targeting on realizing the dream of networking car and successful implementation of vehicular networks. The project Network On Wheels (NOW) [3] is a German research project founded by DaimlerChrysler AG, BMW AG, Volkswagen AG, Fraunhofer Institute for Open Communication Systems, NEC Deutschland GmbH and Siemens AG in 2004. The project adopts an IEEE 802.11 standard for wireless access. The main objectives of this project are to solve technical issues related to communication protocols and data security for car-to-car communications. The Car2Car Communication Consortium is initiated by six European car manufacturers. Its goal is to create a European industrial standard for car-to-car communications extend across all brands.

The unique features of intervehicular communication (IVC) are a double-edged sword: A powerful collection of tools will be available, but a set of dangerous attacks becomes possible.

VANET security should satisfy four goals, it should ensure that the information received is correct (information authenticity), the source is who he claims to be (message integrity and source authentication), the node sending the message cannot be identified and tracked (privacy) and the system is robust [4].

This paper is organized as follows. In Section II we conduct a study of various VANET attacks and attackers to show the problems that VANET faces, in Section III we list the security requirement that must exist to achieve the security system in VANET. Finally in Section IV we discuss the current solutions for the challenges and attacks and requirement to achieve a secure system that have been addressed by researchers.

A. General Architecture

The communication may be of 3 types-1.inter-vehicle communication i.e. vehicle to vehicle communication 2.vehicle to roadside communication i.e. communication between roadside unit (RSU) and vehicles 3.inter-roadside communication i.e. communication between roadside unit and the base station. Applications based on vehicular communication range from simple exchange of vehicle status data to highly complex, large-scale traffic management including infrastructure integration [13].

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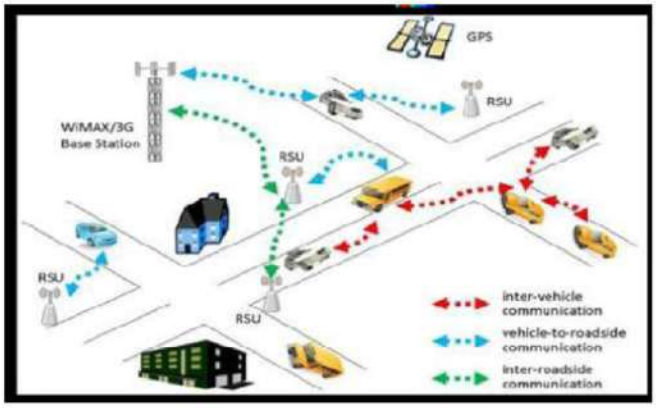

Fig. 1. General Architecture

A number of applications are envisioned for these networks, some of which are already possible in some recently designed vehicles (Fig. 2).

_ Vehicle collision warning
_ Security distance warning
_ Driver assistance
_ Cooperative driving
_ Cooperative cruise control
_ dissemination of road information
_ Internet access
_ Map location
_ Automatic parking
_ Driverless vehicles [15]

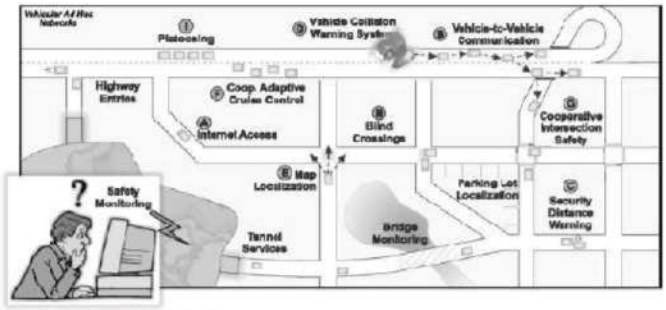

Fig. 2. VANET Applications

B. Security Architecture

All generally includes use of public key signatures. In a public key infrastructure, certificate authorities (CAs) bind between public keys and the nodes. Security and privacy are two critical concerns for the designers of VANETs that, if forgotten, might lead to the deployment of vulnerable VANETs. Unless proper measures are taken, a number of attacks could easily be conducted, namely, message content modification, identity theft, false information generation and propagation, etc. The following are examples of some specific attacks.

1. If message integrity is not guaranteed, a malicious vehicle could modify the content of a message that is sent by another vehicle to affect the behaviour of other vehicles.
By doing so, the malicious vehicle could obtain many benefits while keeping its identity unknown. Moreover, the vehicle that originally generated the message would be made responsible for the damage caused.
2. If authentication is not provided, a malicious vehicle might impersonate an emergency vehicle to surpass speed limits without being sanctioned.
3. A malicious vehicle could report a false emergency situation to obtain better driving conditions (e.g., deserted roads), and if non-repudiation is not supported, it could not be sanctioned even if discovered.

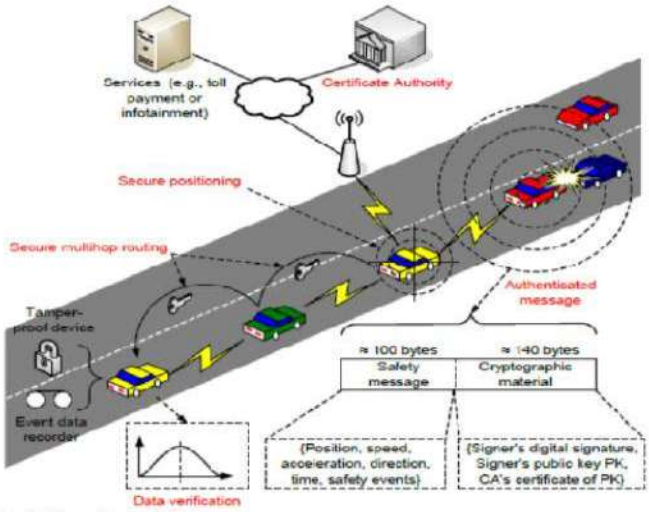

Fig. 3. Security Architecture

II. Various Security Issues in VANETS

There are various security concerns in Vehicular Ad Hoc Networks. These are discussed as follows:

A. Attacks

As we are not specifically concerned to provide the physical security, we will discuss the various attacks perpetrated against the message itself rather than the vehicle.

1) *Message Suppression Attacks:* In a more subtle attack, [16] the adversary may use one or more vehicles to launch a suppression attack by selectively dropping packets from the network. A prankster might suppress congestion alerts before selecting an alternate route, thus consigning subsequent vehicles to wait in traffic.

2) *Alteration Attacks*: A particularly insidious attack in a vehicular network is to alter existing data. [16]This includes deliberately delaying the transmission of information, replaying earlier transmissions or altering the individual entries within a transmission.

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3) *Denial of Service Attack:* This attack happens when the attacker takes control of a vehicle's resources or jams the communication channel used by the Vehicular Network, [4] so it prevents critical information from arriving. It also increases the danger to the driver, if it has to depend on the application's information. [16]If the attacker can overwhelm a vehicle's resources or jam the communication channel used by the vehicular network, then he can prevent critical information from arriving. Not only does this render the application useless, it could increase the danger to the driver if she has come to depend on the application's information. For instance, if a malicious adversary wants to create a massive pileup on the highway, he could provoke an accident and then use a DoS attack to prevent the appropriate deceleration warnings from reaching other drivers.

4) *Masquerading*: The attacker actively pretends to be another vehicle by using false identities and can be motivated by malicious or rational objectives [13].

5) *Bush telegraph*: This is a developed form of the bogus information attack[13].The difference is that in this case the attacker controls several entities spread over several wireless hops. Similarly to the social phenomenon of information spreading and its en-route modification, this attack consists in adding incremental errors to the information at each hop.

B. Attackers

1) *Pranksters:* Include bored people probing for vulnerabilities [16] and hackers seeking to reach fame via their damage For instance, a prankster can convince one vehicle to slow down, and tell the vehicle behind it to increase the speed.

2) *Selfish Driver:* The general idea for trust in Vehicular Network is that all vehicles must be trusted initially, these vehicles are trusted to follow the protocols specified by the application, some drivers try to maximize their profit from the network, regardless the cost for the system by taking advantage of the network resources illegally [4].

2) Malicious Attacker: This kind of attacker tries to cause damage via the applications available on the vehicular network. In many cases, these attackers will have specific targets, and they will have access to the resources of the network [2], [16].
For instance, a terrorist can issue a deceleration warning, to make the road congested before detonating a bomb.

III. SECURITY REQUIREMENTS

1- Authentication
In Vehicular Communication every message must be authenticated, to make sure for its origin and to control authorization level of the vehicles, to do this vehicles will assign every message with their private key along with its certificate, at the receiver side, the receiver will receive the message and check for the key and certificate once this is done, the receiver verifies the message [2], [16].
Signing each message with this, causes an overhead, to reduce this overhead we can use the approach ECC (Elliptic Curve Cryptography), the efficient public key cryptosystem, or we can sign the key just for the critical messages only.

2. Availability
Vehicular network must be available all the time, for many applications vehicular networks will require realtime, these applications need faster response from sensor networks or even Ad Hoc Network, a delay in seconds for some applications will make the message meaningless and maybe the result will be devastating[2].
Attempting to meet real-time demands makes the system vulnerable to the DoS attack. In some messages, a delay in millisecond makes the message meaningless; the problem is much bigger, where the application layer is unreliable, since the potential way to recover with unreliable transmission is to store partial messages in hopes to be completed in next transmission.

3. Non-repudiation
Non-repudiation will facilitate the ability to identify the attackers even after the attack happens [16]. This prevents cheaters from denying their crimes. Any information related to the car like: the trip rout, speed, time, any violation will be stored in the TPD, any official side holding authorization can retrieve this data.

4. Privacy
Keeping the information of the drivers away from unauthorized observers, this information like real identity, trip path, speed etc…The privacy could be achieved by using temporary (anonymous) keys, these keys will be changed frequently as each key could be used just for one time and expires after usage [2], all the keys will be stored in the TPD, and will be reloaded again in next time that the vehicle makes an official checkup [16]. For preserving the real identity of the driver, an ELP (Electronic License Plate) is used, this license is installed in the factory for every new vehicle, and it will provide an identification number for the vehicle, to identify the vehicle in anywhere, with the RFID technology to hold the ELP. In case when the police or any official wants the real identity, it can take an order from the judge to recover the identity of specific vehicles ELP.

5. Real-time constraints
Vehicles move in high speed, this will require a realtime response in some situation, or the result will be devastating [16]. Current plans for vehicular networks rely on the emerging standard for dedicated short-range communications (DSRC), based on an extension to the IEEE 802.11 technology.

6. Integrity
Integrity for all messages should be protected to prevent attackers from altering them, and message contents to be trusted [2].

7. Confidentiality
The privacy of each driver must be protected; the messages should be encrypted to prevent outsiders from gaining the drivers information [2].

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8. *Low Overhead*

Because messages are time critical, the security overheads should retain the message's usefulness [9].

IV. PROPOSED CURRENT SOLUTIONS

In VANET many security solutions been proposed. Authors in [5] presented an optimized conditional privacy preservation model for vehicle ad-hoc networks (VANETs). This model includes an ID-based cryptosystem to assure users' anonymity using pseudonyms; however the model provides a backdoor for law enforcement authorities to trace misbehaving and suspicious users. In this model a heuristic has been proposed that optimizes the pseudonym update process. This heuristic permits vehicles to switch pseudonyms at different times and locations in a way that maximizes the anonymity degree.

Proposed scheme by the authors of [5] consists of an initialization phase, a registration phase, and an update phase. In the initialization phase, the Central Certificate Authority (CCA) generates the parameters N and e and computes t and g as follows:

$$t = re$$
$$g = IDd$$

CCA

The CCA distributes the secret parameters r, g, and d to all the CAs and publishes the parameters N, e, and t to all the VANET entities (CAs, RSUs, and OBUs). In this model, the secret parameters r, g, and d are distributed to all the CAs and publish the parameters N, e, and t to all the VANET entities (CAs, RSUs, and OBUs). In this model, authors assumed that the CAs network is secure. Every node in the network maintains a list of all the CAs including their IDs, their public keys, and their corresponding regions. Although the CAs are distributed regionally, a vehicle can register with any CA in the network. In the registration phase, when a vehicle x wants to register to the VANET network, it selects at random a CA, say CAk. First, it generates on board its RSA private and public keys. Then it sends its identity along with its public key to CAk encrypted with the public key of The CAk computes the first pseudonym and the first signature of vehicle x Then, the CAk sends a message to vehicle x including the necessary parameters encrypted using the public key of x Vehicle x verifies the signature as follows:

$$(Tx1)e = IDCCA.th(t\|Px1\|PK+x\|TExp1)mod(N)$$

Vehicle x can update its pseudonym whenever needed and it can do it with the same CA or with any other CA; however, the update has to be done before the expiration of the current signature.

The authors in [2] and in [7] suggested the use of VPKI (Vehicular Public Key Infrastructure) as a solution, where each node will have a public/private key. When a vehicle sends a safety message, it signs it with its own private key and adds the Certificate Authority (CA's) certificate as follows:

V → r: M, SigPrKV [MT], Certv [7]

Where V is the sending vehicle, r represents the message receivers, M is the message, | is the concatenation operator, and T is the timestamp to ensure message freshness (it can be obtained from the security device).The receivers of the message will obtain the public key of V using the certificate and then verify V's signature using its certified public key. In order to do this, the receiver should have the public key of the CA ; this solution is cited in [16], [10], and [11].

Authors in [6] introduced a system that takes advantage of the RSUs that are connected to the Internet and that provide various types of information to VANET users. Authors provided a suite of novel security and privacy mechanisms in their proposed system. In this paper, they designed a service-oriented vehicular security system that allows VANET users to exploit RSUs in obtaining various types of data. In REACT, users register once with the RSUs online (through the Internet) before they start connecting to the RSUs from their vehicle. After registration, the RSUs obtain from a trusted authority (TA) a master key (Km) for the user. The users get their Km the first time they connect to an RSU from their vehicle. Authors described a novel algorithm that uses the users' password from their account to securely transfer their Km to them. Km will be used to encrypt the initial packet key, which is assigned to the user at the beginning of each session. Then, each packet will be encrypted by a set of derived keys.

Authors in [8] introduced a defensive mechanism for the VANET security with heuristic based ant colony optimization. The heuristic based ant model, worked with known opponents and unknown opponents based on the density of pheromone deposited in the road network path with new road path exploration with traversal of ants. Then the Nash equilibrium is applied with the game theoretic framework to identify the stability state of the players involved in it. Optimal exploitation of traffic organizes and security framework is investigated both in the static (e.g., preset roadside units) and active cases (e.g., mobile law enforcement units). An experimental evaluation is carried out by the authors to evaluate the performance of the proposed defensive mechanism in game theoretic approach using heuristic based ant colony optimization [DMGTA] for VANET security. The proposed framework is efficiently designed for enhancing the VANET security by adapting the defensive measures. Based on the security measures, the VANET security for game theoretic approaches is carried over by three processes. The first process describes the process of identifying the known opponents and unknown opponents using heuristic based ant colony optimization. The second process specifies the NE (Nash Equilibrium) employed to select the appropriate model for a given security problem in VANET. The third process evolves the defensive mechanism for optimization of VANET security in game theoretic model based on traffic conditions like static or dynamic.

In [12] the authors proposed an Attacked Packet Detection Algorithm (APDA) which is used to detect the DOS (Denial-of-Service) attacks before the verification time. They

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introduced model to detect the attacks using Attacked Packet Detection Algorithm. The mechanism is attached with each RSU. Vehicles can send messages to RSU through APDA mechanism. It is used to detect a certain position of the messaged vehicles. After detecting the position of vehicle information is stored in the certain RSU. Each vehicle has OBU and TAMPER PROOF device. These devices, store the detailed information about the vehicles. For example speed, position and etc. Vehicles positions are identified by the frequency and velocity of the vehicles and the use of OBU.

Authors in [17] suggested an idea of using the group signature, but this idea has a major drawback that it is causing a great overhead, every time that any vehicle enters the group area, the group public key and the vehicle session key for each vehicle that belongs to the group must be changed and transmitted, another issue must be considered that the mobility of the VANET prevents the network from making a static group, so the group is changing all the time, and the signatures and keys frequently changed and transmitted, group signature is also mentioned in [10][18], as the authors proposed a protocol for guarantee the requirements of the security and privacy, and to provide the desired traceability and liability, but the result of the study was not quite encouraging. After 9 ms for group signature verification delay, the average message loss ratio was 45%, another result was the loss ratio reaches as high as 68% when the traffic load is 150 vehicles.

Authors in [2] also discussed how to maintain the authentication for the message, where vehicles will sign each message with their private key and attach the corresponding certificate. Thus, when another vehicle receives this message, it verifies the key used to sign the message and if everything is correct, it verifies the message, and they have proposed the use of ECC to reduce the overhead, while authors in [3] suggested another way to use the keys, by using short term certificates and long term, long term certificates are used for authentication while short term certificates are used for data transmission using public/private key cryptography. Safety messages are not encrypted as they are intended for broadcasting, but their validity must be checked; therefore a source signs a message and sends it without encryption with its certificate; other nodes receiving the message validate it using the certificate and signature and may forward it without modification if it is a valid message, so any adversary can inject false information as a safety message, as it doesn't to be encrypted, it also can steal the certificate from any other safety message and send unencrypted message contains false information along with the stolen certificate claiming that the safety message originated from another vehicle.
Using VPKI in VANET accompanied with some challenges, like certificate of an attacker that must be revoked, authors in[34] discussed the Certificate Revocation solution, this solution is used to revoke the expired certificate to make other vehicles aware of their invalidity, and The most common way to revoke certificates is the distribution of CRLs (Certificate Revocation Lists) that contains all revoked certificates, but this method has some drawbacks: First, CRLs can be very long due to the enormous number of vehicles and their high mobility. Second, the short lifetime of certificates still creates a vulnerability window and last one is that there is no infrastructure for the CRL. It is also mentioned some protocols for revocations like RTPD (Revocation Protocol of the Tamper-Proof Device), RCCRL (Revocation protocol using Compressed Certificate Revocation Lists), and DRP (Distributed Revocation Protocol), these protocols have also been proposed in [11], saying that the use of CRL is not appropriate anymore and these protocols are better, but these methods rely on monitoring, so every vehicle has to monitor and detect all the vehicles around it, but this method didn't consider the reputation system, as it is a possible for number of adversary vehicles to make an accusation and causing of an unnecessary revocation, the best result obtained from DRP simulation is that just 25% if the current road vehicles will receive the warning, which is too low.

In[3] authors mentioned that In the IEEE WAVE standard vehicles can change their IP addresses and use random MAC addresses to achieve security, IP version 6 has been proposed for use in vehicular networks. Cars should be able to change their IP addresses so that they are not traceable, however it is not clear how this will be achieved.
Moreover this can cause inefficiency in address usage since when a new address is assigned the old address cannot be reused immediately. Delayed packets will be dropped when the car changes its IP address which causes unnecessary retransmission.

V. CONCLUSIONS

In this paper we analysed the security issue of VANETs. With the wireless technology becoming pervasive and cheap, VANET is going to turn out to be the networking platform that would support the future vehicular applications. We laid out the several drawbacks including security and performance and discussed the various security solutions provided by other researchers. In future we would like to propose an algorithm that would enhance the performance with the maintenances of security using a light weight mechanism.

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Business Outsourcing: An Emerging Growth Oriented Trend in Indian Business

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***Abstract*—In today's innovative world of advanced technologies, lot of companies like Citi Group, IBM, AIG, Dell are outsourcing its business processes to outside suppliers. It is growing day by day. This is called Business Process Outsourcing. Firstly BPO were used as call centers only but now BPOs are also working on software development. In this paper we have discussed: what actually BPO is; quality impact of technology on BPO; emerging trends of BPO in India; Challenges to BPO; and different ways to mitigate the threats. Research Methodology used is based mainly on secondary data. Theoretical frame work has been developed from the literature, data collected from the multiple sources of evidence in addition to books, news papers, journals, websites and other professional magazines. To give it more real look some primary data has also been discussed collected on the basis of personal interactions and interviews done with the learned persons and experts.**

Index Terms— **BPO; call center; companies; outsourcing; software development; technology.**

I. Introduction

In recent years, the number of companies that outsource critical business processes to outside suppliers has grown significantly worldwide and are continuously increasingly sourcing their business processes through external service providers. This service or a practice is called Business Process Outsourcing (BPO). Worldwide, the current BPO market could be as much as $279 billion and has been estimated to be more than worth $309 billion in 2013, including activities such as finance and accounting, legal services and human resource management, procurement and the overall volume has been estimated to be growing at a rate of around 25% annually. Many organizations initiated BPO as part of an operational effort (in order to reduce the costs or access skills), but it has evolved into much more. In high-performing business-process outsourcing relationships, the companies and their service providers are working together to foster innovation. Now a day, BPO is an important branch and trend of outsourcing that many management theories and methodologies generated and developed for outsourcing can be applied to. Many corporations, like Citi Group, IBM, Dell, and AIG have been using BPO and leveraging the larger scale of outside service providers to cut costs, improve process quality and speed time to market. Many IT service vendors, like Accenture, IBM, EDS, and SAP, have also integrated BPO services into their systems and models. Initially BPO started with non-core processes. Now it is moving towards more critical applications. BPO has boosted with call centers and customer support processes. Now at this time BPO is happening with software development, Human Resources (HR), Finance and Accounting (F&A), training, payroll, and procurement.

India is a country where labor is paid relatively lower wages vis-à-vis the U.S. and thus, is a potential ground for providing labor intensive services. India, where the BPO industry is more than a decade old, is witnessing such problems. In the last few years, the salaries of employees have gone up by an average of over 14 percent every year and price for the traditional voice-based services decreased from $16 per hour per agent to $12 per hour per agent, implying a decline in gross margins by 40 to 60 percent. Wage inflation, high attrition, sluggish growth of outsourcing business, Indian currency appreciation and competition from other Asian and East European countries have made high margins unsustainable for Indian outsourcing firms. By identifying the factors that affect a service productivity of a provider, one would be able to provide suggestions to BPO firms for offsetting the negative effects of these exogenous factors. At a micro level, an understanding of the BPO industry is important from the standpoint of the service provider as well as the sourcing firm. According to a supplier, it is crucial to know how a change in one variable filters through the organization to affect its bottom-line performance. A supplier must optimally choose to allocate its resources among potential areas like infrastructure, , marketing front-ends, BCP (business continuity planning), employee training and reskilling, expanding service line/process offerings and human resources to consolidate its position in the industry. There is still a lot of flux in the BPO industry. For example, 2006 year witnessed many Indian BPO firms exiting the industry due to high labor turnover rates and the managers devoted themselves to designing strategies to sustain their human resources. Next year, there were a rise in concerns on data thefts and the managers of BPO firms were seen under pressure to implement information security measures. In fact, the development of the two types of outsourcing industries in India has also been rather similar. Software industry started with low-tech job in India. Over a period of time this software industry evolved to high end software solution provider. In the same way, in India the BPO industry started with captive call

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centers and has now advanced to include risk analytics and other knowledge based processes. Lastly, we take advantage of the existing internalization literature in the vertical production transfer context.

II. What is Business Process Outsourcing

Technically, the term Business Process Outsourcing (BPO) can be defined as the delegation of one or more IT- intensive business processes to an external provider that in turn owns, administers and manages the selected process based on defined and measurable performance criteria.

III. Quality Impact of Technology on BPO: A Present Scenario

Technology plays an important role in improving quality performance in BPO during the entire BPO life cycle. Technology allows the rapid development of various ready-to-use best-practice templates that suits most needed business processes. It offers ready-to-run user interfaces and screens. In addition to this, it also provides generic built-in out of the box interfaces and integration scenarios that are compatible with most business applications and software. Proper technology used by the service provider could allow for saving a blueprint of the clients business process, which would be used in later stages. Technology allows for a smooth and efficient transition of data, processes and knowledge and real-time documentation updates. By enabling and leveraging the values of innovation, standardization, integration, automation and technology impacts BPO, hence enhances the value of BPO. All this shortens the transition phase and minimizes the impact and duration of the transition, and so accelerates the time to benefit, until it reaches the desired quality levels and a streamlined operation. Technology also reduces the risks associated, hence increases the quality level and customer satisfaction with the following impacts:

a) Standardization

For the BPO provider, technology impacts the service quality through affecting the ability to standardize. Providers cannot drive any standardization strategy without having a standard technology, a uniform platform that empowers his standardization activities, while still allowing for "personalization". For the BPO clients, technology accommodates the exceptions related to the language or the country specific rules and laws with the ability to satisfy the country-specific requirements and dissimilarities thus allowing the company to have a uniform standardized process execution throughout all the different divisions, units, and countries. The right technology enables the balance of personalization and standardization of the outsourced activities, creating the capacity to design a process that suits the specificities of each client, while maintaining a standardization level that enables sustainable long term advantages for both the provider and the clients. The standardization reduces the complexity of operations, and thus, helps in reaching higher reliability, responsiveness and conformance. Moreover, this facilitates the use of systems by occasional users due to its simplicity and intuitive design that ensures fast adoption and reduces the risks linked to occasional users use.

b) Integration

Standard interfaces and open standards are built to make it easier to integrate processes together. Their function is not to glue a series of systems together but rather to enable consistency. Technology allows an accurate and centralized consolidation of candidates' information gathered from various sources. Following standard practices and abiding to industry standard processes and applications helps create a better integrated environment. This not only reduces the need for custom code, but also allows the use of software generic templates and interfaces with only minor configuration changes. The integration between the different outsourced processes is easy, neat and tight, and the same for integration with the retained in-house. processes and systems. Evolving technology is providing this kind of support integration. Business software providers and BPO providers are promoting the embrace of open standard and inter-operable interfaces. The industry is moving forward to embed web services and Service Oriented Architecture (SOA) into solutions offering, in addition to supporting standard technologies like Business Process execution Language (BPEL). An integrated system provides the most effective data and information storage, and thereby, improves the efficiency and reliability of service.

c) Automation

Standardization and centralization facilitate and leverage another driver for quality called automation. Technology directly drives the process automation through workflows, paperless document management and online interaction. Technology can automate change requests through real-time workflows that make process governance more effective and more efficient. Another effect of applying technology to the BPO process control is the remote monitoring and supervision of the outsourced activities execution. Technology enables BPO buyers to closely monitor and supervise the process operations. Through automation, technology facilitates this control mechanism, making the process steps clearer. Automation not only speeds the process and decreases cost, but also delivers a more secure and agile service with an enhanced quality of process and new-hires. In summary, the effect of process automation is the reduction in the frequency of errors, and improvement in error detection and correction. This improves the reliability and accuracy of the process outsourced and adds to its perceived quality.

d) Innovation

Though innovation was never a main drivers for outsourcing, many buyers now perceive innovation as one of the biggest advantages of outsourcing. Technology drives innovation and

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business processes adoption directly, such as the development of different internet tools. Business practices could also lead the process innovation, but technology facilitates it a self-service technique. Technology enables innovations like intelligent collection, analysis, and mining of information to create better visibility, which in turn creates competitive advantage. Recently, in HR management, innovations have been created and applied, such as corporate blogs used as a recruitment marketing tool in the recruitment trends of sharing information with candidates.

IV. Emerging Trends of Business Outsourcing in India

India has always been a land of opportunities for the foreign investors. India's demographics and historical background has placed it well in the world's trade map. Further, British colonizers brought English language with them, which now has become the global language of business; hence proving to be a boon in disguise for Indians. Also being world's largest democracy we have favorable political environment, which aids in attracting investments worldwide. Even in the gloomy backdrop of global meltdown, India has managed to maintain a fair GDP growth rate of 8.8% up to June last week-2010. Globally, India has became a prominent member of many International associations like BRIC, IBSA, G-20, ASEAN+8 which has enabled her to be the torch-bearer of economic growth by the virtue of its accelerating Purchasing Power Parity (PPP) which is estimated to be $3.4billion for the whole Indian economy. Other strategic factors which have lead to investment boom in India includes the tax exemption and tax incentive schemes of GOI provided specially to IT and ITES, KPO companies in the wake of New Economic Policy – 1991, which opened doors of our economy to the world through combined policies of Liberalization- Privatization-Globalization better known as LPG in economic terminology. So, in nutshell we can say that all the above factors and many more, have acted in cohesion to make India a favorable investment destination for the developed nations which in turn lead to rise in our national income propelling growth for us. Due to strategic advantages India has become a leading country for offshore outsourcing business, since its beginning in mid 1980s. IT and BPO export sector has grown more than $64 billion due to attractions like English speaking youth, low cost workforce present in abundance in Indian Subcontinent. American and European have the largest customers for the Indian outsourcing industry with account for 61% and 31% respectively for IT and BPO sectors. The largest vertical sector includes financial services (41%), manufacturing (17%), high-tech/ telecom (20%) and retail (8%) in India. IT and ITES industry had employed more than 2.3million people in the year 2009 in itself. Business from governments is a fast – growing segment for IT companies. Presently governments across the world are expected to spend close to $175 billion on IT. The IT budget of US federal government is around $36 Billion. The top rankers in India includes that of TCS group, Infosys , Wipro, Spectramind, Daksh e-services, Converges, HCL Technologies, Zenta, EXL etc. India boasts of a large number of English speaking populations who with a little bit of voice accent training are readily employable in BPOs. Also India is relatively good in the level of technological readiness as internet is highly accessible at nominal rates which are a strategic advantage for our country.

V. Challenges for Business Outsourcing in India

1. *Performance/Quality Concerns:* Due to lack of supervision there can be dip in performance of outsourcing business in India, which may again lead to increase in costs at the parent company's side. This is a major concern, which is needed to be checked out.
2. *Higher Than Expected Costs:* Outsourcing is meant for reduction of costs, but the vice-versa may happen because of causes like excessive attrition rate due to which frequent recruitments have to be done which accelerates the cost of the company.
3. *Data Security Concern:* Since In India, BPOs provide similar kinds of services to many clients even to rivals also, therefore arises the data leakage concern among the outsourcing company.
4. *High Attrition Rates Among BPO Employees:* Due to cross-cultural variances between the customer and service provider, there arises the urge to switching over to other "Stable" or "Secure" jobs leading to higher attrition rates which creates a problem for the HR manager. Cases are also heard about racial discrimination or abuses which derogates an individual's self-esteem and he feels like leaving not only the job but outsourcing industry as a whole.
5. *Lack Of Coordination Between Different Cultural Backgrounds:* Lack of coordination is created due to interaction of different people from different time-zones, dipping the efficiency of the employees.
6. *Cultural Misfit:* Employee unrest is possible due to cultural misfits of Indians in the US or UK based shifts or work settings.
7. *Loss of In-House Expertise:* Loss of in-house expertise due to higher attrition rates in BPO business is a challenge.

VI. Ways to Mitigate the Threats Cconcerning BPO Industry in India

Though there will be always some friction when people from two or more different cultural backgrounds work together, because of differences in work ethics, expectations, and delivering standard benchmarking performance in the work place. Few innovative strategies are detailed below, which can help in reducing the imbalance between the customer and service provider and help in exhibiting coordination between the two ends.

1. *Projecting A Positive Brand Equity:* In Indian society, BPO industry has a negative image of a temporary job and its generally not a long term career option for youth. This negative image is earning

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negative brand equity for them and reversing the trend is the need of the hour. Making the industry friendly, offering high growth opportunities to the society will definitely help in attracting best talents to outsourcing industry also, and in turn increasing the efficiency of the service provider.

2. *Highly Skilled Employees To Be Recruited:* BPOs should try to attract calibre people in their arena by providing them flexible environment and ample growth opportunities so as to increase their efficiency and retain them in organization.
3. *Elimination Of Unethical Practices:* The Customer Service provider relationship is based on mutual trust which should be maintained at any cost in outsourcing business by proper record keeping, maintaining high level of secrecy in business dealing and providing effective means of data security.
4. *Strategic Human Resource Management:* While operating business in a cross cultural setting, a human resource manager has to play the trio role of a Friend-Philosopher- Guide to the employees providing them with proper work-life balance opportunities and create a congenial environment at office to ease the stress levels.
5. *Control of High Attrition Rates:* BPOs in India are plagued with the problem of high attrition rates due to unfriendly environment and erratic schedule of work. This is needed to be controlled at once in order to reduce real costs and save time of the organization.
6. *Creating Favorable Business and Economic Environment:* The rigid business and volatile economic environment of India has to improve in order to compete with the other emerging lucrative outsourcing destinations.

VII. CONCLUSIONS

To build sustainable competitive advantage, leading compa nies all over the world are now using an advanced form of outsourcing, dubbed globalcollaboration, to drive new reve nue quicken time-to-market, and increase innovation. Due to strategic advantages India has become a leading country for offshore outsourcing business, since its beginning in mid 1980s and also global industrial collaboration deeply impacts its industries top as well as bottom lines.

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Indian Mutual Fund Industry: Opportunities and Challenges

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Abstract: - **The mutual fund industry, today presents a picture of opportunity and challenges. As the industry sensitizes itself to the changing regulatory landscape, business strategies are endeavoring to respond to these developments. The Indian mutual fund industry is primarily debt-oriented with debt funds (including liquid funds) forming 64% of the AUM. Increased equity participation is the need of the hour for the mutual fund industry.**

Despite domestic MF growing at substantially higher rate in last decade, it is still many times behind US MF industry, the size of which is estimated at over US$ 12 trillion as against about Rs.9 lakh crore of India with its market penetration of 4% of total population, compared to 49% in the US and 20% in UK. About 75% of the assets under management are contributed by top five metro cites. Only 3-4 percent of household saving is investment in mutual funds. US nearly half of the household own mutual fund. This paper tries to find out what are the opportunities and challenges of Mutual fund industry in India.

Keywords: **Mutual Funds, Potential of Mutual fund in India, Penetration of Mutual funds, Opportunities in Mutual funds, Mutual funds Industry**

I. INTRODUCTION

India's 44 fund houses together had an average AUM (Asset Under Management) of Rs. 8,77,973 crore at the end of 2013, from Rs. 7,93,331 crore at the end 2012, an increase of about 11 percent in this year as per data available with industry body AMFI (Association of Mutual Funds in India). The mutual fund industry has registered a compound annual growth rate (CAGR) of around 20% during the last decade (2003-2013). The impressive growth in the Indian Mutual fund (MF's) industry in recent years can largely be attributed to various factors such as rising household savings, comprehensive regulatory framework, favorable tax policies, and introduction of several new products, investor education campaign and role of distributors. Despite this high growth in recent years, Indian MF industry remains a small player in Indian Financial system. Given the dearth of long term investment options available and high saving rate in India, one would expect mutual funds as popular saving instrument. Moreover, one would expect poorly financial literate Indian investor to participate in the economy's growth by outsourcing the complex investment function to mutual funds rather than trying to do it themselves.

Mutual fund industry was supposed to tap the saving of common man as it provides an option of diversified investment structure with varying degree of risk. India with a population of 120 crore plus people as only just four crore mutual fund investors, India's AUM penetration as a per cent of GDP is between 5-6 per cent while it is around 77 per cent for the U.S., 40 per cent for Brazil and 31 per cent for South Africa. Government estimates suggest that only 3-4% of Indian household saving is invested into security related investment. Majority of Indian saving are direct towards gold and real estate. Of 8.78 lakh crore of asset only 1.82 lakh crore are in equity assets the rest of assets are in liquid and debt funds, A successful asset management business is evaluated on the basis of the equity assets it manages. On the equity side, the industry's AUM experiences a decline despite the capital appreciation of most of the equity funds due to a rise in stock prices. The reason for the fall in AUM was mainly due to redemption by retail investor.

II. THE UNTAPPED MARKET IN INDIA

The Indian population is largely under-banked with a very low level of financial inclusion leaving room for further penetration. The extent of under-penetration in the market is a sore point with the banking and financial services industry, with a large amount of savings being channelized into gold and real estate rather than the capital market. The GDP growth has slowed down, sluggish at 5% in 2012-13, with savings and investment rates following a downward trend. In 2010-11, the savings and investment rates were 34% and 36.8%, respectively, which declined to 30.8% and 35%, respectively, in 2011-12 and 31.8% and 35.4% in 2012-13.

For savings to be streamlined into the capital market, investors need to first and foremost be made aware of avenues and opportunities. The mutual fund industry is yet to spread its reach beyond Tier I cities. The top five cities contribute to 74% of the pie, with the remaining 26% distributed among other cities. Statistics show that in March 2013, penetration in the top five cities increased to 74% as compared to 71 in March 2012, whereas for cities beyond the top five, penetration has decreased. One of the prime areas the industry is focusing on is developing the penetration ratio and increasing its presence in other cities. Another interesting fact worth noting is how skewed the business from the industry is, with the top ten fund houses contributing 77% of the total assets under management and the bottom ten a mere 1%.

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III. DISTRIBUTION AND PENETRATION RELATED CHALLENGES

Traditionally, large distribution networks were developed by the Life Insurance Corporation of India and the private insurance companies for their own products. The Insurance model involved engaging deeply with distributors and agents, by educating and equipping them to sell. Agents were well-compensated and penetration was deep. In return, the agents worked exclusively with insurance company and did not sell other products. Unlike this, the mutual fund distribution network evolved in an open architecture mode. All distributors were free to distribute or offer products from multiple asset management companies (AMCs). As a result, the bond between the AMC and the distributor was relatively weaker. An AMC did not end up spending resources beyond a certain level on developing the distributor skills as the latter could then easily use these improved skills to sell other competing products.

The withdrawal of the entry-load in August 2009 , which constituted a good part of the commissions passed on to the distributors, was one of the other factors leading to a sudden change in the distribution space. Generally, it is more expensive for a distributor to reach out to a retail investor than to a corporate investor. While an average retail investor folio has about Rs. 35,000 of assets, an average corporate investor folio has Rs. 59 lakh of assets. Hence, a distributor will need to reach around 170 retail investors to get the same AUM as a single corporate folio, which acts as a relative disincentive to chasing and capturing individual retail investors.

Considering the higher costs of acquisition of a retail investor, one could consider evaluating differential expenses being charged to retail and institutional investors. This may, however, impact investor returns of the two segments who have invested in the same scheme, leading to discontent among retail investors. Moreover, despite the higher upfront cost of acquiring a retail investor, the sticky nature of retail investors indicate that retail consumers break even and are actually more profitable than corporate clients in the long run.

Upfront commission: After the alteration to entry-load norms, in August 2011, transaction charges were introduced to compensate distributors (refer to the 'transaction charges paid to distributors' point in the regulatory section). In respect of the 'opt-in' facility offered to distributors, only 16% have opted in with the rest opting out of charging the transaction fee. A possible reason for this trend could be the lower limit of 10.000 INR on the ticket size which consequently disincentivises small scale distributors and sub-distributors who typically get large volumes of low ticket size subscriptions. This trend also indicates that this move has only partially brought back distributor interest in selling to this segment.

Trail commission: The changes to trail commission led to large distributors focusing on servicing and retaining existing investor-clients rather than reaching out to new investors. Later, in May 2010, AMFI members agreed to ban trail commission on transferred portfolio. The reduced trail commission, which was typically charged to schemes, implied increased scheme returns which could prove beneficial to investors. However, the blanket ban on all trail commissions for transferred portfolios could serve as a detraction to investors whose existing agents were not servicing them, given the reduced attraction for a new agent to service sans a trail commission.

Product Relevance

Indian stock markets have experienced inconsistent returns in the recent past. Higher inflation and inconsistent economic growth has worried the retail investor who is now concerned about assured returns. In such a scenario, the investor would divert their funds from the equity market to saver investment option like bank deposit, real estate and gold. Investment portfolio is determined largely by the performance of the capital markets and interest rate cycles. One reason for fewer new Investments in Mutual Funds is the lack of new fund offers (NFOs). Between 2003 and 2008, NFOs ruled the mutual fund market. Hundreds of those hit the market and collected thousands of crores. According to the McKinsey study, industry assets grew at a whopping 45 per cent compounded annually during this period. The Bull Run in the equity markets provided the perfect backdrop for attracting retail investors to Mutual Funds.

According to SEBI Chairman U K Sinha pointed out that nearly half the industry had a significant number of schemes underperforming their benchmark indices. Beating the returns provided by the index against which a scheme is benchmarked is the main objective of a fund manager. According to Sinha, "at least nine major fund houses had more than 50 per cent schemes consistently lagging their benchmark over a three-year period." Another nine had up to 50 per cent of schemes in the laggards' list.

The presence of a large number of similar schemes has ended up diluting the basic fundamentals of simplicity and ease of investing, because of which investors choose MFs instead of investing directly in bonds or buying stocks from stock exchanges. Too many schemes have ended up confusing the minds of investors. This results in inaction even for the most informed investors in top cities, not just the uninitiated in the hinterland. The work of leading psychologists and behavioral economists, who have examined how people make choices, can be extended to mutual funds to understand why people don't opt for them.

IV. INVESTOR EDUCATION

The efforts taken by the industry and AMFI towards investor education are definitely showing results. The media is also making a fair share of its contribution. Today, we have news channels, running dedicated shows for mutual funds, wherein fundamentals of investing in mutual funds are explained and queries of investors are answered by experts. However, the fact remains that in our country mutual funds are sold rather than bought. And this trend has been observed uniformly across all classes of investors and for all kinds of products. This is where professional help is required. The

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economic boom in our country has led to the emergence of a very strong Small and Medium Enterprise (SME) sector. Banks and financial institutions are also vying for a stake in wooing this niche business segment. However, the focus of SMEs has primarily been in the manufacturing sector. The services sector could also be accredited with this status. This would help professionalize financial planning in our country as is the trend in mature markets like the USA. The Certified Financial Planner accreditation can now be acquired in India. With the right kind of assistance from the banking sector, we could have an army of entrepreneurs willing to take up financial planning as a very profitable business option and this could go a long way not only in ensuring professional education and guidance to the investors but also in improving the long term financial health of investors.

The emergence of financial planning as a framework that enables investors to define their preferences before making a choice is a welcome step. However, this is in the realm of financial advisory, not fund management. Mutual funds depend heavily on advisers to provide this preference framework to investors. Therefore, developing a professional cadre of advisers and planners is in their interest. Unless mutual funds are able to achieve that, product reach will continue to be a factor of commission-driven push, with its undesirable consequences.

V. CONCLUSION

Low customer awareness levels and financial literacy pose the biggest challenge to channelizing household savings into mutual funds. The low awareness levels among retail investors have a direct bearing on the low mutual fund off take in the retail segment. A large majority of retail investors lack an understanding of risk-return, asset allocation and portfolio diversification concepts. However, this is in the realm of financial advisory, not fund management. Therefore, developing a professional cadre of advisers and planners is very important for the success of Mutual Fund. Mutual fund industry manifests big opportunity for growth and further penetration, and this can be achieved over time, with support from technology. It is also important to market MFs as a 'concept' in order to create a strong pull from customers. The Indian mutual fund industry has immense growth potential beyond Tier I cities were majority of people lives. Mutual Fund aided well by technological advancements, professional financial advisor and increased awareness. MFs can be a major contributor to the overall development Indian economy. In India reaching the retail masses and ensuring a viable business model for the distributor is essential for the success of MFs. One way to increase retail penetration is for MFs to go up-country, and penetrate into smaller cities and towns with a focused distribution network. Mutual Funds industry can use the distribution net.

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MICROFINANCE: DEVELOPING SECTOR IN INDIA

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Abstract - **Micro finance sector in India is still in its nascent. Micro finance yet remains a powerful tool for development. It may be a panacea, but it has brought a sea of change in the lives of many in the poor and over.The study aims at identifying the origin and concept of micro finance sector, features and role of micro finance in India, reviewing the progress and weakness followed by suggestion for making micro finance sector as an effective instrument of poverty elevation, women empowerment and rural development in India.**

I. INTRODUCTION

The concept of micro-credit is not new. It existed in every society in one form or other. Towards microfinance, the concept was first developed by Jonathan Swift in 1700 in Ireland with a view to bring out the financial services to the door steps of the neglected rural poor by banks by establishing 'Irish Loan Fund System' through provision of short-period without collateral security. In India, Nobel Laureate Muhammad Yunus laid the foundation of the modern MFIs by establishing Grameen Bank in Bangladesh, 1976. NABARD took this idea and started concept of Micro Finance in India. In this concept, there exists a link between SHGs (Self-help group), NGOs (registered as societies or trusts), Commercial Banks, Regional Rural Banks (RRBs), cooperative societies and other large lenders playing an important role in providing refinance facility to MFIs. The SHGs are formed and nurtured by NGOs and only after accomplishing a certain level of maturity in terms of their internal thrift and credit operations they are entitled to seek credit from the banks. There is an involvement of the concerned NGO before and even after the SHG-Bank linkage. The SHG-Bank linkage programme, which was undertaken since 1992 in India, had financed about 22.4 lakh SHGs by 2006. With financial inclusion emerging as a major policy objective in the country, Microfinance has occupied centre stage as a promising conduit for extending financial services to unbanked sections of population. Microfinance sector has grown rapidly over the past few decades. At the same time, practices followed by certain lenders have subjected the sector to greater scrutiny and need for stricter regulation.

MICROFINANCE is a Small scale financial service targeting the rural population. Microfinance is not just about giving micro credit to the poor rather it is an economic development tool whose objective is to assist poor to work their way out of poverty. It covers a wide range of services like credit, savings, insurance, remittance and also non-financial services like training, counseling etc.

"Microfinance is the provision of financial services to low-income clients or solidarity lending groups including consumers and the self-employed, who traditionally lack access to banking and related services."

In the Indian context, micro, small and medium enterprises as per the MSME Development Act, 2006, are based on their investment in plant and machinery on equipments for enterprises providing or rendering services.

For manufacturing enterprise:

- a micro enterprise, where the investment in plant and machinery does not exceed twenty five lakh rupees.

  In the case of the enterprises engaged in providing or rendering of services,
- a micro enterprise where the investment in equipment does not exceed ten lakh rupees.

Salient features of Microfinance:

- Loans to those people who live BPL *(Below Poverty Line)*
- Loans are of small amount – micro loans and of short duration
- Loans are offered without collaterals
- Loans are generally taken for income generation purpose
- Maximum limit of loan under micro finance Rs25,000/-
- The terms and conditions given to poor people are decided by NGOs

II. LEGAL FRAMEWORK

The literature review for this study included research work undertaken by ASSIST in support with SIDBI to review and understand the practices and systems adopted by MFIs through 25 sampled MFIs across sizes, delivery models (SHG, JLG, Grameen and Individual), legal forms (NBFCs, Societies, Section 25, Not for Profits, Trusts) and regions

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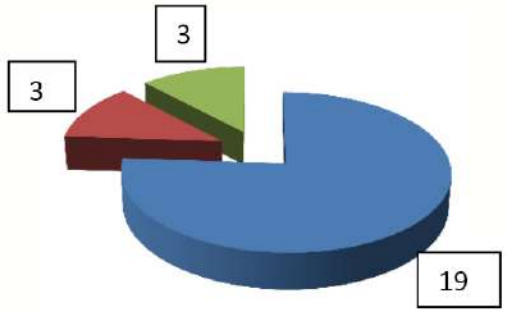
(North, South, East, West and Northeast); to identify best practices, gaps and challenges faced by them. Out of 25 MFIs studied, 19 MFIs were NBFCs, 3registered under Societies Act and 3 under Not-for-Profit (Section 25) Company. Though the Business processes were similar amongst them all, the add-ons were different. For Instance in the case of societies, savings was an integral part of the system, whereas in case of 'not-forprofit' organizations, the focus was on social service and channelizing its efforts through the groups formed for financing. However, non NBFC MFIs found it difficult to comply with all the requirements of lenders in turn posing challenge in getting external funds.



Legal Status of MFIs

Blue - NBFC
Red - Society
Green – Sec 25 Not for profit

III. GAPS IN FINANCIAL SYSTEM AND NEED FOR MICROFINANCE

According to the latest research done by the World Bank, India is home to almost one third of the world's poor (surviving on an equivalent of one dollar a day) official estimates range from 26 to 50 percent of the more than one billion population. About 87 percent of the poorest households do not have access to credit. The demand for microcredit has been estimated at up to $30 billion; the supply is less than $2.2 billion combined by all involved in the sector. Though many central government and state government poverty alleviation programs are currently active in India, microfinance plays a major contributor to financial inclusion. In the past few decades it has helped out remarkably in eradicating poverty. Reports show that people who have taken microfinance have been able to increase their income and hence the standard of living.

About half of the Indian population still doesn't have a savings bank account and they are deprived of all banking services. Thus, Microfinance institutions serve as a supplement to banks These institutions not only offer micro credit but they also provide other financial services like savings, insurance, remittance and non-financial services like individual counseling, training and support to start own business and the most importantly in a convenient way. The borrower receives all these services at her/his door step and in most cases with a repayment schedule of borrower's convenience. But all this comes at a cost and the interest rates charged by these institutions are higher than commercial banks and vary widely from 10 to 30 percent. Some claim that the interest rates charged by some of these institutions are very high while others feel that considering the cost of capital and the cost incurred in giving the service, the high interest rates are justified. In India microfinance operates through two channels: 1.SHG – Bank Linkage Programme (SBLP) and 2. Microfinance Institutions (MFIs).

IV. STATUS OF MICRO SECTOR IN INDIA

According to the Fourth All India census of Micro, Small and Medium enterprises; Micro sector had 14.85 lakh working enterprises, accounting for 94.93% of the total working enterprises of MSME sector with 687.42 thousand in rural and 797.34 thousand in the urban sector i.e., 97.18% in the rural areas and 93.03% in the urban sector. The Micro sector dominated both in rural and urban areas and the average employment provided by the micro enterprise was (4.40 per enterprise) 65.34 lakh people were employed in this sector i.e.17.19% of the total MSME sector. Employment intensity of micro sector was (38.54 persons per crore of fixed investment). Micro sector had a share of 37.75% in the total fixed investment and 44.24% share in the gross output of the registered MSME sector. Analysis of the distribution of enterprises by type of organisation in MSME sector reveals that complete dominance of proprietary enterprises is true only in micro sector (91.77% of micro enterprises are the proprietary concerns), 3.47% are in partnership, and 1.78% in private companies, 0.37% in public ltd. companies and 0.28 were cooperatives. 1.81 lakh enterprises were availing for loan which was very high i.e., 90.5% of the total MSME sector. 1274.10 Thousand (85.81%) male and 210.66 thousand (14.91%) of females owned the micro sector. Number of district covered under the SHGs linkage programme increased from 26 in 1993 to 583 in 2006. North east Region accounts for the lowest number of SHGs credit link with 160 as against the highest number of 1, 09,218 in the South during 2000-2001. The status of the two regions continued even during the year 2005-06. North East Region continued to be the lowest in SHGs credit link with 28,279 and South recorded the highest SHGs credit link of 2,75,490 followed by East with 1,28,723 and centre with 70,550 respectively during 2005-06. Small Industries Development Bank of India (SIDBI) with World Bank assistance has launched India Microfinance Platform, a portal which gives comprehensive information about microfinance players in the country. It has data about each and every microfinance firm working

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right up to district level. The site monitors the performance of an MFI on quarterly basis.

V. IMPACT OF MICRO FINANCE IN INDIA

- MFI's achieved an overall growth of customer base by 10.8%
- Borrowing base increased from 83.6 to93.9 million
- Increase of personal income
- Empowerment of women
- Increased education of the borrower's children
- Pressure on banking institutions to improve

VI. MAJOR HINDRANCES IN THE MICRO FINANCE SECTOR

Financial illiteracy: It makes difficulty in creating awareness of microfinance and even more difficult to serve them as microfinance clients.

Inability to generate sufficient funds: Though NBFCs are able to raise funds through private equity investments because of profit motive, such MFIs are restricted from taking public deposits. Not-for-profit companies constituting a major part of the MFI sector primarily rely on donations and grants from Government and apex institutions like NABARD and SIDBI. In absence of adequate funding from the equity market, the major source of funds for MFIs are the bank loans, which is the reason for high Debt to Equity ratio of most MFIs.

MFIs receive debt from banks against their equity and in order to increase their portfolio size they need to increase their debts for which they further need to increase their equity. MFIs as they find it very difficult to get bank loans because of their small portfolio size and so they have to look for other costlier sources of fund.

Dropouts and Migration of group members: Majority of the microfinance loans are disbursed on group lending concept and a past record of the group play an important role in getting new loans either through SHG-Bank linkage or through MFIs. The two major problems with the group concept are dropouts (when one or more members leave the group) and migration (when one or more members move to another group). Most MFIs lend on the basis of the past record of the group i.e. SHG or JLG and also on the individuals repayment performance. In absence of a decent past record, members are deprived of getting bigger loan amounts and additional services.

Transparent Pricing: Non-transparent pricing by MFIs confines the bargaining power of the borrowers and their ability to compare different loan products, because they don't know the actual price. In absence of the proper understanding of the pricing, clients end up borrowing more than their ability to payback which results in over-indebtedness of the borrower.

MFIs, in order to make their products look less expensive and more attractive, disguise their actual/effective interest rates (better known as the Annualized Percentage Rates – APR) by including other charges like service charge, processing fee etc. Some MFIs even take interest free deposits for lending microloans. Sometimes the interest rates are linked with the loan amount, which means a higher interest rate for smaller loans (because of higher transaction cost). This is resulting in highest interest rate being charged to the poorest clients, which contradicts with the social aspect of microfinance.

Cluster formation – fight to grab established market: MFIs' drive to grab an established market and reduce their costs by resulting in formation of clusters in some areas leaving the others out of the microfinance outreach. By getting an established microfinance market, MFIs reduce their initial cost in group formation of clients, educating them and creating awareness about microfinance. This is one of the reasons for the dominance of the microfinance sector in the southern states. A similar trend is being followed in the northern states as well. This cluster formation is restricting MFIs from reaching to rural areas where there is the actual need for microfinance. Because of the initial cost involved in serving a new location, MFIs are not willing to go to such remote locations. This is the reason most of the MFIs have their branches in urban and semi-urban areas only resulting in a very low rural penetration of microfinance.

Multiple Lending and Over-Indebtedness: Both of these are outcome of the competition among the MFIs. Microfinance is one such sector where the Neo-liberal theory of free market operation fails, at least to some extent. Though competition is good for many sectors but in this case it is going against both the parties. In order to eat away each others' market share, MFIs are ending up giving multiple loans to same borrowers which in some cases is leading to over-indebtedness (a situation where the borrower has taken loans more than her/his repaying capacity) of the borrower. MFIs are getting affected because borrowers are failing to make payments and hence their recovery rates are falling, while over-indebtedness is making the borrower go to depression and in some cases forcing them to commit suicide.

VII. CHALLENGES FACED BY MICROFINANCE SECTOR

The SHG-Bank linkage and finance through MFIs approaches is an effective instrument by which every poor can access hassle free formal credit without any collateral security and simultaneously improve their thrift habits. But in order to make the approaches more useful means for poverty alleviation a sustainable rural development, there is

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a need for sincere intervention by the promotional agencies particularly the banks and block authorities in the areas of awareness building skill Development and training, etc. considering the number of clients, range of services and to increase involvement of both formal and informal sector institutions, there is tremendous scope for sustaining of micro finance development in India.

- Building permanent, sustainable institutions that provide financial services to the poor on a mass scale.
- Developing and strengthening appropriate supervision and regulation
- Developing high quality growing cadre of managers and professionals
- Improving financial transparency.
- MFIs are dependent on borrowings from banks & FIs
- Public sector banks prefer lending through SHG-bank linkage model
- Available bank funds are typically short-term (max. 2 years period)
- Interest rates charged by MFIs are primarily to the poor people; thereby it can become a politically-sensitive issue
- Over the past few years, MFIs in Southern India states were accused of excessively charging high interest rates and have been targeted by local administrations
- MFIs risk management practices have weakened over the past few years in search for growth & expansion
- Credit sanctioning & monitoring practices have weakened
- Weak governance
- MFIs also face a challenge to strike a balance between social and business goals

VIII. FINDINGS

- The launch of platform by SIDBI will help in promoting transparency.
- Illiteracy can be dangerous when one doesn't know how to read but he/she knows how to accept or approve it (by signing it).
- It is high time for the MFIs to understand that though microfinance is a resalable product, increasing the outreach of the microfinance sector by including new clients and serving new locations is what which is needed the most at the moment.
- Ambiguity in the pricing by MFIs is inviting regulatory bodies to implement strict measures like interest rate caps. But simply putting an interest rate cap may encourage MFIs to look for clients with larger loan requirements. This may deprive the clients with smaller loan requirements who are supposed to be the actual beneficiary of microfinance.
- Some experts advocate that multiple lending is not but over-indebtedness is dangerous. This may be true but multiple lending is eating away the opportunity of new borrowers, and in a country where it is believed that the microfinance sector is able to cater to only 10-15 percent of its potential clients, even multiple lending proves out to be a big concern.
- It has been seen that in lieu of reducing the initial cost, MFIs are opening their branches in places which already have a few MFIs operating.
- MFIs are employing different patterns of charging interest rates and a few are also charging additional charges and interest free deposits (a part of the loan amount is kept as deposit on which no interest is paid). All this make the pricing very confusing and hence the borrower feels incompetent in terms of bargaining power.

IX. RECOMMENDATIONS

- In addition to proper regulation of the microfinance sector, field visits should be adopted as a medium for monitoring the conditions on ground and initiating corrective action if needed. This will keep a check on the performance of ground staff of various MFIs and their recovery practices. This will also encourage MFIs to abide by proper code of conduct and work more efficiently. However, the problem of feasibility and cost involved in physical monitoring of this vast sector remains an issue in this regard.
- Encouraging MFIs for opening new branches in areas of low microfinance penetration by providing financial assistance will increase the outreach of the microfinance in the state and check multiple lending. This will also increase rural penetration of microfinance in the state.
- MFIs should provide complete range of products including credit, savings, remittance, financial advice and also non-financial services like training and support. As MFIs are acting as a substitute to banks in areas where people don't have access to banks, providing a complete range of products will enable the poor to avail all services.
- MFIs should use new technologies and IT tools & applications to reduce their operating costs. Though most NBFCs are adopting such cost cutting measures, which is clearly evident from the low cost per unit money lent (9%-10%) of such institutions. NGOs and Section 25 companies are having a very high value of cost per unit money lent i.e. 15-35 percent and hence such institutions should be encouraged to adopt cost-cutting measures to reduce their operating costs. Also initiatives like development of common MIS and other software for all MFIs can be taken to make the operation more transparent and efficient.

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- In absence of adequate funds the growth and the reach of MFIs become restricted and to overcome this problem MFIs should look for other sources for funding their loan portfolio. Some of the ways through which MFIs can raise their fund are:
- By getting converted to for-profit company i.e. NBFC; without investment by outside investors, MFIs are limited to what they can borrow to a multiple of total profits and equity investment. To increase their borrowings further, MFIs need to raise their Equity through outside investors. The first and the most crucial step to receive equity investment are getting converted to for-profit NBFC.
- By securitization of loans and portfolio buyout they are similar in many ways like first loss default guarantee clause, limit to the amount of loans that can be sold off etc. The major difference between the two is that securitizations require a rating from a credit rating agency and that it can be re-sold, which makes securitized loans attract more potential buyers. Also unlike portfolio buyout, there can be multiple buyers and sellers for each transaction in case of securitization of loans as compared to single buyer and single seller in portfolio buyout. Through securitization, MFIs can tap new sources of investments because fund of certain types like mutual funds, which are barred from directly investing in MFIs, can invest through securitized loans.
- A common practice for charging interest should be followed by all MFIs so that it makes the sector more competitive and the beneficiary gets the freedom to compare different financial products before buying.
- Change our mindset and think microfinance as an huge business opportunity with high social impact
- Learn from the past experience and from neighboring countries.
- A regulatory environment that protects interest of stakeholders as well as promotes growth

CONCLUSION

Micro finance has emerged as a catalyst of rural development, especially in the overpopulated country like India. Microfinance has proven to be an effective and powerful tool for rural development and poverty reduction. Like many other development tools, it has sufficiently penetrated the poorer strata of society. The impact of micro finance programme especially through Self-Help Groups (SHGs) has been effective in making positive social change to all members, irrespective of the direct borrowers of the micro credit. Micro-finance is one of the ways of building the capacities of the poor and developing them to self-employment activities by providing financial services like credit, savings and insurance. To provide micro-finance and other support services, MFIs should be able to sustain themselves for a long period..During the last decade, the sector has witnessed a sharp growth with the emergence of a number of Micro Finance Institutions (MFIs) providing financial and non-financial supports to the poor in an effort to lift them out of poverty. But industry has barely scratched the surface of the market potential and still transparency in Interest rates is required. There are over 1,000 Indian MFIs. These institutions assume the responsibility of making available much needed micro credit to the poor section of the society for generating the self employment The MFI channel of credit delivery, coupled with the national level programme of SHG-Bank Linkage, today, reaches out to millions of poor across the country.

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Site Selection for Installation of Cellular Towers Using Fuzzy Logic Technique

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***Abstract*--- When installing a new tower the first step is to conduct a site survey to select the location for the installation of cellular towers. Site selection for infrastructures such as towers is extremely complex so there is a strategic need to take into account several criteria, which are often conflicting, incommensurate (measured on different scales) and subject to uncertainty. This paper describes an effort to design and implement a fuzzy logic based approach to select a suitable site for the installation of cellular towers. In this system seven input parameters which are distance from other tower, ground space for equipment, site location, subscriber density, distance from main transmission line, power supply, safe distance and one output parameter which is used.**

Keywords- Fuzzy Logic, Cellular Towers, Site selection

I. INTRODUCTION

A cell site is a cellular telephone site where antennas and electronic communications equipment are placed, usually on a radio mast, tower or other high place, to create a cell or adjacent cells in a cellular network.Some cities require that cell sites be inconspicuous, for example blended with the surrounding area. Preserved treescapes can often hide cell towers inside an artificial tree or preserved tree. These installations are generally referred to as concealed cell sites or stealth cell sites.

The working range of a cell site - the range within which mobile devices can connect to it reliably - is not a fixed figure. It will depend on a number of factors, including[1]

- Height of antenna over surrounding terrain (Line-of-sight propagation).
- The frequency of signal in use.
- Timing limitations in some technologies.
- The transmitter's rated power.
- The directional characteristics of the site antenna array.
- Reflection and absorption of radio energy by buildings or vegetation.
- It may also be limited by local geographical or regulatory factors and weather conditions.

It should be ensured that there is enough overlap for "handover" to/from other sites and the overlap area should not be too large, to minimize interference problems with other sites.

Another most important area of concern is the electromagnetic radiation emitted by this fixed infrastructure,it is emitted continuously and is more powerful at close quarters.

In order to protect the population living around base stations and users of mobile handsets, governments and regulatory bodies adopt safety standards, which translate to limits on exposure levels below a certain value. There are many proposed national and international standards, but that of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) is the most respected one, and has been adopted so far by more than 80 countries. For radio stations, ICNIRP proposes two safety levels: one for occupational exposure, another one for the general population. Currently there are efforts underway to harmonize the different standards in existence.

Radio base licensing procedures have been established in the majority of urban spaces regulated either at municipal/county, provincial/state or national level. Mobile telephone service providers are, in many regions, required to obtain construction licenses, provide certification of antenna emission levels and assure compliance to ICNIRP standards and/or to other environmental legislation.

Many governmental bodies also require that competing telecommunication companies try to achieve sharing of towers so as to decrease environmental and cosmetic impact. This issue is an influential factor of rejection of installation of new antennas and towers in communities.

The safety standards in the U.S. are set by the Federal Communications Commission (FCC). The FCC has based its standards primarily on those standards established by the Institute of Electrical and Electronics Engineers (IEEE), specifically Subcommittee 4 of the "International Committee on Electromagnetic Safety".

On 1 September 2012, India set electromagnetic frequency exposure limit for all mobile phone base stations to

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one tenth of the existing ICNIRP exposure level. Telecom Enforcement Resource & Monitoring (TERM) cells will audit the self-certification provided by the mobile network operators.

In the USA, a small number of personal injury lawsuits have been filed by individuals against cellphone manufacturers, such as Motorola, NEC, Siemens and Nokia, on the basis of allegations of causation of brain cancer and death.

A case was also filed against the mobile towers in residential areas, schools and hospitals in India in 2012. In March 2013, based on the WHO notification dated May 31, 2011wherein the mobile tower radiations have been classified as possibly carcinogenic and the research conducted by the scientists of IIT Kharagpur, India a writ has been filed by Advocate Vikas Nagwan for the suspected death of one Late. Hemant Sharma for removal of the mobile towers from residential areas.[3]

There are certain rules and regulations set up by telecom regulatory authority of India for erection of towers[2]:

1) Before installation of tower, the licensee company obtains siting clearance from DoT to ensure that no interference with other wireless users, no aviation hazards and no obstruction to any other existing microwave links.

2) Telecom service providers have to obtain the necessary permission from the concerned local authorities/ municipal corporation before installation of tower.

3) Ensure that no nearby buildings right in front of the antenna with height comparable to the lowest antenna on tower at a distance threshold as specified .

Through this paper using fuzzy logic system we are making decision support system to choose suitable location for cell site.

II. INTRODUCTION TO FUZZY LOGIC

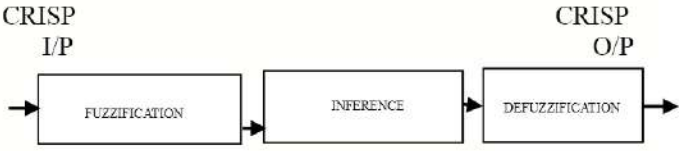
FUZZY logic was proposed in 1965. In this context, fuzzy logic is a problem-solving control system methodology that lends itself to implementation in systems ranging from simple, small, embedded micro-controllers to large, networked, multichannel PC or workstation-based data acquisition and control systems. It can be implemented in hardware, software, or a combination of both. Fuzzy logic provides a simple way to arrive at a definite conclusion based upon vague, ambiguous, imprecise, noisy, or missing input information. FUZZY logic's approach to control problems mimics how a person would make decisions, only much faster.

Fuzzy logic incorporates a simple, rule-based IF X AND Y THEN Z approach to a solving control problem rather than attempting to model a system mathematically. The FUZZY logic model is empirically-based, relying on an operator's experience rather than their technical understanding of the system.Fuzzy logic requires some numerical parameters in order to operate such as what is considered significant error and significant rate-of-change-of-error, but exact values of these numbers are usually not critical unless very responsive performance is required in which case empirical tuning would determine them[4].

III. FUZZY INFERENCE SYSTEM:

Fuzzy inference system is a popular computing framework based upon fuzzy set theory,fuzzy if-then rules and fuzzy reasoning.it has found successful applications in wide variety of fields such as automatic control,data classification and decision analysis,expert systems,time series prediction,robotics and pattern recognition.the basic structure of fuzzy inference system consists of three conceptual components:a rule base which contains selection of fuzzy rules,a data base which defines membership functions used in fuzzy rules and a reasoning mechanism which performs inference procedure upon the rules and given facts to derive a reasonable output or conclusion.

A basic fuzzy inference system can use either fuzzy inputs or crisp inputs but the outputs it produces are almost always fuzzy sets,sometimes it is necessary to have crisp output especially in the situation where fuzzy inference system is used as a controller.Thus we need a method of fuzzification to extract a crisp value that best represents a fuzzy set.with crisp inputs and outputs,a fuzzy inference system implements a non linear mapping from its input space to output space.this mapping is accomplished by fuzzy if then rules,each of which describes the local behaviour of mapping [4].



IV. FUZZIFICATION:

Fuzzification is a means of mapping measured input values fuzzy membership functions. A membership function is a curve that defines how each point in the input space is mapped to a membership value between 0 and 1. There are different shapes of membership functions; triangular, trapezoidal, piecewise, Gaussian, bell-shaped, etc.[6][5]

V. DEFUZZIFICATION:

Defuzzification is a conversion of internal fuzzy output variables into crisp values that can actually be used. It is done after the evaluation of inputs and applies them to the rule base. The centroid calculation method is commonly used for defuzzification **The defuzzification of the data into a crisp output is accomplished by combining the results of the inference process and then computing the "fuzzy centroid" of the area**. The weighted strengths of each output member function are multiplied by their respective output membership function center points and summed. Finally, this area is divided by the sum of the weighted member function strengths

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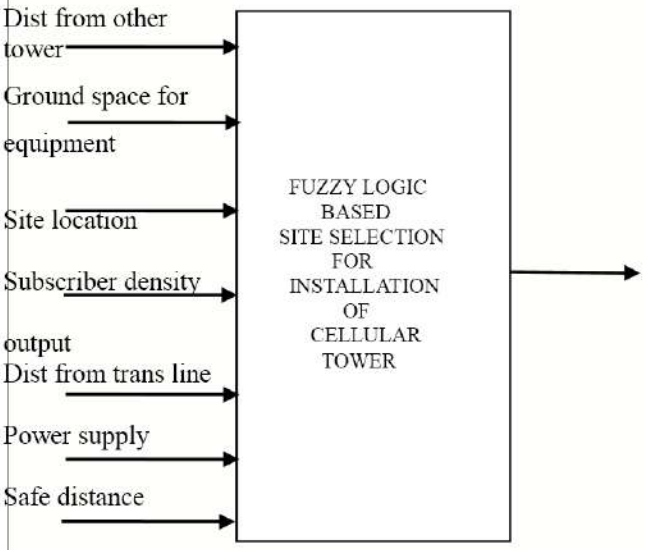
and the result is taken as the crisp output. One feature to note is that since the zero center is at zero, any zero strength will automatically compute to zero. If the center of the zero function happened to be offset from zero (which is likely in a real system where heating and cooling effects are not perfectly equal), then this factor would have an influence [5][6].

VI. SIMULATION ARCHITECTURE

The simulation model is built with the Fuzzy Logic Toolbox of Math Works. Fuzzification comprises the process of transforming crisp value into grade of membership for linguistic terms of fuzzy sets. The membership function is used to associate a grade to each linguistic term. The first step in using fuzzy logic within this model is to identify the parameters that will be fuzzified and to determine their respective range of values. The final result of this interaction is the value for each performance parameter.



A. INPUT AND OUTPUT PARAMETERS:

The input and output parameters are created in FIS editor as shown in the figure 1. We have considered seven input parameters and one output applied to the FIS[7].

Input parameters are:

1. distance from other tower
2. Ground space for equipment
3. Site location
4. Subscriber density
5. Distance from main transmission line
6. Availability of power
7. Safe distance

There is one output parameter as shown in figure 1.

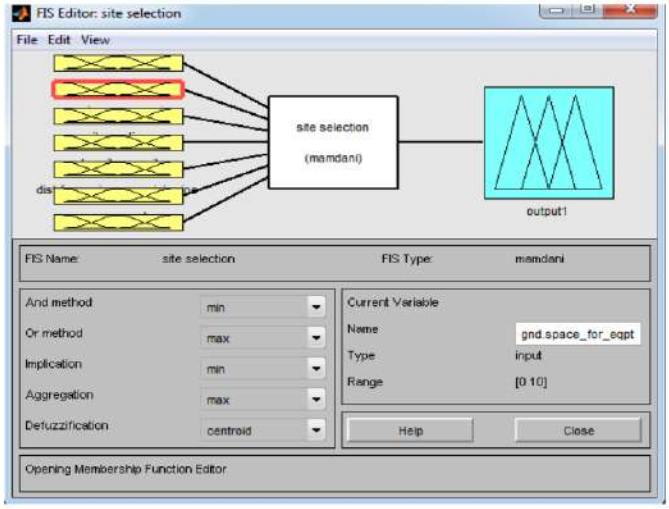


Fig. :1 Input and output parameters

B. MEMBERSHIP FUNCTIONS:

The membership function is used to associate a grade to each linguistic term. The membership function editor is used to define the properties of the membership function for the systems variables. The membership function is a graphical representation of the magnitude of participation of each input. It associates a weighting with each of the inputs that are processed, define functional overlap between inputs, and ultimately determines an output response. The rules use the input membership values as weighting factors to determine their influence on the fuzzy output sets of the final output conclusion. Once the functions are inferred, scaled, and combined, they are defuzzified into a crisp output which drives the system. There are different membership functions associated with each input and output response. Some features to note are:

SHAPE- triangular is common, but bell, trapezoidal, haversine and, exponential have been used. More complex functions are possible but require greater computing overhead to implement. HEIGHT or magnitude (usually normalized to 1) WIDTH (of the base of function), SHOULDERING (locks height at maximum if an outer function. Shouldered functions evaluate as 1.0 past their center) CENTER points (center of the member function shape) OVERLAP (N&Z, Z&P, typically about 50% of width but can be less).

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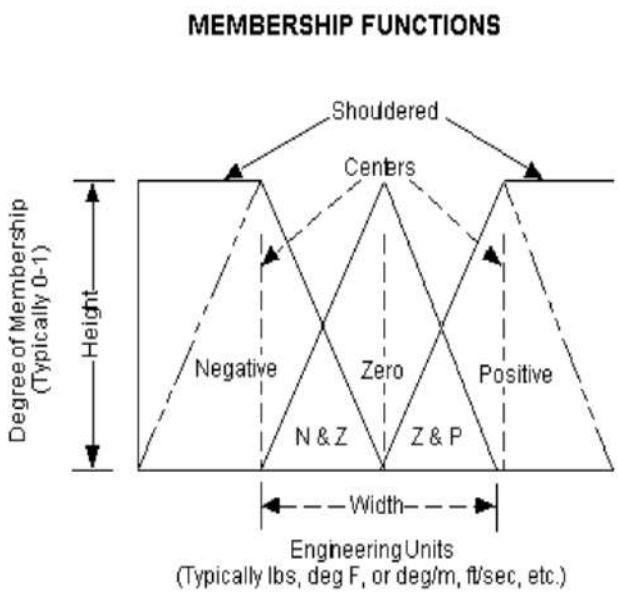

Fig 2- The features of a membership function

Figure 2 illustrates the features of the triangular membership function which is used in this example because of its mathematical simplicity. Other shapes can be used but the triangular shape lends itself to this illustration.

The degree of membership (DOM) is determined by plugging the selected input parameter (error or error-dot) into the horizontal axis and projecting vertically to the upper boundary of the membership function(s) [5].

Membership functions for given input parameters:

Input parameters	Mf1	Mf2	Mf3
distance from other tower	Less than 1.5kms	More than 1.5 kms	
Ground space for equipment	Less than 2000 square foots	More than 2000 square foots	
site location	residential	commercial	
subscriber density	low	med	High
Distance from main transmission line	low	med	High
power supply	low	med	High
safe distance	low	med	High

Membership functions for given output parameter:

Output parameter	Mf1	Mf2
Output1	no	yes

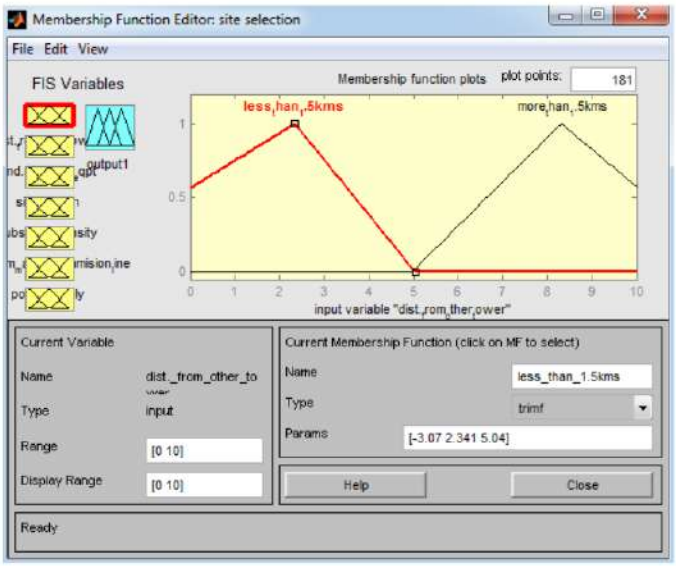

Fig. 3: Membership function plot for input parameter i.e. distance from other tower

C. RULE BASE:

A fuzzy rule base is a collection of knowledge in the If-Then format from experts. It describes the relationship between fuzzy input parameters and output. It is used to display how an output is dependent on any one or two of the inputs. The rule editor enables the user to define and edit the rules that describe the behavior of the system. As per the input and output parameters fuzzified, rule base is generated by applying reasoning to evaluate the performance of a teacher. There are 195 number of rules generated. Fig 4shows rule viewer and figures 5 and 6 shows surface viewer for our system[6].

Assessment:

1. If ground space for equipment is low but all other parameters are high then output is no because a tower cannot be set without sufficient space.
2. If all parameters are high then output is yes.
3. If all parameters are high but distance from main transmission line and safe distance is low then output is no because of interference.
4. If site location is residential and power supply is low then output will be no because there will be disturbance in

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residential areas as generators will be used for power generation.

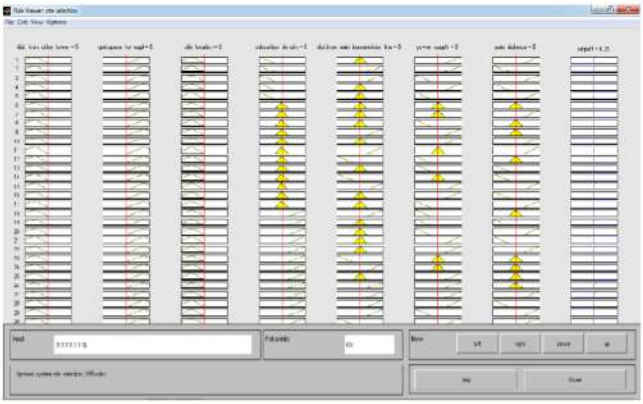

Fig. 4: Rule viewer

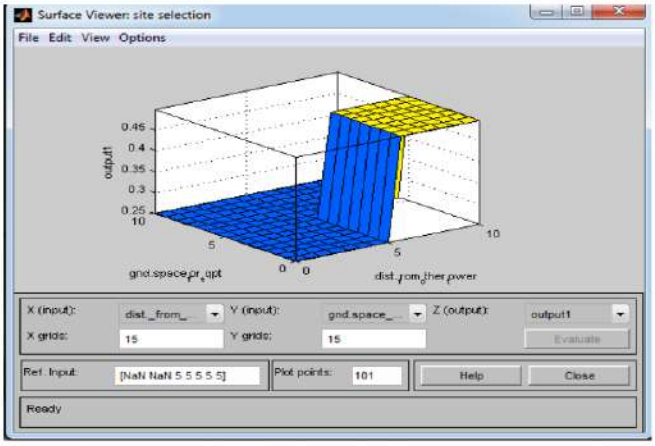

Fig. 5: Surface viewer (distance from other tower vs. ground space for equipment.)

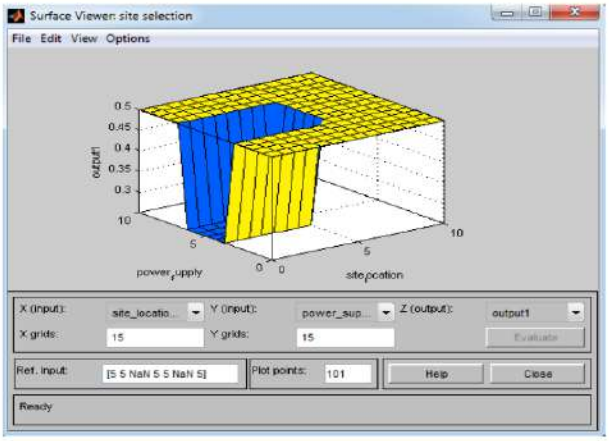

Fig. 6: Surface viewer (power supply vs. site location)

CONCLUSION:

The process of setting of cellular towers is very important procedure as according to TRAI(telecom regulatory authority of India) there are certain rules and regulations which are to be followed by telecom companies before setting of towers. Thus with the help of this model we have designed a decision support system for selecting an accurate location for building an infrastructure to set antennas for cellular communication.The membership functions and fuzzy rule bases were developed based on logical reasoning.The results obtained reflect that the proposed system can be used to select the suitable location for setting tower. This research can be extended by considering remaining categories for site selection after reaching in to more surveys for further improvements.

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Dispersion compensation using Fiber Bragg Grating

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***Abstract*: In the modern day industries, Fiber optic transmission and communication are technologies that are constantly growing and support more challenges. Three properties of optical fibers are dispersion, absorption and scattering which cause attenuation and also decreased in transmitted power. To combat these losses and improve the reliability of fibers introduced many advanced technologies. Dispersion needs to be compensated to get the best performance of communication system. One of the techniques to compensate dispersion is Fibre Bragg gratings. Using advance fabrication techniques and production facilities modulation in gratings and refractive index can be made along the length of the fiber to produce Chirped FBG. Three schemes (pre-compensation, post-compensation, mix-compensation) are discussed.**

***Keywords:* Dispersion, Fiber Bragg grating (FBG) Dispersion compensation fiber (DCF), Chromatic dispersion.**

I. INTRODUCTION

When optical signals are transmitted over optical links, different wavelength components of the optical signals will generally experience different propagation times due to the fact that the transport medium has different effective refractive indices for different wavelengths. In recent years, with the rapid growth internet business needs, people urgently need more capacity and network systems. So the demand for transmission capacity and bandwidth are becoming more and more challenging to the carriers and service suppliers. Under the situation, with its huge bandwidth and excellent transmission performance, optical fiber is becoming the most favorable delivering media and laying more and more important role in information industry [1, 2].

Fiber optic communication is a method of transmitting information from one place to another by sending light through an optical fiber. The light forms an electromagnetic carrier wave that is modulated to carry information. The process of communicating using fiber optics involves the following basic steps: Creating the optical signal using a transmitter, relaying the signal along the fiber, ensuring that the signal does not become too distorted or weak, and receiving the optical signal and converting it into an electrical signal [3,4] .When different wavelengths of light pulses are launched into an optical fiber, these pulses will traveled at different speeds due to the variation of refractive index with wavelength. These light waves tend to get spread out in time after traveling some distance in the optical fiber and this is continued throughout the length of the fiber. This phenomenon of boarding the pulse width is called dispersion [5].

Fig 1: Input pulses spread out as running along the fiber

There are generally two sources of dispersion: material dispersion and waveguide dispersion. Material dispersion comes from a frequency-dependent response of a material to waves. For example, material dispersion leads to undesired chromatic aberration in a lens or the separation of colors in a prism. Waveguide dispersion occurs when the speed of a wave in a waveguide (such as an optical fiber) depends on its frequency for geometric reasons, independent of any frequency dependence of the materials from which it is constructed [6].

II. DISPERSION COMPENSATION TECHNOLOGY

To improve overall system performance and reduced as much as possible the transmission performance influenced by the dispersion, several dispersion compensation technologies were discussed. Amongst the various techniques discussed in the literature [7] the ones that appear to hold immediate promise for dispersion compensation and management could be broadly classified as: dispersion compensating fiber (DCF), chirped fiber Bragg gratings (FBG), and high-order mode (HOM) fiber . The idea of using dispersion compensation fiber for dispersion compensation was proposed as early as in 1980 but, until after the invention of optical amplifiers, DCF began to be widespread attention and study. DCF has become a most useful method of dispersion compensation and has been extensively studied. There is positive second-order and third-order dispersion value in SMF while the DCF dispersion value is negative. So by inserting a DCF, the average dispersion is close to zero. As the local dispersion of higher transmission link, FWM and XPM were ignored; only to consider the role of SPM and dispersion.

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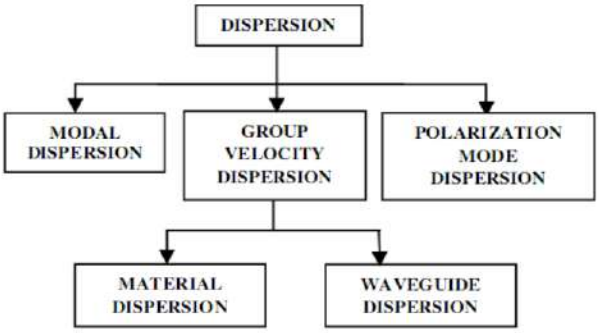

Fig 2: Classification **of** dispersion

III. DISPERSION COMPENSATING FIBER

Dispersion compensating fiber is an easy and efficient way to upgrade installed links made of single mode fiber. Dispersion compensating fibers have negative dispersion of -70 to -90 ps/nm.km and can be used to compensate the positive dispersion of transmission fiber. Performance degradation in optical WDM system is because of group velocity dispersion, Kerr nonlinearity, and accumulation of amplified spontaneous emission noise due to periodic amplification. Because of the nonlinear nature of propagation, system performance depends on the power levels at the input of different types of fibers, on the position of the DCF and on the amount of dispersion.

IV. DISPERSION

A. *Chromatic dispersion:*

Chromatic dispersion occurs in single mode fiber. It occurs due to the inherent property of silica fiber i.e refractive index varies with wavelength. Therefore, different wavelength channels will travel at slightly different speeds within the fiber. This results in a spreading of the transmission pulse as it travels through the fiber. Hence chromatic dispersion can be referred as a phenomenon which is created due to the dependence of group index to wavelength. Spreading of pulses leads to missing of some data which needs to be minimized so that original data can be attained. The original data can be attained by various dispersion compensation methods.

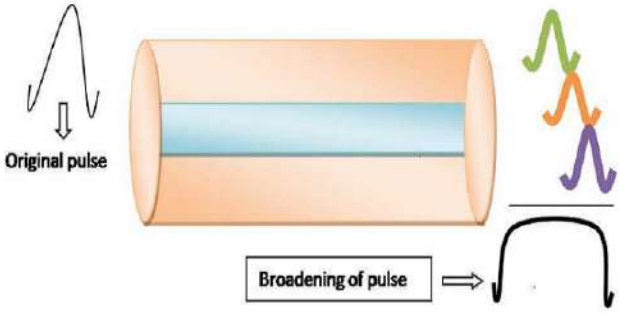

Fig 3: Broadening of pulse i.e. chromatic dispersion

B. *Compensation method to compensate dispersion:*

The term dispersion compensation refers to the process of designing the fiber and compensating element in the transmission path to keep the total dispersion to a small number. In generalized form dispersion compensation can be referred as the control of overall chromatic dispersion of the system. There are basically two types of dispersion compensation method namely dispersion compensation fiber (DCF) and fiber Bragg gratings (FBG). DCF needs very high negative dispersion coefficient to eliminate positive dispersion coefficient. Hence the overall cost of the system is increased and also the non-linear effect is increased. It also has high insertion loss. On the contrary FBG is a reflective device composed of an optical fiber that contains a modulation of its core refractive index over a certain period length. Using FBG is a promising approach because they are passive optical component fiber compatible, having low insertion losses and costs [8].

Compensation is done by three different methods depending on the position of the DCF:

(i) Pre-Compensation
(ii) Post Compensation
(iii) Mix Compensation

Pre-Compensation: In this Compensation scheme, the dispersion compensating fiber of negative dispersion is placed before the standard fiber to compensate positive dispersion of the standard fiber.

Post-Compensation: In this Compensation scheme, the dispersion compensating fiber of negative dispersion is placed after the standard fiber to compensate positive dispersion of the standard fiber.

C. *Fiber Bragg gratings:*

Hill in 1978 demonstrated the first in-fiber Bragg grating. Fiber Bragg gratings are created by fabricating or scribing the periodic variation of refractive into the core of a special type of optical fiber using intense ultraviolet(UV) source such as UV laser. FBG has a very narrow operating window. FBG is a reflective device composed of an optical fiber that contains a modulation of its core refractive index over a certain length. The grating reflects light propagation through the fiber when its wavelength corresponds to the modulation periodicity. The reflected wavelength (λ_b) is called the Bragg wavelength, and defined by the relationship:

$$\lambda_b = 2n\Lambda \qquad \text{“Eq. 1”}$$

Where n is the effective refractive index of the grating in the fiber core and Λ is the grating period.

Using fiber Bragg gratings for dispersion compensation is a promising approach because they are passive optical component fiber compatible, having low insertion losses and costs. If some modifications are made to gratings of fiber Bragg gratings a better performance can be achieved. Gratings that have a non-uniform period along their length are known as Chirped FBG. Principle operation of FBG is shown in figure 5.

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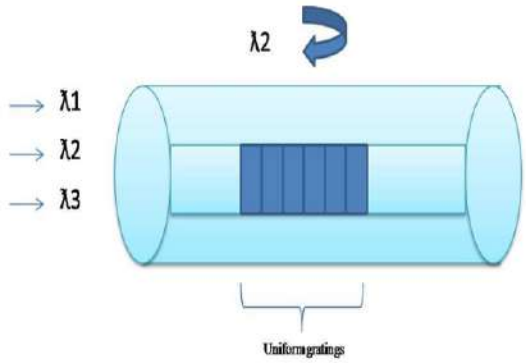

Fig 5: Principle operation of FBG

D. Chirped Fiber Bragg gratings:

The method of chirped FBG to compensate dispersion was introduced by Quellete and later was demonstrated by Williams et.al. Chirped FBG can be defined as an in-filter broadband reflective optical fiber. Using advanced fabrication technique and production facilities, grating period and refractive index modulation depth along the length of the FBG can be precisely controlled to produce Chirped FBG.

Working of chirped Fiber Bragg gratings to compensate dispersion

A dispersion light pulse with a longer wavelength and the shorter wavelength is incident on the chirped fiber Bragg grating [9]. The longer wavelength light is reflected near the front of grating whereas the shorter wavelength light is reflected back. Therefore the shorter wavelength delayed related to longer wavelengths. The chirped grating can be designed so that the entire wavelength in the light pulse comes out at the same time and the dispersion in the optical pulse is equalized or nullified. Chirped FBG not only helps in minimizing the cost of the transmission system but also has low loss insertion.

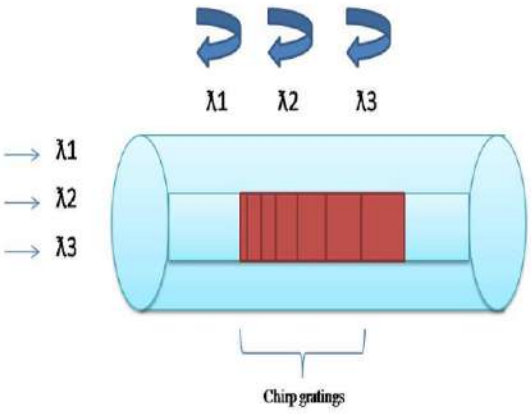

Fig 6: A chirped FBG to compensate dispersion by reflecting different Wavelength's at different location along the grating

CONCLUSION

In this paper, it is concluded that in optical communication system, dispersion can be compensated by using fiber gating technology. Using advance fabrication techniques and production facilities modulation in gratings and refractive index can be made along the length of the fiber to produce Chirped FBG. Chromatic Dispersion in optical fiber needs to be compensated to improve the performance of the link design and to reduce the cost of the fiber. It is found that chromatic dispersion can be compensated by adding chirp FBG in the transmission system. Not only it helps in reducing the losses but also minimizes the cost of the system. It can also be seen that when chirp FBG is added to the system total output power also decreases.

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A Review on Big Data

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***Abstract*—Big data is the term for a collection of data sets so large and complex that it becomes difficult to process using on-hand database management tools or traditional data processing applications. The challenges include capture, storage, search, sharing, transfer, analysis and visualization. The trend to larger data sets is due to the additional information derivable from analysis of a single large set of related data, as compared to separate smaller sets with the same total amount of data, allowing correlations to be found to "spot business trends, determine quality of research, prevent diseases, link legal citations, combat crime, and determine real-time roadway traffic conditions. In this paper we review big data's content, strategy, IBM Platform, architecture, advantages and challenges and discuss it.**

***Index Terms*—Big data Architecture, Big data Obstacles, Big data Use cases, IBM Big Data Platform, IBM Big Data Strategy**

I. INTRODUCTION

Big data is a collection of data from traditional and digital sources inside and outside your company that represents a source for ongoing discovery and analysis.
While defining big data , it is important to understand the mix of unstructured and multi-structured data that comprises the volume of information.

Unstructured data comes from information that is not organized or easily interpreted by traditional databases or data models, and typically, it's text-heavy. Metadata, Twitter tweets, and other social media posts are good examples of unstructured data.

Multi-structured data refers to a variety of data formats and types and can be derived from interactions between people and machines, such as web applications or social networks. A great example is web log data, which includes a combination of text and visual images along with structured data like form or transactional information. As digital disruption transforms communication and interaction channels—and as marketers enhance the customer experience across devices, web properties, face-to-face interactions and social platforms—multi-structured data will continue to evolve[8]. Big data is not restricted to the data that is captured by the forms and logs on your website. It also incorporates relevant user activity on their websites as well as on third party websites, such as social media platforms. Some examples of such data could be: likes, comments, tweets, and uploaded images on Facebook, Twitter, Google+, Pinterest, StumbleUpon,YouTube, Quora, LinkedIn, and other platforms that are relevant to your brand, websites, and offerings[11]. Big data is also defined for massive data sets having large, more varied and complex structure with the difficulties of storing, analyzing and visualizing for further processes or results. The process of research into massive amounts of data to reveal hidden patterns and secret correlations named as big data analytics. These useful informations for companies or organizations with the help of gaining richer and deeper insights and getting an advantage over the competition. For this reason, big data implementations need to be analyzed and executed as accurately as possible.[2]

The massive amounts of data collected over time that are difficult to analyze and handle using common database management tools. Big data may include business transactions, photos, surveillance videos and activity logs as well as unstructured text posted on the Web, such as blogs and social media.[3]

Big Data is sized in peta-, exa-, and soon perhaps, zetta-bytes. We don't define Big Data in terms of being larger than a certain number of terabytes (thousands of gigabytes). We assume that as technology advances over time the size of datasets that qualify as big data will also increase. And, it's not just about volume, the approach to analysis contends with data content and structure that cannot be anticipated or predicted. These analytics and the science behind them filter low value or low-density data to reveal high value or high-density data. As a result, new and often proprietary analytical techniques are required. Big Data has a broad array of interesting architecture challenges.[4]

1.1 IBM BIG DATA PLATFORM

a) It Includes traditional Big Data technologies (ie Netezza) that have been used to address the more traditional Big Data problems
b) NoSQL-like technologies that include velocity and variety capabilities.[5]

Netezza is architected for high performance on Business Intelligence (OLAP) workloads

- Designed to processes data it at maximum disk transfer rates
- Queries compiled into C++ and FPGAs to minimize overhead [6]

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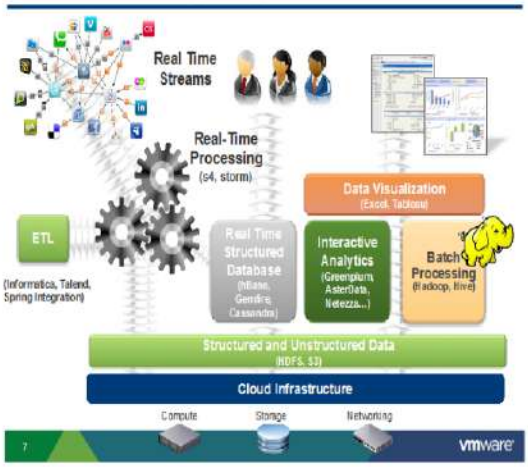

Fig. 1. A view of Big data

1.2 The four Big Data "V"s

Volume : Volume refers to the fact that there is too much data, driven primarily by digital channels, to manage with traditional Tools [13]. Data Warehouses: from terabytes to exabytes (the amount of data)

Velocity : Velocity refers to the rate at which data is being produced, which is too high for the capability of traditional tools –whether it is in batches, near-real-time, or real-time. Machine logs on active networks and real-time user events from popular mobile apps are high-velocity data generators [13].Complex real-time transactions (the speed of information generated and flowing into the enterprise)

Variety : Variety refers to the fact that data may be structured, semi-structured or unstructured, or of a format/structure that does not lend itself to traditional modeling and analysis [13].Diverse data sources/integration of data, structured or not (the kind of data available)

Veracity: elevance, use for decision making, Meaningfulness.[5]

1.3 Big Data Obstacles

Challenges that inhibit big data adoption differ as organizations move through each of the big data adoption stages. But our findings show one consistent challenge – regardless of stage – and that is the ability to articulate a compelling business case. At every stage, big data efforts come under fiscal scrutiny. The current global economic landscape has left businesses with little appetite for new technology investments without measurable benefits – a requirement that, of course, is not exclusive to big data initiatives. After organizations successfully implement POCs, the biggest challenge becomes finding the skills to operationalize big data, including: technical, analytical and governance skills.

1.4 IBM Big Data Strategy:

Move the Analytics Closer to the Data. New analytic applications drive the requirements for a big data platform

- Integrate and manage the full variety, velocity and volume of data
- Apply advanced analytics to information in its native form
- Visualize all available data for ad-hoc analysis
- Development environment for building new analytic applications
- Workload optimization and scheduling
- Security and Governance

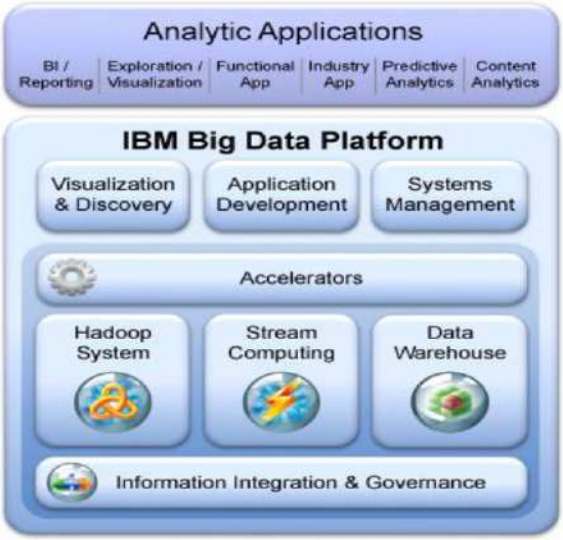

Fig. 1.1 IBM Big Data Platform

a) Hadoop System

Augments open source Hadoop with enterprise capabilities
–Enterprise-class storage
–Security
–Performance Optimization
–Enterprise integration
–Development tooling
–Analytic Accelerators
–Application and industry accelerators
–Visualization

b) Stream Computing

- Built to analyze data in motion
  –Multiple concurrent input streams
  –Massive scalability
- Process and analyze a variety of data
  –Structured, unstructured content, video, audio
  –Advanced analytic operators

c) Data Warehousing

- Workload optimized systems
  –Deep analytics appliance
  –Configurable operational analytics appliance
  –Data warehousing software
- Capabilities
  –Massive parallel processing engine
  –High performance OLAP

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–Mixed operational and analytic workloads

d) Information Integration and Governance

- Integrate any type of data to the big data platform
  - –Structured
  - –Unstructured
  - –Streaming
- Governance and trust for big data
  - –Secure sensitive data
  - –Lineage and metadata of new big data sources
  - –Lifecycle management to control data growth
  - –Master data to establish single version of the truth

e) User Interfaces

- Business Users
- Visualization of a large volume and wide variety of data
- Developers
- Similarity in tooling and languages
- Mature open source tools with enterprise capabilities
- Integration among environments
- Administrators
- Consoles to aid in systems management

f) Accelerators

- Analytic accelerators
  - –Analytics, operators, rule sets
- Industry and Horizontal Application Accelerators
  - –Analytics
  - –Models
  - –Visualization / user interfaces
  - –Adapters

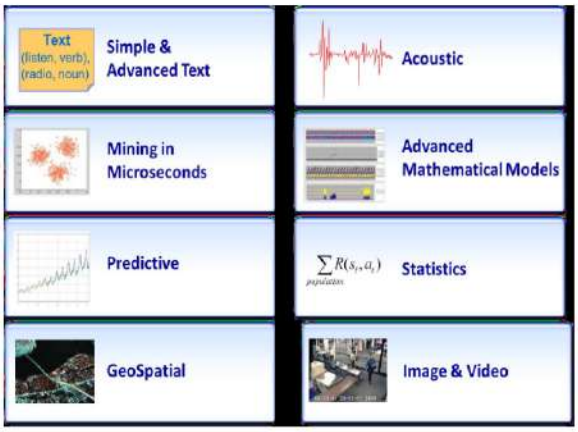

Fig.1.2 Analytic Accelerators Designed for Variety

Accelerators Improve Time to Value

Telecommunications : CDR streaming analytics Deep Network Analytics

Finance : Streaming options trading Insurance and banking DW models

Public transportation : Real-time monitoring and routing optimization

Retail Customer Intelligence : Customer Behavior and Lifetime Value Analysis

Social Media Analytics : Sentiment Analytics, Intent to purchase

Data mining : Streaming statistical analysis

g) Analytic Applications

Big Data Platform is designed for analytic application development and integration.

BI/Reporting – Cognos BI, Attivio

Predictive Analytics – SPSS, G2, SAS

Exploration/Visualization – BigSheets, Datameer

Instrumentation Analytics – Brocade, IBM GBS

Content Analytics – IBM Content Analytics

Functional Applications – Algorithmics, Cognos Consumer Insights, Clickfox, i2, IBM GBS

Industry Applications – TerraEchos, Cisco, IBM GBS[6]

1.5 Big Data Architecture

The building blocks of the *Big Data* architecture are :

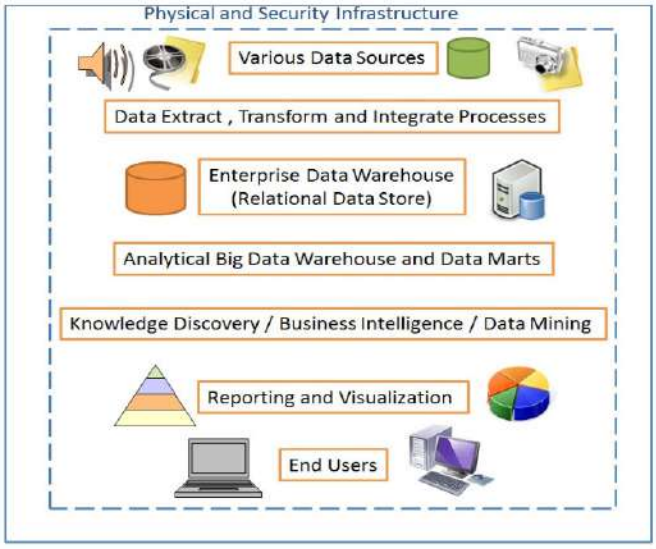

Fig.1.3 Building Blocks of Big Data Architecture

In Big Data various different data sources are part of the architecture hence extract, transform and integration are one of the most essential layers of the architecture. Most of the data is stored in relational as well as non-relational data marts and data warehousing solutions. As per the business need various data are processed as well converted to proper reports and visualizations for end users. Just like software the hardware is almost the most important part of the Big Data Architecture. In the big data architecture hardware infrastructure is extremely important and failure over instances as well as redundant physical infrastructure is usually implemented[9].

A. NoSQL in Data Management

NoSQL is a very famous buzz word and it really means Not Relational SQL or Not Only SQL. This is because in Big Data Architecture the data is in any format. It can be unstructured, relational or in any other format or from any

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other data source. To bring all the data together relational technology is not enough, hence new tools, architecture and other algorithms are invented which takes care of all the kind of data. This is collectively called NoSQL[9].

In Big Data architecture, there are various sources involved, each of which is comes in at different intervals, in different formats, and in different volumes[10].

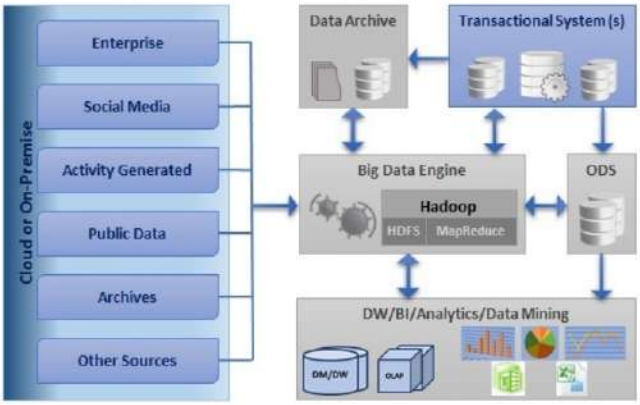

Fig.1.3 A high level architecture of an enterprise data management system with a Big Data engine.

Various components of this modern architecture.

a) Source Systems

There are various different sources of Big Data including Enterprise Data, Social Media Data, Activity Generated Data, Public Data, Data Archives, Archived Files, and other Structured or Unstructured sources.

b) Transactional Systems

In an enterprise, there are usually one or more Transactional/OLTP systems which act as the backend databases for the enterprise's mission critical applications. These constitute the transactional systems represented above.

c) Data Archive

Data Archive is collection of data which includes the data archived from the transactional systems in compliance with an organization's data retention and data governance policies, and aggregated data (which is less likely to be needed in the near future) from a Big Data engine etc.

d) ODS

Operational Data Store is a consolidated set of data from various transactional systems. This acts as a staging data hub and can be used by a Big Data Engine as well as for feeding the data into Data Warehouse, Business Intelligence, and Analytical systems.

e) Big Data Engine

This is the heart of modern (Next-Generation / Big Data) data processing and management system architecture. This engine capable of processing large volumes of data ranging from a few Megabytes to hundreds of Terabytes or even Petabytes of data of different varieties, structured or unstructured, coming in at different speeds and/or intervals. This engine consists primarily of a Hadoop framework, which allows distributed processing of large heterogeneous data sets across clusters of computers. This framework consists of two main components, namely HDFS and MapReduce. We will take a closer look at this framework and its components in the next and subsequent tips.

1.6 Big Data Use Cases

Big Data technologies can solve the business problems in a wide range of industries. Below are a few use cases.

- **Banking and Financial Services** : Fraud Detection to detect the possible fraud or suspicious transactions in Accounts, Credit Cards, Debit Cards, and Insurance etc.
- **Retail** : Targeting customers with different discounts, coupons, and promotions etc. based on demographic data like gender, age group, location, occupation, dietary habits, buying patterns, and other information which can be useful to differentiate/categorize the customers.
- **Marketing**
  - Specifically outbound marketing can make use of customer demographic information like gender, age group, location, occupation, and dietary habits, customer interests/preferences usually expressed in the form of comments/feedback and on social media networks.
  - Customer's communication preferences can be identified from various sources like polls, reviews, comments/feedback, and social media etc. and can be used to target customers via different channels like SMS, Email, Online Stores, Mobile Applications, and Retail Stores etc.
- **Sentiment Analysis**
  - Organizations use the data from social media sites like Facebook, Twitter etc. to understand what customers are saying about the company, its products, and services. This type of analysis is also performed to understand which companies, brands, services, or technologies people are talking about.
- **Customer Service**
  - IT Services and BPO companies analyze the call records/logs to gain insights into customer complaints and feedback, call center executive response/ability to resolve the ticket, and to improve the overall quality of service.
  - Call center data from telecommunications industries can be used to analyze the call records/logs and optimize the price, and calling, messaging, and data plans etc.

Apart from these, Big Data technologies/solutions can solve the business problems in other industries like Healthcare, Automobile, Aeronautical, Gaming, and Manufacturing etc.

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1.7 Big Data Adoption

Some of the common reasons for the increasing adoption of Big Data technologies is due to various factors including the following:

- **Cost Factors**
  - Availability of Commodity Hardware
  - Availability of Open Source Operating Systems
  - Availability of Cheaper Storage
  - Availability of Open Source Tools/Software
- **Business Factors**
  - There is lot of data being generated outside the enterprise and organizations are compelled to consume that data to stay ahead of the competition. Often organizations are interested in a subset of this large volume of data.
  - The volume of structured and unstructured data being generated in the enterprise is very large and cannot be effectively handled using the traditional data management and processing tools[10].

II. Related Work

A. Ecommerce Businesses Use Big Data

- **Extracting Superior Information From Data**
  But the fact is that there is so much data out there that present methods of analysis seem inadequate to derive valuable and actionable information from them. But if an ecommerce professional has a strong conceptual understanding of big data then it is possible to use analytics to unearth gems of information where none were obvious.
- **Making Pricing, Promotions, Placement, and Other Important Decisions**
  Instead of pulling critical numbers from thin air, wouldn't it be great to be able to base important management decisions on actual information? This too is something that big data can help with.
- **Overcoming the Scourge of Impersonal Ecommerce**
  There are several disadvantages of ecommerce, but in my mind, the greatest disadvantage is that it de-personalizes the shopping experience. The communication on an ecommerce website is generic, if not cookie-cutter. But if you are able to analyze data effectively, you can create a unique buying experience for each visitor[11].
- **Integrating Data From All Streams and Unearthing Correlations**
  Modern processes for collating and analyzing big data can actually pull together data from multiple sources and come up with correlations.
- **Make Sure to Avoid Reaching the Wrong Conclusions**
  It is important to avoid making gross generalizations when analyzing big data or, for that matter, drawing erroneous conclusions. One common error is assuming causality between two types of customer behaviors, where actually they are just co-occurring and do not have a cause-effect relationship.
- **Privacy Issues in Accessing and Processing Big Data**
  As you get deeper and deeper into mining data, you are likely to hit a roadblock in terms of privacy rights. In fact there might be statutory limitations to the kind of data you can access or, more importantly, share. [11].

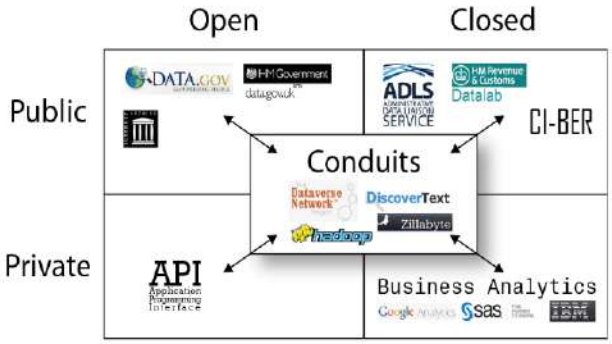

Fig.3.1 Accessing and using Big Data to Advance Social Science Knowledge [12]

B. The Business Case for Big Data

The business case for Big Data listed five broad ways in which Big Data analyses can create value[14]

- Unlocking of value by making information more transparent and usable at a much higher frequency
- Organizational performance boost via collection of information on a variety of customer interactions all across the product lifecycle
- Development of precisely tailored products and services
- Improved decision-making via sophisticated analytics
- Improved development of next-generation products and services[13]

C.Using big data type to classify big data characteristics

The characteristics of the big data along certain lines — for example, how the data is collected, analyzed, and processed. Once the data is classified, it can be matched with the appropriate big data pattern:

- Analysis type — Whether the data is analyzed in real time or batched for later analysis. Give careful consideration to choosing the analysis type, since it affects several other decisions about products, tools, hardware, data sources, and expected data frequency. A mix of both types may be required by the use case:
  - Fraud detection; analysis must be done in real time or near real time.
  - Trend analysis for strategic business decisions; analysis can be in batch mode.
- Processing methodology — The type of technique to be applied for processing data (e.g., predictive, analytical,

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ad-hoc query, and reporting). Business requirements determine the appropriate processing methodology. A combination of techniques can be used. The choice of processing methodology helps identify the appropriate tools and techniques to be used in your big data solution.

- Data frequency and size — How much data is expected and at what frequency does it arrive. Knowing frequency and size helps determine the storage mechanism, storage format, and the necessary preprocessing tools. Data frequency and size depend on data sources:
  - On demand, as with social media data
  - Continuous feed, real-time (weather data, transactional data)
  - Time series (time-based data)
- Data type — Type of data to be processed — transactional, historical, master data, and others. Knowing the data type helps segregate the data in storage.
- Content format — Format of incoming data — structured (RDMBS, for example), unstructured (audio, video, and images, for example), or semi-structured. Format determines how the incoming data needs to be processed and is key to choosing tools and techniques and defining a solution from a business perspective.
- Data source — Sources of data (where the data is generated) — web and social media, machine-generated, human-generated, etc. Identifying all the data sources helps determine the scope from a business perspective. The figure shows the most widely used data sources.
- Data consumers — A list of all of the possible consumers of the processed data:
  - Business processes
  - Business users
  - Enterprise applications
  - Individual people in various business roles
  - Part of the process flows
  - Other data repositories or enterprise applications
  - Hardware — The type of hardware on which the big data solution will be implemented — commodity hardware or state of the art. Understanding the limitations of hardware helps inform the choice of big data solution[15].

III. Conclusion

We have reviewed the IBM Big Data Platform, the four Big data V's, IBM Big Data Strategy, IBM Big Data Architecture, IBM Big Data Adoption and IBM Big Data Use Cases. Hence all the topics have been discussed. To conclude, all the topics related to big data are performing in their related areas and every day a new issue arises related to Big Data. Big Data is "a key basis of competition and growth"[1].Big data is already changing the way business decisions are made — and it's still early in the game. However, because big data exceeds the capacity and capabilities of conventional storage, reporting and analytics systems, it demands new problem-solving approaches. With the convergence of powerful computing, advanced database technologies, wireless data, mobility and social networking, it is now possible to bring together and process big data in many profitable ways [7]. This review paper gives clear idea about Big Data Architecture, IBM Big Data Adoption, IBM Big Data Strategy and Use Cases. Based on review of Big Data we conclude it has a great scope in various fields where large amount of data handling is concerned.

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Review of Load Balancing Routing Protocols in Mobile Ad Hoc Networks

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Abstract- **Load balancing is the crucial part of the MANET routing protocols. It has been seen that many experts proposed many new techniques for balancing the load in MANETs. Here this paper includes many load balancing techniques in MANETs and also measures their performances by taking several parameters. This paper contains the basic knowledge about the MANETs with their applications and limitations. It also contains MANET's routing protocols**

Index terms- **load balancing, MANETs, routing protocols, FARP, AODV, LBPRP, and NCLBR.**

INTRODUCTION

Load balancing plays an important role in routing protocol for efficient data transmission in MANETS (mobile ad hoc network). Today, the most challenging Task in designing an adhoc network is the development of efficient routing protocol that provides high quality communication. In MANETS, the role of the routing protocol is to distribute the routing tasks among the mobile host. If the node with heavy routing duties i.e. has large queuing delay and high packet loss ratio which results in the serious problem like congestion, power depletion and queuing delay. To remove these problems, a load balancing tool is emerged for better use of MANET's resource and also to enhance MANET's performance. With the use of the load balancing techniques, MANETS can be able to minimize the traffic congestion, end to end delay and to maximize the lifetime of mobile nodes.

MOBILE ADHOC NETWORK

MANETS are the wireless communication network in which nodes are not in the direct range of each other. They separately establish their communication by using the different nodes to forward the data between them. They will occur without any fixed infrastructure and also comes under the multi-hop wireless networking

APPLICATIONS OF MANETS

MANETS are often used in the situations where fixed networks are either very much expensive or they are impractical in nature. They are used in large no of applications for example [1]

1. **PERSONAL AREA NETWORK (PANs):** PANs are particularly designed for individual users. They are derived from different types of mobile devices. The main role of PANs is to build an embedded network by combining some nodes that are inside or near the human body to exchange the digital data between them. The communication between nodes of different PANs can take advantage of using the facilities provided by adhoc network for example a doctor can distribute different set of devices (sensors) on the patient's body so that he can able to get the medical information also named as Wireless Body Area Network which has many applications in medical field.
2. **MILITARY APPLICATIONS**: In the area of battle field military applications can be considered as the most popular application of adhoc network because of providing an infrastructure less network which gives reliable communication and fast failure recovery. In the battle field, it is not so complicated to set up a fixed network for military communications.

LIMITATION OF ADHOC NETWORK [1]

There are many restrictions that need to be accounted for when designing routing protocols for MANETs which is indeed a challenging task. These physical constraints include the following.[1]

A. **Limited CPU Capacity**: Nodes have limited processing operations.
B. **Limited Storage Capacity**: Memory resources are normally restricted in the mobile nodes.
C. **Limited Battery Power**: where each node has a limited life time battery.
D. **Limited Bandwidth**: Bandwidth is shared by a number of mobile nodes.
E. Nodes have limited transmission range since they are depends on the radio waves.
F. Rapidly changing topology, where the nodes are continuously moving and changing their places.

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ROUTING FOR ADHOC NETWORK

Routing is the essential component of any adhoc network which is responsible for balancing the load between the source and the destination. It is a mechanism of finding an appropriate route between the source and the destination in order to send the packets between them. They are divided into two basic types which are [1]:

1: **Static Routing:** Static Routing is the type of routing which is done manually by the administrator. Administrator assigns the route manually to send the packet in the network. From this we conclude that the source and the destination are fixed during the whole transaction. Here the router is not responsible for building a routing table.

2: **Dynamic Routing:** Dynamic routing is the routing technique which is responsible for building and exchanging the routing table information. It is much more flexible than the static routing since it detects congested paths. It comes under the following three categories:[1]

1. Reactive Protocols
2. Proactive Protocols
3. Hybrid Protocols

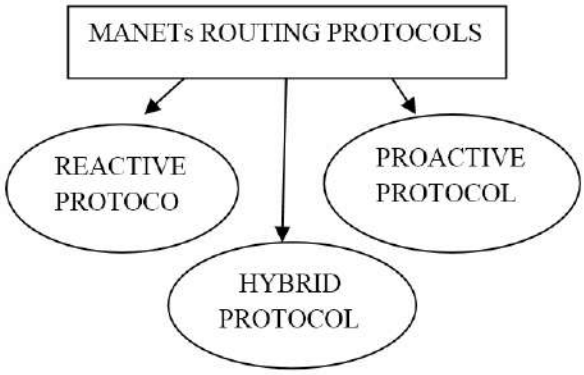

Fig1. Types of MANETs Routing Protocols

I. **Reactive Protocols:** They are also called On Demand routing protocols because it does have any prior knowledge about the routes between the nodes until the source node sends a route request to the destination node. They are used to reduce the no of control overhead by determining routes to a destination whenever required. This can be achieved by a process called two-phase route discovery which is initiated by source node. This include Route Request Packet (RREQ) and Route Reply Packet (RREP).When large no of flows, reactive protocols shows significant drop in data throughput due to global flooding. To reduce this global flooding two protocols are introduced Location aided routing (LAR) and RDMAR. Reactive protocols have the following four characteristics [1]

1. The route should be found only when needed.
2. Flooding technique is used in order to broadcast the route request.
3. Saving bandwidth by decreasing control packets.
4. Bandwidth is used when source node decides to transmit data to a destination node. Adhoc On-Demand Distance Vector Routing Protocol (AODV) is an example of on-demand protocol.

II. **Proactive Protocols:** It is the first step in designing the routing protocol. They include two protocols DSDV and GSR which are used to maintain the routes to all nodes within the network. They contain full information regarding the routes between each pair of nodes whether the nodes need to send data or not. This lead to disadvantage of having lack of scalability and large no of overhead. This can be removed by introducing two protocols i.e. OLSR and TBRPF by reducing the no of re-broadcasting nodes in the network. The advantages and disadvantages of proactive protocols are given below.

Advantages:[1]

1. Nodes can easily obtain routing information.
2. Nodes can easily initiate a session.

Disadvantages: [1]

1. Consuming bandwidth because of the large overhead caused by the control messages exchange
2. A huge amount of data needs to be saved in the memory of each node in the network.

III. **Hybrid Protocols:** It is a combination of both reactive and proactive protocols to take out the advantages of each of them. The most popular example of the hybrid routing is Zone Routing Protocol (ZRP). In these routing protocols all the network nodes are groups into zones. The nodes having the same zone come under the proactive protocol where as the nodes having different zones comes under the reactive protocols. Fig1 shows an example of the ZRP protocol with two hops.

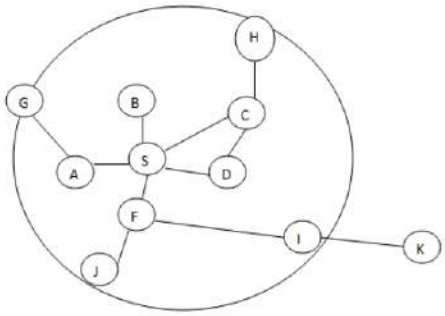

Fig2. Example of routing zone with two hops

In the fig1 we notice that the nodes in ZRP protocol are differentiating into three categories:[1]

1. **Peripheral Nodes:** Peripheral nodes are the nodes which are at the same distance from the central node with equal zone radius. The nodes J, I, G and H are the peripheral nodes.
2. **Interior Nodes:** The interior nodes are the nodes which are placed at a distance from the central node smaller than the zone radius. The nodes A, B, C and d are the interior nodes.
3. **Nodes outside the routing zone:** Those nodes which are separated from the central nodes by a distance more than the zone radius. The node k is the only node which resides outside the routing zone.

FLOW AWARE ROUTING PROTOCOL

Flow aware routing protocol is the protocol whose purpose is to reduce the amount of control overhead so that a better distribution of the traffic between the nodes takes place. To reduce congestion or the creation of the bottleneck nodes, they introduce a utility metric for restricting the propagation of route request (RREQ) over the nodes having minimum no of the active data flows from different source nodes.

PERFORMANCE METRICS IN FARP [4]

There are four different types of performance metrics to compare the FARP routing strategies. They are:

1. Packet Delivery Ratio(PDR)
2. Control Packets
3. Delays

1. **Packet Delivery Ratio (PDR):** It has been observed that the PDR performance of AODV and FARP only for small to medium sized mobile ad hoc network.
   In case of 20 nodes – both AODV and FARP achieves over 98% of PDR. [4]
   In case of 100 nodes- the PDR performance of FARP is much more than AODV in case of having high node mobility. This is due to FARP reduces the establishing routes over bottleneck. Also FARP establishing a more selective approach to flooding than AODV.

2. **Control Packet:** Here, also by taking the case of 20 or 100 nodes, FARP produces fewer control packets than AODV because of having restriction of flooding over nodes which are further break down the no of rebroadcasting nodes as compared to AODV.

3. **Delays**: **In case of 20 nodes**- both AODV and FARP obtaining equal levels of end-to-end delay because of introducing lower level of traffic in the network than that of the available bandwidth and capacity of each node.[4]

In case of 100 nodes- when the mobility is high 50 flows of FARP obtains significantly lower end-to-end delay than AODV. This is due to the AODV protocol produces more control overhead than FARP.[4]

MANET NETWORK MODEL

The MANET network model consists of a collection of nodes that have the capacity to connect on a wireless medium and form either an arbitrary and dynamic network with the wireless links that will change with respect to time. They have no permanent infrastructure.

Adhoc on demand Distance Vector Routing Protocol (AODV)

In case of the MANETs, AODV protocol is a reactive unicast routing protocol in which it maintains a routing table for storing each entry of the routing data for all the nodes. If we not been used the routing table entry for such a long period it will get expires or reactivated for a pre-specified expiration time.

OVERVIEW OF CORMAN

CORMAN stands for the Cooperative Opportunistic Routing in mobile adhoc network. It is an extension of EXOR. Unlike EXOR, CORMAN also forwards the information in batch oriented fashion i.e. information packets are divided into batches. To support CORMAN, we have proactive source routing which provides complete routing information to each node in the network.

LOAD BALANCING PARALLEL ROUTING PROTOCOL (LBPRP)

The main aim of this system is to develop a product which results in increase in the MANETs lifetime by using Load Balancing multipath technique representing parallelism in sending data using disjoints multipath. Here disjoints multipath means all the selected nodes will send data at the same time. Hence, it results in solving the overloading problem and prevention of the node starvation.

NODE CENTRIC LOAD BALANCING ROUTING PROTOCOL (NCLBR)

The working of this protocol is same as like the AODV protocol. In this protocol it performs three distinct roles for the nodes named as Terminal, Trunk and Normal Nodes. The nodes which are connected through a single link are called Terminal nodes. They contains only one neighboring nodes. The nodes which are connected to two distinct networks are called Trunk nodes. Normal nodes are those nodes which are neither the Terminal nodes nor the Trunk nodes.

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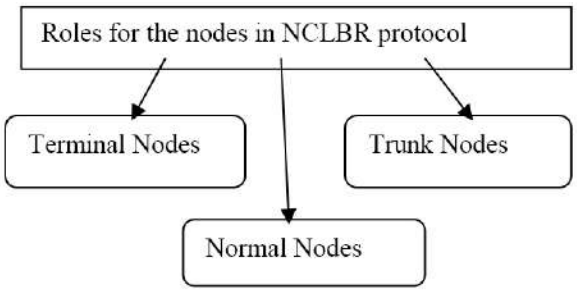

Fig3. Roles for the nodes in NCLBR protocol

COMPARISON CHART

ROUTING PROTOCOLS	PDR(PACKET DELIVERY RATIO)	CONTROL PACKETS	DELAYS
FARP(FLOW AWARE ROUTING PROTOCOL)	A		A
AODV(Adhoc on demand Distance Vector Routing Protocol)	B		B
LBPRP(LOAD BALANCING PARALLEL ROUTING PROTOCOL (LBPRP)	D		C
CORMAN	C		D

A- EXCELLENT B- GOOD C- AVERAGE D- POOR

CONCLUSION

This paper proposed many load balancing techniques for MANETs. It includes routing protocols like FARP (Flow Aware Routing Protocol), AODV (Adhoc on demand Distance Vector Routing Protocol), LBPRP (LOAD BALANCING PARALLEL ROUTING PROTOCOL (LBPRP), CORMAN, NCLBR (NODE CENTRIC LOAD BALANCING ROUTING PROTOCOL). On comparing all these protocols on the basis of the following parameters like PDR (Packet Delivery Ratio), Control Packets, Delay. It has been observed that FARP is the best protocol among all protocols.

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Performance Analysis on Routing Protocols in Mobile Ad Hoc Networks

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***Abstract*-Mobile ad-hoc network (MANETs) is a network without fixed infrastructure. In MANETs path routing and protocol selection are the strategies to design a wireless network. MANET should selected the protocol which has the high capability of data delivery and used in large network, So performance analysis on routing protocols is carried out i.e. AODV,DSR,TORA,OLSR and DSDV using OPNET simulator. The delay, throughput and load are the three parameters used for the comparison of the performance of above protocols.**

***Index terms*- performance analysis, MANETs, routing protocols, AODV, TORA, DSR, OLSR and DSDV.**

1. INTRODUCTION

The mobile ad-hoc networks (MANETs) contain the ad-hoc network which consists of wireless network without any fixed infrastructure. It provides the facility to get access to the network for the communication or exchanging information from anywhere. It has the facility of changing the network structure dynamically due to the move ability of nodes. In this nodes behave or act as a host or routes for the transmission of data from one node to another node in the network. In MANETs the security of information during transmission has guaranteed. In MANETs to transfer information from source to destination i.e. to get the efficient routing. The routing protocols take some parameters.

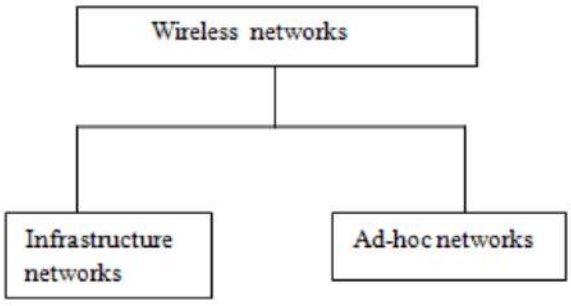

Figure1: Wireless Networks Categories

The routing protocols that used are AODV, DSR, OLSR, TORA and DSDV for finding the routing paths and efficient data delivery and data integrity. Through these protocols, it can find the best performance metrics, so the output of these performance metrics decide which routing protocols is the best to transfer large information from one source to another source. There are some operations i.e. performance analysis of protocol to judge their delay, throughput, and packet delivery ratio. To calculate their performance using simulation software.

2. MANET ROUTING PROTOCOLS

There are some important features of these protocols that can be studied in simulations and we have some parameters to implement these protocols. There are some differences in routing protocols i.e. lies on protocols. The routing strategy based on two classifications i.e. reactive and proactive. So through this the protocols find the way to launch the terms like scalability, mobility support and energy consumption.

A. Reactive Routing Protocols

It represents the determination of routes, only and only when there is availability of packets to send. So this reactive routing protocol describes about the AODV, DSR, TORA protocol in detail .The routing protocol is used for large networks.

B. Proactive Routing protocols

Proactive routing protocols are basically used to maintain routes to all the destinations of all the time. It cannot be used for large networks. There is slow reaction where any link breakage or failures. the facility of this routing is quickly obtain routing information and establish routes. It describes about the OLSR and DSDV.

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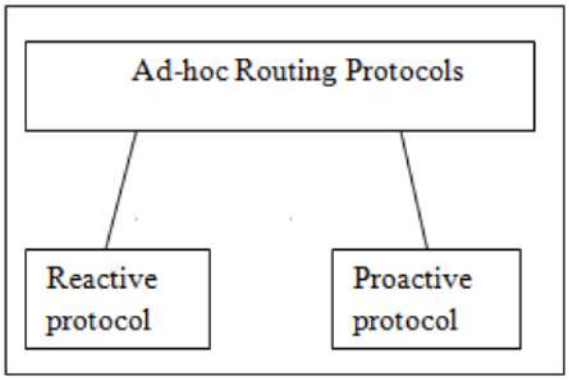

Figure2: Classification of Routing Protocols

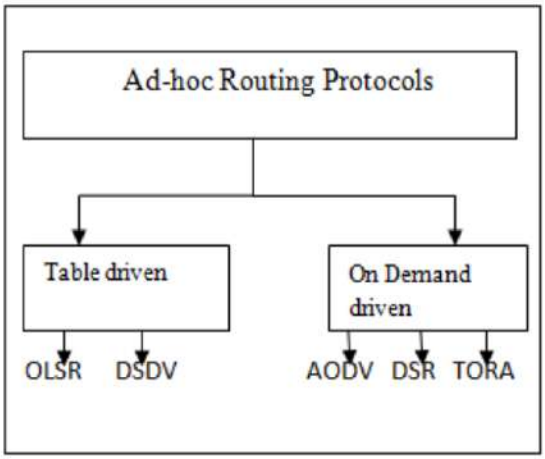

Figure3: Represents Family Tree

3. Ad-hoc On-Demand Distance Vector Routing Protocol (AODV)

AODV is a combination of on-demand and distance vector i.e. hop-to-hop methodology. This protocol performs routing discovery when a node needs to know the route from source to destination, it creates a ROUTE REQUEST and ROUTE REPLY, it creates when the request reaches a node with route to destination. And there is a ROUTE ERROR which is sent to the effected source nodes. When a source node receives, it again creates a route discovery, if route is needed.

4. Dynamic Source Routing (DSR)

It is a reactive routing protocol.DSR is also known as on demand routing protocol, It is very simple and efficient protocol designed for the use in multichip wireless ad-hoc networks. It has two mechanisms i.e. [3]

1. Route Discovery
2. Route Maintenance

In route discovery we use ROUTE REQUEST and ROUTE REPLY for sending data packets. The data packet that we sent it carries in its header to know that from which source the packet is sent or at which destination.

5. Temporally Ordered Routing Algorithm (TORA)

TORA is reactive routing protocol. It is a distributed algorithm, adaptive and efficient protocol. It is basically known for their three main functions that are creating routes, mentioning routes and erasing routes. It creates the route when we required not at all time the route establishment is achieved through the directed acyclic graph. Characteristics of TORA:-

1. Distributed execution
2. Loop-free routing
3. Multipath routing

6. Destination Sequenced Distance Vector (DSDV)

DSDV is a proactive routing protocol(table driven routing protocol).It is based on hop-by-hop distance vector .In this routing protocol, each node in the routing table, in which all destinations and number of hops that used them in network. It also generates the sequence number for the route generated by nodes.

7. Optimized link State Routing (OLSR)

OLSR also comes under the proactive routing protocol. It provides the link state routing for mobile ad-hoc networks. It also maintains the routing table by the link state called MPR (multipoint relays) for forwarding control traffic. It helps in exchanging of messages. It creates two types of packet: [1]

1. Hello packets
2. TC packets (topology control) through its MPR.

8. SIMULATION and ANALYSIS [1]

In this study, the simulation software is Optimized Network Evaluation Tool (OPNET), which is to simulate and analyze for network communication and distributed system. It provides three-tier model, where the top layer is the network layer that reflects the topology of the network, the middle layer is the node layer that is composed of the corresponding protocol modules and the bottom layer is the process model that is described by finite state machines.

Aim is to analyze the performance of the routing protocols of AODV, DSR, TORA, DSDV and OLSR which takes the parameters of throughput (bits per second), delay (sec).The analyzing of routing protocols is done by the simulation tool OPNET. The communication over the wireless nodes with the transmission range of 1500 with transmission power of 0.05w. The traffic generator starting time has set to 10(sec), pause time (0) size and the duration period constant 10(sec). The random mobility model was used. The simulation was 300 seconds in length.

These routing protocols can be configured on:

1. MANET routing protocols
2. Routers

Performance indexes:

1. Throughput
2. Delay
3. Load

In the OPNET simulator first create a design of the network and by applying individuals statistics to each node the

performance is viewed by view result.Figure3 shows the workflow of OPNET simulator.

Routing protocols	AODV,DSR,TORA,OLSR,DSDV
Number of wireless nodes	5,10,15,20
Simulator	OPNET
Transmit power	0.05(watt)
Data rate	11Mbps
Simulation seconds	300(sec)

Table1: Simulation Parameters.

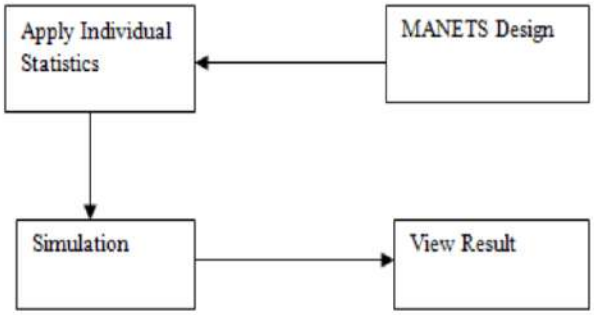

Figure 3: Simulation Flow

8.1 PARAMETER ANALYSIS [2]

There are some performance evaluations with respect to the parameters of the routing protocol. The parameters are delayed, load, throughput.

DELAY: It is time taken for an entire message to completely arrive at the destination from the source. It includes the components i.e. propagation time (PT), transmission time (TT),

Queuing time (QT) and processing delay (PD).

It is evaluated as:

Delay=PT+TT+QT+PD

THROUGH PUT: It is a measure of how fast a node can actually sent the data through a network. Through put is the average rate of the control information sent to the data actual received at each node.

$$\text{Throughput (bits/sec)} = \frac{\text{no of delivered packets*packet size*8}}{\text{Total simulation period}}$$

LOAD: It represents with respect to bits/sec, which is put forward to wireless LAN layers.

Routing protocols	Delayed	Network load	Throughput
AODV	Excellent	Very good	Average
DSR	Worst	Good	Very good
TORA	Very good	Excellent	Average
OLSR	Average	Average	Good
DSDV	Good	Average	Excellent

Table2: Comparison of routing protocols depending upon number of nodes.

9. CONCLUSION

In this study, an effort has been made to concentrate on the comparative performance analysis of routing protocols are reactive (AODV, TORA, DSR) and proactive (OLSR, DSDV) routing protocols on the basis of above mentioned performance metrics using OPNET simulator. While comparing five routing protocols, in OLSR load and delay is low while the number of nodes is less, so OLSR can use in small network areas. While DSDV because of its proactive nature it provides delay is low. The average load and delay is high for DSR and throughput is also high in DSR when the number of nodes increases and hence it can be used for large networks but not suitable for wireless transmission. TORA and AODV both have less, load while increasing number of nodes. So TORA and AODV have the capability of higher packet delivery than DSR.

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Cognitive Radio System: A Review

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Abstract: **A cognitive radio is an intelligent radio that can be programmed and configured dynamically. Such a radio automatically detects available channels in wireless spectrum, then accordingly changes its transmission or reception parameters to allow more concurrent wireless communications in a given spectrum band at one location. The most important task for a Cognitive Radio (CR) system is to identify the primary licensed users over a wide range of spectrum. Radio spectrum is one of the most scarce and valuable resource for wireless communications. This review paper introduces cognitive functionality and provides an in- depth comparitive survey of various spectrum awareness techniques in terms of their sensing accuracy and computational complexities along with their merits and demerits.**

keywords: **radio, primary user, secondary user, spectrum sensing.**

1. INTRODUCTION

The increasing development and deployment of wireless communication represents a challenge to efficient spectrum utilization. To address this challenge, Cognitive Radio (CR), pioneered by Mitola [1], has emerged as a promising concept for improving the consumption of limited radio spectrum resources by reusing the under utilized spectrum in wireless communications and mobile computing. It is an intelligent communication system that is aware of its surrounding environment, and adapts its internal parameters to achieve reliable and efficient communication [1]. In fact, cognitive analysis is always based on the process of learning about and understanding from the phenomenon, and it creates the opportunity to develop intelligent information systems [2]. CR thus adapts its internal states to statistical variations in the incoming radio frequency stimuli by making corresponding changes in certain operating parameters with two primary objectives: highly reliable communication and efficient utilization of the radio spectrum [3].

A group of users who collaborate to share a frequency band by using CR form a Cognitive Radio Network (CRN). CRNs consist of various kinds of communication systems and networks, and can be viewed as heterogeneous networks. There are two broad classes of CR user, namely the Primary User (PU) and the Secondary User (SU). The primary user is the licensed user of a particular radio frequency band and the secondary user is an unlicensed user who cognitively operates without causing harmful interference to the primary user [4]. Thus, there are two networks within CRNs: Primary User Networks (PUNs), which constitute an existing network infrastructure operating with license in a given spectrum band, such as current cellular or TV broadcast networks, and offering its services to incumbents or primary users [5], and Secondary User Networks (SUNs), which are only allowed to use spectrum in an opportunistic manner without causing interference to the primary networks [5]. Both cooperative and non-cooperative methods are proposed by modeling the uplink power control to protect licensed users in CRNs and to maximize the spectrum efficiency under interference constraints. The architecture of a CRN is depicted in Fig. 1.

2. COGNITIVE RADIO WORKING PROCESS

The working capabilities of a CRN can be classified according to the working functionalities as shown in Fig. 2. A cognitive radio senses the environment (cognitive capability), analyzes and understands the sensed information (self-organized capability), makes decisions (decision capability) and adapts to the environ- ment (reconfigurable capabilities). In this section, for completeness, we have forwarded an overview of each of these activities

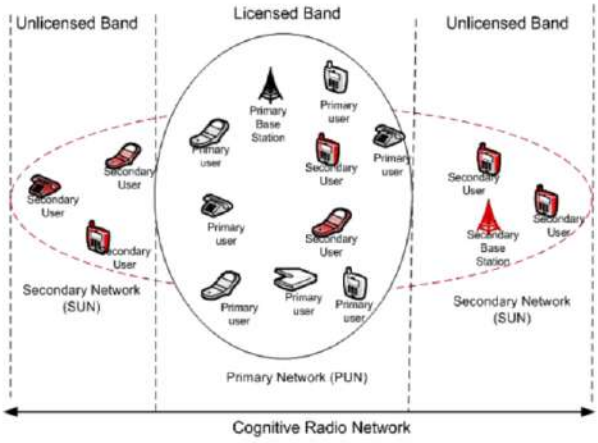

Fig.1.Cognitive radio network architecture[4,5]

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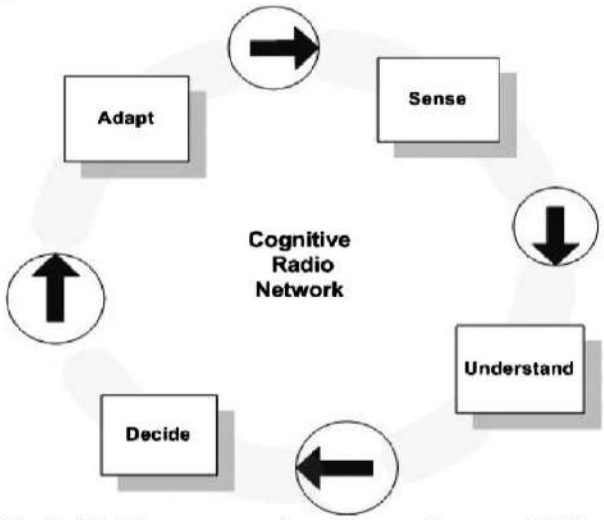

Fig. 2. Working process of cognitive radio network [6]

SENSE (COGNITIVE CAPABILITY)

Spectrum sensing

A cognitive radio has the capability of spectrum sensing by using several sensing algorithms. By using this sensing capability, it can sense the spectrum and detect whether there are any spectrum holes surrounding the networks or not. CRNs use free frequency bands which are not used by licensed users or have limited interference with them. Some of the methods used for spectrum sensing purposes in CRNs are Energy Detector-Based Sensing, Waveform-based sensing, Cyclo stationarity-based sensing, Radio Identification-based sensing, and Matched-Filtering. Tevfik et al. in Yucek and Arslan (2009) described all of these spectrum sensing methods. They also provided a basic comparison between all of these methods in terms of complexity and accuracy

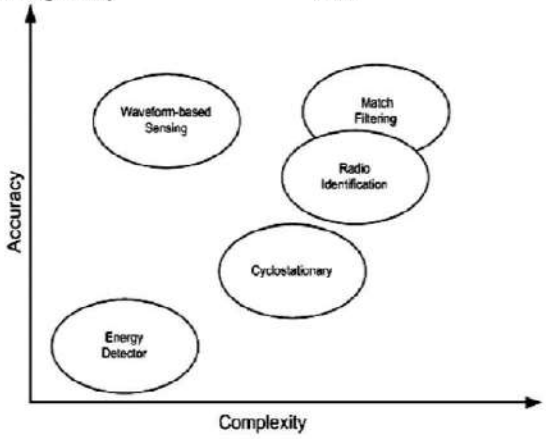

Figure 3 shows a basic comparison between different sensing methods in terms of complexity and accuracy[7]

Figure 3. Sensing methods in terms of complexity and accuracy.

Spectrum sharing

A cognitive radio could in corporate a mechanism that helps to share spectrum under different terms of agreement and policies between a license and a third party, meaning that parties may be able to negotiate for spectrum use on an ad hoc or real-time basis, without the need for prior agreements between all parties.

3. WIRELESS NETWORK AND COGNITIVE RADIO NETWORK

A cognitive radio terminal also has the ability to negotiate with another spectrum and network utilization. This negotiation process may be undertaken with the support of network/infrastruc- ture sides or simply by proceeding in an ad hoc manner. In CRNs, the radio could also facilitate interoperability among different communication systems in which frequency bands and/or for- mats are not the same (Chen et al., 2008a). On the other hand, cognitive radio is placed above the SDR (Software Defined Radio) and it uses its intelligence that lets an SDR to determine which mode of operation and parameters to use. Actually, an SDR is simply a radio that puts most of the Radio Frequency (RF) and Intermediate frequency (IF) functionality, including waveform synthesis, into the digital (rather than the analog) domain, allowing great flexibility in the modes of radio operation (called personalities) (Haykin, 2005). CRNs are more flexible and exposed to Wireless Networks compared with other traditional radio networks.

Service discovery: Service discovery is almost similar to network/system discovery. Network or system operators provide their services through their access networks. A cognitive radio terminal tries to find appropriate services to fulfill its demands throughout the net- work. Cognitive radio terminals discover the service by identify in nearby Bluetooth, WiFi devices based on the Time-binning approach, the Bit-Comparison approach,etc

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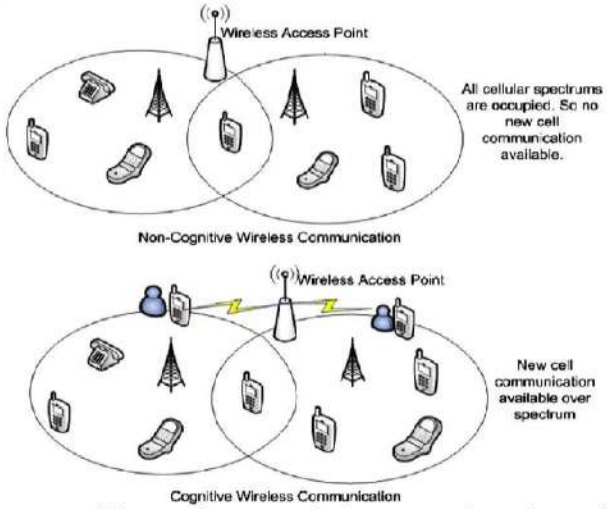

Fig.4. Difference between wireless networks and cognitive radio networks[8]

4. APPLICATIONS OF COGNITIVE RADIO NETWORKS

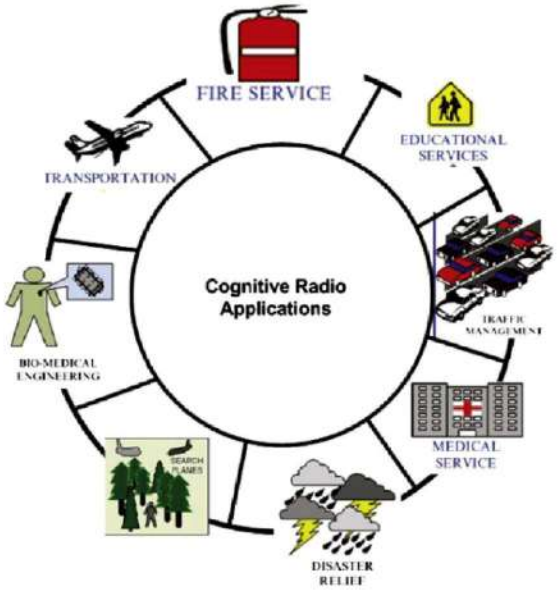

Fig.5. cognitive radio applications[9]

Traffic control: Traffic is a major problem, especially during the rush hours in the mornings and in the evenings. Insuch situations, the local traffic control can transmitt to the mobile user the location of congested traffic,the predictive traffic delay and an alternate route. Cognitive intelligence can be applied to traffic signals themselves as well, to determine how long the red or green signal remains on,depending on the traffic volume in each direction.

Weather forecast: If sensors are equipped with a cognitive ability, they can communicate with each other without any user inter- vention (Arslan and Ahmed, (2007). The authorsin Arslan and Ahmed (2007) describe how cognitive radio can be used weather forecasting. Sensors, which can detect, collect and share information among themselves for optimum performance, are deployed in the field. When the required amount of data is collected, the data can be passed to the central control by the sensor closest to the station for optimum power usage, optimum network usage, and minimized delay

Military application: Of all the applications of CR,the military is perhaps one of the most significant areas,where different aspects of cognitive radio have been deployed for sometime. The SDR, SPEAK easy, Joint Tactical Radio System (JTRS), and jamming and anti-jamming are some of them important technologies in the military field that utilize CR concepts

CONCLUSION

This paper presents a survey on the architecture and security issues in cognitive radio networks and also conclude the comparison between wireless and cognitive radio networks. Cognitive radio is better than wireless networks.Cognitive Radio (CR), a novel technology, has attempted to minimize this problem by dynamically using the free spectrum in wireless communications and mobile computing.

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A Review on Comparative performance of a Dye sensitized solar cell and Silicon based solar cell

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Abstract-**The present study reviews the performance of a dye-sensitized solar cell (DSC) compared to a silicon solar cell Due to the fundamental difference in cell structure of the DSC and the silicon cell, different electrical behavior under varying conditions has been observed. An understanding of the cell behavior with respect to Irradiance Intensity, Operating Cell Temperature and Incidence Angle has been reviewed.The investigations by various workers have explained that DSC exhibits highest conversion efficiency under low light conditions, whereas the highest conversion efficiency for silicon cells is seen at high irradiance. Under high irradiance, the DSC shows positive dependence to elevated operating temperatures, whereas the efficiency for the silicon cells is negatively proportional to cell temperature. A beneficial ISC-generation is seen for the DSC for increasing incidence angles which may be interpreted as the effect of increased light path within the active layers. The silicon cells exhibits a reduction in relative ISC for increasing incidence angles due to the increased reflection at the surface of the top-glass.**

I.INTRODUCTION

The Dye sensitized solar cell(DSC) functions as the natural photosynthesis by capturing solar irradiance and converting it into energy, all performed in a closed chemical circuit. The resemblance to the natural photosynthesis is found as the absorption of light and the charge separation takes places in different components than the charge transport.

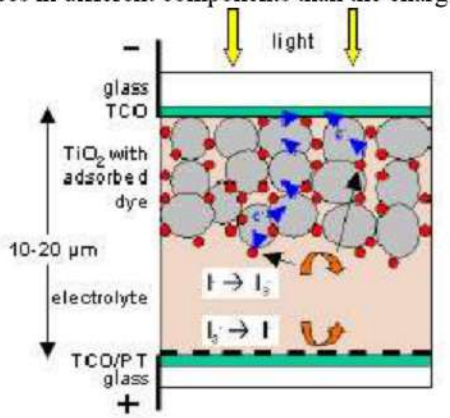

FiG.1 Diagram showing working of a dye sensitized solar cell

The use of silicon for solar cells is most widespread as this is the most mature technology within the world of solar cells. Currently 93% of installed PVs are made from silicon. The working principle as well as the behaviour of the silicon solar cell is such that material absorbs energy and separation of charges as well as charge transport takes place in the material.There are three types of silicon used in solar cells, which all have specific properties andchemical structure. Monocrystalline Silicon , Polycrystalline Silicon , Amorphous Silicon.The monocrystalline silicon, is the most expensive type of silicon, due to the ordered crystal structure which is obtained by a very slow growth of crystals. The uniformity of the crystal structures makes this the type of silicon which has the most uniform and predictable behaviour of cells from the same wafer . The polycrystalline silicon, has a different structure and can be grown faster, but due to the crystalline structure the efficiency will be lower than that of monocrystalline silicon. Many crystals are formed within the structure and the orientation of the crystals is random. The crystals meet in a 'grain boundary' and these boundaries reduce the efficiency of silicon as conducting material. The structure of amorphous silicon, is random and there is no long-range order in structural arrangement of the atoms. Some of the atoms have dangling bonds resulting in undesired electrical behaviour. Only a very thin layer of silicon is required, approx. 1/100 of the thickness of mono- or polycrystalline cells, due to the production
process where the silicon can be deposited on large areas by chemical vapour deposition. The disadvantages are lower performance and shorter lifetime, which has not been fully proven by long-term tests

II.DYE SENSITIZED SOLAR CELL VERSUS SILICON BASED SOLAR CELL

The solar cells are characterized by the voltage V and current I generated when the cell is subjected to illumination of a given spectral distribution as well as a given cell temperature. An IV-curve is used to characterize the solar cell, displaying current I as function of voltage V.The generated power output P of the solar cell is defined as the product of I and V,hence the area of the fitted rectangle under the IV-curve for a given (V; I). Pmax is indicated in the schematics, whereas Pmax is defined as the product of (Vmax; Imax).

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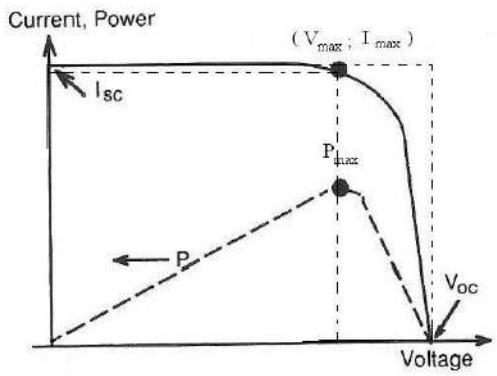

Fig.2 The IV-curve, used to characterize solar cells

The silicon solar cell is estimated to have similar behavior as a diode in parallel with a
current generator. The behavior of the DSC cell is not well documented as for the
silicon cell, but the electrical equivalent can be assumed equal to the silicon cell This is referred to as the one-diode model.

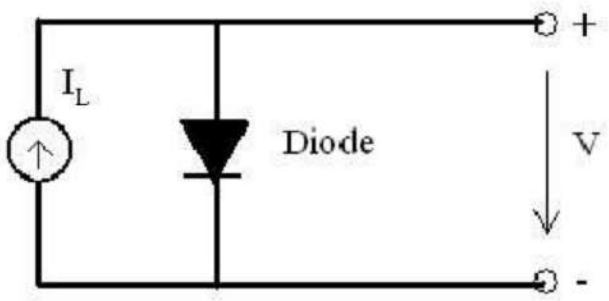

Fig.3 One-diode Model

The one-diode model shown is used as theoretical model in the evaluation of experimental results. This model is simplified, and more elaborate models with diodes in parallel and resistances that take cell losses into considerations have been developed. With these models it is possible to simulate the silicon solar cell very accurately as most material parameters can be included. For diodes, the current I [A] induced, with the equivalent circuit shown , is given by the relation:

$I=I_0-I_L\{ e^{qv/nkt}-1\}$

The conversion efficiency of a solar cell defines how much of the irradiance is converted into electrical energy by the solar cell and therefore gives a measure of howefficient the solar cell functions. The conversion efficiency □□[%] is determined by:

$$\eta = \frac{I_{SC}V_{OC}FF}{G.A\ Active} \quad \text{x } 100$$

The objective of the sipresent study is to perform a comparison of a DSC- and a silicon cell with respect to performance when subjected to varying conditions. The difference in electrical behaviour between the two solar cell technologies under varying operating conditions was experimentally investigated and linked to already known theoretical relations.The experimental results show that the cell efficiency is strongly influenced by irradiance, as a reduction in overall cell performance for the DSC was seen for increasing irradiance levels. This is interpreted as losses in the DSC which increases for increasing irradiance due to charge transport limitation. The silicon on the other hand exhibits positive performance dependence with highest efficiency at high irradiance levels. The operating cell temperature is seen to hold influence for the conversion efficiency where the DSC benefit from elevated cell temperatures under high illumination in contrast to the silicon cells which shows a negative temperature dependence in efficiency. An indication of dependence between cell temperature and irradiance level is seen, as the temperature coefficient determined under low light levels holds minor influence on the efficiency.

A beneficial ISC-generation is seen for the DSC at increasing incidence angles. The experimental results from indoor tests indicate an additional ISC-gain of 10-60% in relative ISC at high incidence angles for the DSC, which can be interpreted as an effect of the increased light path within the active layers of the cell. The silicon cells exhibits a reduction in relative ISC for increasing incidence angles due to the increased reflection at the surface of the top-glass.

III. CONCLUSION

Based on the knowledge gained about the difference in performance characteristics of a DSC and a silicon cell it is evident that the application of the cells should be considered. The cells investigated show very different electrical behavior under varying weather conditions and therefore a specific cell technology should be chosen from the type of application desired. An estimation of the DSC performance from the present Standard Test Conditions, which highly favor the silicon cell, is believed to underestimate the DSC performance. A need for development of a specific electrical model of the DSC is seen, so a realistic estimate of the electrical behavior can be determined. The model should include the performance characteristics of the cell as well as the external parameters influencing cell performance in form of weather conditions. The importance of the performance parameters: Irradiance, Cell temperature and Incidence angle has in this work been investigated, but further studies needs to be performed in order to create the electrical model which can characterize the DSC fully.

The present study indicate a promising future for the DSC if the problems dealt with
today: Mechanical and chemical stability, encapsulation and up scaling, can be overcome. Hopefully this work will function as an encouragement for the future work of characterizing and improving the dye-sensitized solar cell.

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Analysis of radon concentration in ground water samples from some regions of Pathankot district of Punjab

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Abstract- **The estimation of radon level has been increasingly supervised in world due to its unsafe effects to mankind. In the present study, groundwater samples were taken from different regions of Pathankot district. The analysis of radon concentration in these samples was carried out by using RAD7, an electronic radon detector equipped with an appropriate unit (Aqua kit). The radon concentration in the samples has been found to be in range of 73.18 pCi/L to 259.18 pCi/L, which is well within safe limit as recommended by USEPA in all the regions from where the samples were collected.**

Keywords: **Estimation, Radon Concentration, RAD7.**

Introduction: Uranium and thorium have been present since the earth was formed and have very long half-lives (4.5 billion years for uranium and 14 billion years for thorium). Uranium and thorium (solids) are found in rocks, soil, air, and water. Uranium and thorium decay to other elements such as radium (a solid), which in turn decays into radon (a gas). Radon (222Rn) is a naturally occurring, radioactive gas formed within the 238U decay series **[1]**. As radon undergoes radioactive decay, it gives off radiation and becomes another radioactive element. This is repeated several times until it becomes stable lead. The elements that radon changes into are called radon daughters or radon progeny. The radiation given off is alpha particles, beta particles, and gamma rays. This radiation gives a radiation dose to people when they are exposed to radon. Radon (222Rn) as a decay product of radium in the naturally occurring uranium series, is a radioactive inert gas and is responsible for about half of the radiation dose received by the general population **[2]**. Natural product of the environment Radon isotopes are formed naturally through the radioactive decay of uranium or thorium. For humans, the greatest importance among radon isotopes is attributed to 222Rn because it is the longest lived of the three naturally produced isotopes **[3]**. Radon has no commercial uses other than as a radiation standard for calibrating radon monitoring equipment in support of environmental surveys of homes and other buildings. According to the U.S. Environmental Protection Agency (EPA), radon is a carcinogen and the second leading cause of lung cancer in the U.S.**[4]**.On average, radon accounts for roughly 55% of one's annual radiation dose with the remaining coming from medical (11%), internal (11%), terrestrial (8%), cosmic (8%), and other sources**[5].**

In addition to the radon present in air, radon dissolved in drinking water can lead to significant health problems for humans **[6]** because water is a major part of total body weight and are the most prominent source for life. The major risk of radon dissolved in water comes from ingestion & its contribution to indoor air. Naturally occurring radon gas (222Rn) exists in ground water and drinking water supplies. Research involving radon in ground water requires the ability to accurately measure Radon in water. Many studies have investigated the transfer of radon from water into air, and on average, there is 10^{-4} BqL^{-1} in air per BqL^{-1} in water **[7]**. Radon is particularly well suited to study groundwater and surface water and their interaction, because of activity in groundwater 1 to100 kBq m^{-3}; depending on the lithology of the area, which is much higher than the surface water 1 to 100 Bq m^{-3} **[8]**. Many extensive studies have been performed on radioactivity in drinking waters worldwide in recent years **[9, 10, 11]**. The present work tries to explore the concentration of radon in water samples taken from some regions belonging to Pathankot district of Punjab.

Methodology: Water samples were taken from the study area used for drinking and radon concentrations in these samples were measured with the calibrated alpha spectrometer DURRIDGE RAD 7 USA, with special accessories. The detector converts alpha radiation directly to an electric signal. Its accessory **[12]** RAD H_2O is used to measure the radon in water over a wide range of concentration. It has the possibility of determining electronically the energy of each particle, which allows the identification of the isotopes (218Po, 214Po) produced by radiation, so it is possible to instantaneously distinguish between old and new radon, radon from Thoron, and signal from noise. **Figure 1** shows RAD7 and schematic diagram of RAD H2O. The radon detector was used for measuring radon in water by connecting it with a bubbling kit which enables to degas radon from a water sample into the air in a closed loop. A sample of water was taken in a radon-tight reagent bottle of 250ml capacity. This bottle was connected in a close circuit with a zinc Sulphide coated detection chamber which acts as Scintillatore to detect alpha activity and a glass bulb containing calcium chloride to absorb the moisture. Air was then circulated in a closed circuit for a period of 5-10 min until the radon was uniformly mixed

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with the air and the resulting alpha activity was recorded and it directly gives the radon concentration.

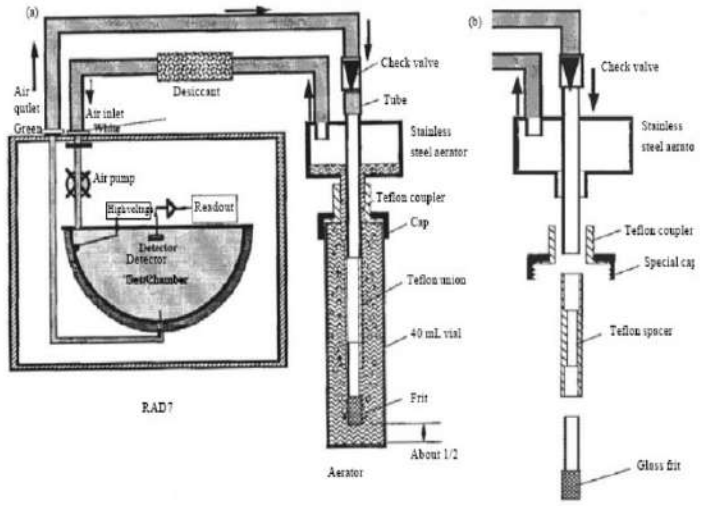

Figure 1: RAD 7

Study Areas: The study area covers some regions belonging to Pathankot district located in the north zone of the Punjab state as shown in the map in Figure 2.

Results and Discussions: The results of measurements are summarized in tables 1. A total of 20 samples were analysed. It can be seen that radon activity in water varies from 73.18 pCi/L to 259.18 pCi/L and the safe value recommended by EPA is 300pCi/L.

Sample no.	Location	Radon conc. In pCi/L
1.	Model town	150.56
2.	Pangoli	194.35
3.	Bharoli	187.84
4.	Daulatpur	78.47
5.	Saran	178.35
6.	Jhangase	195.18
7.	Gobindsar	117.87
8.	Bahlopur	87.32
9.	Sherpur	187.04
10.	Jakhwar	216.73
11.	**Jhakhian Lahri**	**73.18**
12.	Chotapur	210.26
13.	Sujanpur	82.39
14.	Bhoa	155.48
15.	Sunderchak	118.89
16.	Gatora	202.56
17.	Gharota	176.61
18.	**Malakpur**	**259.18**
19.	Jhokho Lahri	93.69
20.	Ranipur	204.69

Table 1

Conclusions: Present study reveals that the value of radon concentration in the water samples is well below the recommended safe limit values in all the regions from where the samples were collected.

Graphical representation of results obtained after study—

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Quantum Logic Gates – An Overview

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***Abstract*-Last three decades have seen the evolution of digital electronics and hence the information technology. The whole development in this field was due to improved transistor based circuitry and laser based Very Large Scale Integration (VLSI) techniques. In present day processors there may be millions of components on a small chip of a few square centimeter size. This is leading to saturation in the field as further miniaturization is becoming more and more difficult and expensive. The number of transistors required for more information processing increases exponentially, which further inhibits the scope of improvement in the traditional information processing methods. In quantum mechanics the existence of superposition states, capable of holding more information, present a new avenue. The scope of the field is further enhanced as the information transmission across particles, entangled quantum mechanically; need no physical contact between them. The reversibility of quantum logic gates requires one to one mapping between its inputs and outputs. In the present work CNOT gate and three bit Toffoli gate have been studied.**

Key words: Quantum entanglement, CNOT gate, Toffoli gate

I. INTRODUCTION

Conventional silicon based computing technology has reached to its upper physical limits of design complexity, processing power, memory, energy consumption, density and heat dissipation [1]. According to Moore's law the number of transistors that can be placed inexpensively on an integrated circuit doubles every two years[2]. As the need of processing more information increases, the number of components required on the processor also increases. There are about 55 million components on a Pentium IV chip of size 0.705 inch diameter [3]. This density of components has already seen the design complexity. Further extrapolation of Moore 'law would require silicon transistors with layers only a few atoms wide. Further miniaturization will lead to exponential growth in the price index of the silicon based industry which can be counterproductive itself.

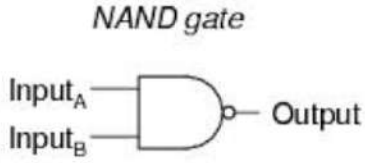
Another problem with the existing classical computer technology is the increase in the power consumption. It is increasing at the rate of S0.7 for every generation of the processor [4]. The power consumption of the first computer chip was 0.1 Watt whereas it has increased to 135 Watts for Pentium IV 3.2 Ghz processor [5].

II. PROBLEM ORIGIN AND FUTURE PROSPECTS

The discussion leads us to conclude that in order to avoid reaching saturation in the information processing speed, the scientific fraternity must look for alternative computing options. Much theoretical experimentation has been in picture for quite a long time now. The leading theories include optical computers. These computers use light pulses instead of electrical pulses, this leads to claimed speeds 105 times the conventional computers [6]. DNA computers are another option in which the information can be stored and processed by a small molecule just as DNA does in living organisms. Information encrypted on a DNA performs biological processes at molecular level [7]. However none of the proposed theories are as practicable as Quantum Computers. In quantum computation, unlike transistors where they may be either in '0'ór '1'''states, the superposition of '0'ánd '1'áre also allowed. The concept of superposition state can be understood from its optical analogy. A beam of unpolarised light cannot pass through a pair of crossed polaroids, yet we can get some light beyond the second Polaroid if we put a third Polaroid between the first two polaroids. This can be ssen as the superposion of horizontally and vertically polarized lghts.

III.QUANTUM LOGIC GATES AND REVERSIBILITY

The basic computing theory of Turing [8] had irreversible classical computation with 'many to one' mapping. Consider the truth table of universal classical NAND gate



A	B	Output
0	0	1
0	1	1
1	0	1
1	1	0

FIG.1 A classical NAND Gate

It is easy to find out the output by knowing the inputs but the converse is not correct. For superposed states it is essential to create gates with one to one mapping. This basic quality of reversibility is shown by some of the classical gates like NOT gate. Here we discuss now the reversibility property of quantum gates. The CNOT gate, one of the most fundamental quantum logic gate, has its operation similar to

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classical XOR gate. It works with q-bits rather than with classical '0'ánd '1'' states.

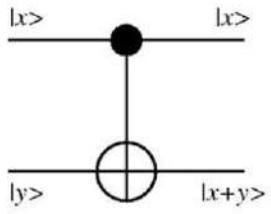

Fig.2 Quantum C-NOT gate

Here the first bit is the control bit. If it is zero then there is no effect on the second bit but if it is one then the second bit is complimented. The q-bits $x\rangle$ and $y\rangle$ themselves can be superposition staes of zero stae and one state. The matrix formulation of the C-NOT gate is

$$\mathbf{CNOT} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 \end{pmatrix}$$

Fig.3 Matrix formulation of CNOT gate

But the problem is that a two q-bit reversible logic gate is not universal in nature unlike its classical counterpart.

To make the NAND gate reversible in nature and hence be fit for quantum computers we can copy one of its inputs to the output and the second output will be input1.NAND.input2.

Output1= input1 (or input2)

Output2= input1.NAND. input2

Still the truth table does not remain reversible. The reversibility however can be achieved if we copy both the inputs to the output and the third q-bit stores the output of two inputs NANDed together.Toffoli [8] proposed three q-bit gate which is reversible as well as universal.It is termed as C-C-NOT gate (Controlled controlled Not gate). The complimentation of the third bit takes place only if first two bits are in aparticular $\langle 1|1\rangle$ state. For other states it does not do anything to the third bit.

Toffoli =

$$\begin{matrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \end{matrix}$$

Fig. 4 Formulation of Toffoli gate

IV. PRACTICAL IMPLEMENTATION

Although theoretically the concept of quantum logic gates is well founded and is being worked upon for a long time still its practical implementation is at least 10 years away. The information q-bit in its physical form may be a photon oscillating between a pair of parallel mirrors, the polarization state of which is the required q-state. Or it may be the spin of a particle which serve as the q-bit. But for any practicability these physical states should be able to reliably store and interrogate the q-bit, however due to Decoherence the particle change state [9,10]. IBM has claimed to have gained a coherence of about 0.1 milisecond, which is good but not enough.

V. CONCLUSIONS

In the scenario where further miniaturization of classical computers is not possible quantum computers can offer a great advancement in the future information technology. The reversibility of quantum logic gates is a fundamental property which can be achieved using Toffoli gate. Practical implementation of these gates is still facing problems of decherence.

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Implementation of Cloud Computing on Web Application

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Abstract-Cloud computing is a new method to add capabilities to a computer without licensing new software, investing in new hardware or infrastructure or training new personnel. Applications are purchased, licensed and run over the network instead of users desktop. It provides common business applications online that are that are accessed from a web browser, while the software and data are stored on the servers. The web is a global hypertext system, has evolved into a distributed application platform, in which the application logic and user interface are two separate entities. As we move toward the cloud computing web platform, web from web content to web of applications, the bulk of user data applications will reside in the network cloud.

Web applications are a critical part of internet infrastructure and are used for banking, email, financial management, online shopping, auctions, social networking and the corporations such as Google, Microsoft and yahoo expend considerable effort to keep up with the growing demand for communication-heavy internet services which require image and video sharing, social networking and searching. There is a shift from displaying information using locally installed programs towards displaying information on a browser. In this paper, we give special importance to the connection between cloud computing and web application. Also we discuss the advantages of cloud computing and survey challenges and issues related to cloud computing.

Keywords-Browser, Cloud computing, Network cloud, Web application.

I. Introduction

Web applications are distributed client-server applications in which a web browser provides the user interface, the client browser and the server side exchange protocol messages represented as HTTP requests and responses. Due to current implementation methods, it is difficult to find out if a certain application enforces adequately the confidentiality or integrity of the information it manipulates.

The vast amount of content available via URLs is now accessible by highly reactive user interfaces via HTML and JavaScript. Most browsers allow JavaScript code to issue its own HTTP requests, a functionality used in the AJAX (Asynchronous javaScript and XML) development approach [1]. Using AJAX, a web page can contain executable code that connects your computer to a server and thevirtual connection bypasses the security mechanism integrated into your browser. The underlying mechanism of AJAX is the function XM LHTTP Request [5] which allows a remote procedure call to a server on the internet.

Applying web technologies to the web, in which the user has final control over the visual presentation and user interaction. Web gadgets such as specialized browsers automate away a large part of the user actions when navigating through websites and directly embed the target webpage into the user browser. Browsing the web on small devices like mobile phone relies on Web API, Rich Site Summaries (RSS) and Atom feeds [3]. Web gadgets provide specialized browsing functionality and are hosted in a variety of environments ranging from server-side containers to client-end user. Users can drastically alter the interaction with web content through scripting. Grease monkey, a Firefox extension has enabled users to attach arbitrary scripts to web content [4]. To enable scripting, Google offers Google- Axs JAX [5]- a JavaScript library which helps developers to enhance accessibility for users with special needs such as hearing and visual impairment [6] [7]. A new paradigm of computing has started to evolve in recent times called cloud computing. In this environment, the applications, data and software no longer exist on the client side, instead they are treated as abstract services and reside in a cloud. A cloud can be network of nodes which exist on the server side [8].

II. Web Application and Cloud Computing

The services are accessible anywhere in the world, with the cloud appearing as a single point of access for all the computing needs of consumers. New advances in processors, virtualization technology, disk storage, broadband internet access and fast, inexpensive servers have all combined to make cloud computing a compelling paradigm. Cloud computing allows users and companies to pay for and use the software and storage that they need, when they need then and as wireless broadband connection options grow, where they need them. This type of software deployment is called Software as a Service (SaaS) [9]. [10]

Many of the underlying technologies such as grid computing, peer-to-peer computing have a direct contribution to cloud computing. In order to understand what type of components exist in a cloud, we first need to enumerate the

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typical components of an application development. The components excluding human resources are i) infrastructure resources ii) software resources, iii) application resources and iv) business processes [11]. In the cloud computing paradigm, all of the above components are treated as services and are in the "cloud"; users do not have to invest or pay huge licensing fees to won any of the above resources. Infrastructure resources are storage, computing power and so forth, which can take advantage of already existing technologies such as grid computing. The software resources include application servers, database servers, IDE and so on. The application resources include applications deployed as SaaS for example Google docs.

The business process resources can be standard set of common business utilities given as services to clients. Example is ERP software such as SAP and Oracle providing standard business workflows in the cloud. Some of the major players in cloud computing are Amazon [12], Google [13], IBM [14], Joyent [15], Microsoft [16] and Sales Force[17].

Current cloud computing services are storage services, spam filtering, performing applications in high level programming languages such as Java or the use of some kind of database. In 2008, Google has released Google App Engine [13], a cloud-based platform used for running applications both individuals and businesses. Microsoft has released Windows Azure [16], a cloud-based operating system, for the Community technology Preview.

III. Advantages and Issues Related to Cloud Computing for Web Application

There are several advantages to cloud computing and some of them are presented below:

3.1 Price: It is easy to see that start-up enterprise companies do not have to invest huge sums of money into setting up infrastructure such as huge application servers, data servers, database administrators, people resources for managing such critical systems including backup and recovery, etc. Instead, enterprise companies pay for services based on usage.

3.2 Simplicity: It is simple to use and set up all the services without having to worry about resource management and other hassles that come with infrastructure set up and management.

3.3 Reliability: Network and data access are guaranteed to be reliably maintained as the service provides are experts in maintaining the infrastructure and such reliability is backed by some kind of "money back guarantees" or penalties for the providers in the event if they have a down time.

3.4 Flexibility: Service consumers have the flexibility to "outsource" parts of the infrastructure and can still maintain to some extent proprietary data at their own site.

3.5 Collaboration: Since all the applications are on the cloud, it becomes a natural fit for consumers to effectively collaborate on a common project or application.

There are several issues related to cloud computing and some of them are presented here.

IV. Privacy and Security

Cloud computing allows users to add more capacity, more services and seamless software patches, despite of existence of encryption and access-control software, some organizations will be hesitant to put their proprietary data on a public-access cloud. From a practical point of view, does the data still remain proprietary if it is stored on a public server? What laws will protect such data in case of software piracy? Anyone who stores data on the memory bank could theoretically access locations outside their space. How is security of the data handled in this case? From both privacy and security points of view, the more restricted the access to the data is, the easier it is to protect it. In order to ensure fast access to data stored and to prevent the loss of data in case of failure of one data centre, the users data may be mirrored on two or more sites, making it even more vulnerable. On the other side, grouping such a massive amount of data in one physical location makes it prone to damage. To prevent such large-scale failures, the data should be stored on sites that are geographically far apart.

4.1 Standards: There need to be standards governing regulations which ensure uniformity in how the applications are accessed, stored and modified. Otherwise consumers have fewer options to move their entire operations because of cost considerations. However, with standards, enterprises will have neutrality in picking the service provider. Yet, at this time of this writing, none of the entities have started describing such standards. To be effective, major players need to join to agree on standards.

4.2 Legality: Who owns the enterprise data? Do the service provides also have ownership? Even if non-disclosure agreements are signed, these might be waived when government agencies are involved. This begs the question whether the client might be ready to forgo the rights of their data. As well, issues arise regarding intellectual property rights when data services are hosted by a third party site.

4.3 Mentality: For wide acceptance of cloud computing it requires consumers to relinquish the ownership mentality some extent and to develop a somewhat broader mindset. Indeed once service for cloud computing is accepted; it will be hard to go back to older ways.

4.4 Pricing Theory: If prices do become prohibitive then pricing theories and mechanisms need to be revisited certainly in the long run. Are the service provides willing to give discounts based on length of usage, frequency of usage, etc? It is hard to impose limits on a free market where the survival of the company depends on cloud computing services employed.

V. Data Servers and Managing Energy Consumption

As of 2009 the majority of cloud computing infrastructure consists of reliable services delivered through data centers and built on servers with different levels of virtualization technologies. Data centers are the physical form of cloud computing.

The idea is to move computing and storage from the user's desktop or laptop to remote locations where a huge collection of servers, storage systems and network equipment can form a seamless infrastructure for applications and storage. Data

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centers are warehouse-like buildings with thousands of servers. They are built by the internet giants such as Amazon, Google, Microsoft, and Yahoo, based on affordable land, readily available fiber-optic connectivity, abundant water, inexpensive electricity and relative goof weather. Today, most advanced data centers store tens of thousands of servers. Each server has the dimension of a pizza box and contains one or more processors, memory, a hard disk, a network interface, a power supply and a fan. A rack holds up to 400 such blade servers, slid vertically like books on a shelf. Vendors like IBM, HP, Sun Microsystems, Rackable Systems, Venari Systems houses 1400 blade servers. Energy efficiency reduces greenhouse gas emissions, saves money and water. Power plants require an average of two gallons of water per kW-hour electricity produces. In 2007, US Environmental Protection Agency (EPA) confirmed that the data centers spend almost half of their energy consumption on power converters and cooling systems for the servers [18] [19]. The computing components- the CPUs and the money-receives around two thirds of the total energy consumed by a server, the rest is lost. A major loss occurs when converting electricity from AC (power outlet) to a set of low DC voltages. The voltage regulator circuitry on the motherboard converts further the low DC voltages to the voltages required by the microchips. The data center is supplied by high-voltage AC that needs to be converted to the standard 120 or 208, with up to 9% loss. Additionally, the components of a server use DC, so an AC-to-DC conversion is needed, that generates additional loss. Distributing high-voltage DC power throughout the data center may reduce the loss. The new Nehalem servers of Intel will have voltage regulators, software tools to monitor power consumption e.g. Dynamic Power Node Manager, a power-efficient motherboard that uses 85W instead of 115W in idle mode [20]. Still, better designs are needed to improve the power needs. The Climate Saver Computing Initiative is a group of industry partners which includes Intel and Google. The initiative advocates efficient computing and is committed to cut the energy used by computers in half by 2010.

VI. Conclusion

Cloud computing is currently gaining popularity as an inexpensive way of providing storage and software. A new paradigm of computing has started to evolve in recent times called cloud computing. As wireless broadband connection options grow cloud computing allows users and companies to pay to and use the software and storage as needed, in this environment, applications, data and software no longer exist on the client side, instead they are treated as abstract services and reside in a cloud. A cloud can be a network of nodes that are located on the server side.

Many of the technologies such as grid computing, peer-to-peer computing have a direct contribution to cloud computing. We have given special importance to the connection between cloud computing and web applications. We have listed advantages of cloud computing and have highlighted challenges with cloud computing.

Special software tools like virtualization allow a single machine to be seen as multiple independent machines. In this way, a server can increase its utilization to up to 80%, compared to the average of 16% obtained currently. Self-management of such servers will involve controlling power usage, sharing of the distributed data and failure detection and correction.

Many companies are moving forward with the intention if building easy to use clouds. There is tremendous potential for consumers to exploit the cloud computing technology. With that in mind, in this paper we have given an introduction to the technology and discussed the advantages as well as the challenges associated with it.

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