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Biometrics in IRIS Technology: A Survey

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Abstract- In olden days people were identified by physical characteristics such as birthmarks and scans, which was biometrics then. Today we have devices that do similar jobs and more accurately. Modern era is full of advantages and culprits who tamper with these advantages .In this we try to present a way to deal with these people at large. Biometric systems fall into two categories:

- Authentication
- Identification.

To be authenticated by a system, a subject presents a password or a token such as an ID card along with a live biometric sample such as fingerprint or iris. Airports, prisons, and companies that need secure access use these biometric systems [1].

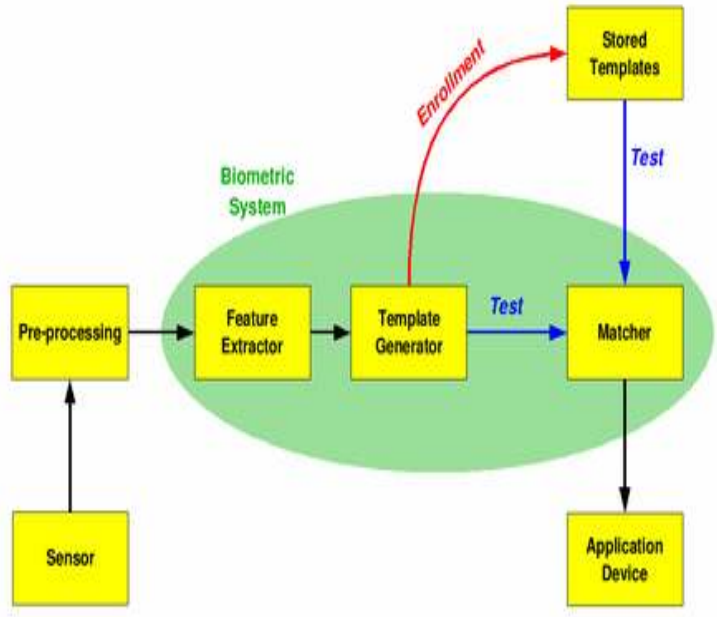

Figure 1: Biometric System

As time evolved various issues of the security, using recognition technologies has evolved. It comes in various forms like…

- Iris and retinal scans
- Facial recognition
- Finger print
- Voice recognition
- Hand geometry

Here we try to present one of the various above-mentioned ways that is iris Technology. We try to explain how and where it is employed.

Index Terms- Biometric Identification, Biometric Authentication, IRIS scans, Retinal scans, Remote Optical Unit

I. Introduction

In golden days people were identified by birth marks facial features and scans which were biometrics then. Biometrics is slowly but surely becoming standards of Authentication in everyday life. Banks worldwide are already experimenting with iris and Retinal scans for ATM machines; laptops are being produced with built in finger print scanners. There are more and more industries going biometric way. With the advent of Modern era, it has become important to go for technologies, which are more secure.

As time evolved various issues of the security, using recognition technologies has evolved. It comes in various forms like

1. Iris and retinal scans
2. Facial recognition
3. Finger print
4. Voice recognition
5. Hand geometry

II. Research Details About Other Authentication

A. Iris and Retinal scan

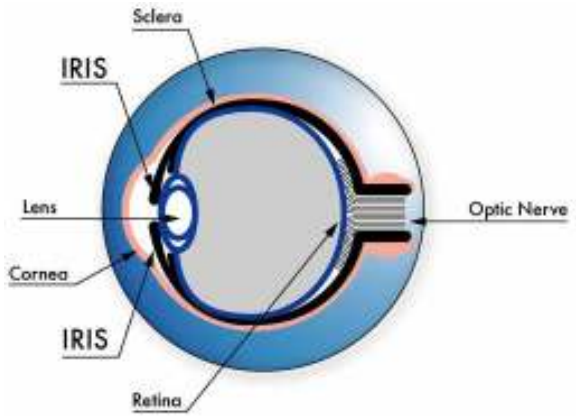

Figure 2: IRIS Scan

Iris and retinal scans are two completely different methods of identification.

1. The iris is photographed using a conventional COD camera, and the resultant image is compared to the template image that is stored in the database for iris characteristics such as filaments, crypts, striations and freckles.
2. In retinal scanning, the capillaries at the back of the eye are analyzed but it creates problem with those using spectacles.

B. Facial Recognition

Facial recognition tries to match various facial characteristics such as distance between eyes, width of nose, cheekbones, jaw line and chin characteristics to arrive at an identity match. This has found limited success in practical applications due to various factors such as facial features being covered by hats or hair, reflection from spectacles angle of capture.

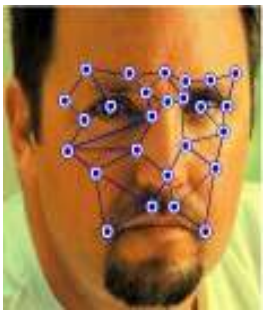

Figure 3: Face Pattern

C. Hand Geometry

Hands by themselves are not descriptive enough to result in positive Identification. It takes into consideration a combination of various factors such as shape, Size, finger length, thickness, and such. It is generally used where fingerprint is considered intrusive.

Figure 4: Hand Geometry Scan

D. Fingerprint Scans

Fingerprinting has played a very important role in forensics. Fingerprint scanning devices are one of the most common biometric devices available. However the device used are slightly more complex. They follow various methods from matching print patterns such as whorls, cusps, and ridge the matching of at least 15 different characteristics.

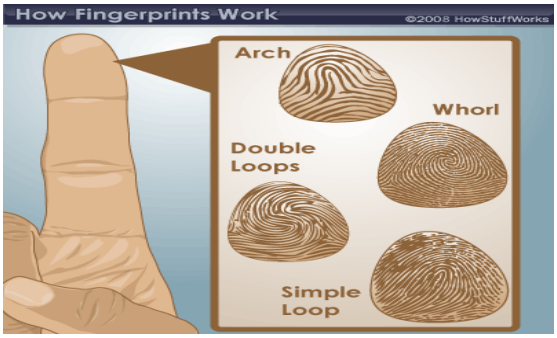

Figure 5: Finger Print

E. Voice Recognition

This is favorite of moviemakers. Some often access their cars, secret underground tunnels by just mentioning a few key phrases. Voice verification is not effective because acoustics and other external disturbances interfere with the process.

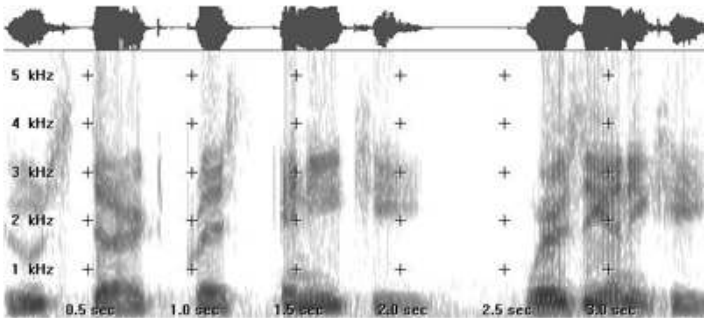

Figure 6: Voice print

III. IN DEPTH: IRIS TECHNOLOGY

Iris is a part inside our eye, which is unique in every individual, it remains unchanged till end of life this is the most prominent technique that can be implemented. The capture of iris is very simple one even need not stand before the camera. So here, we try to give the details of how iris scan is implemented.

Iris recognition is the best of breed authentication process available today. Iris recognition takes a picture of the iris; this picture is used solely for authentication it is different from retinal scanning.

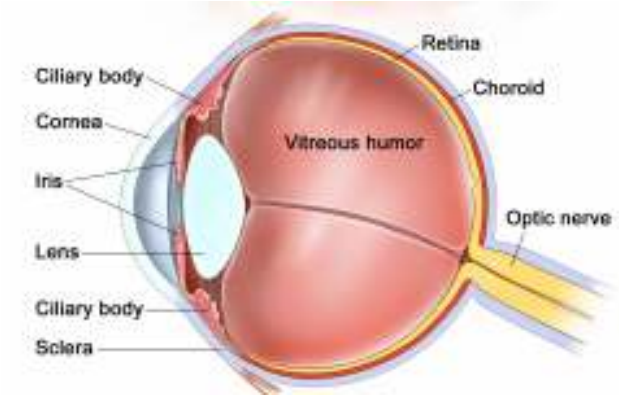

Figure 7: Retina Scan

Iris security system is smoother, smarter and more secure identification system Automated high speed iris capturing and precision identification make iris identification system the world's most advanced access and entry point security identification system. The automatic capturing of iris, identification is as simple as looking at the camera. High speed and precision make this system the world's most advanced access and entry point security identification system.

Using the iris recognition technology has reduced errors to less than one in 1.2 million ensuring highly precise individual identification. Confusion or duplication with another individual is virtually impossible. No physical contact makes it perfectly

safe. As the users simply need to stand in front of the camera, physical contact is not required. A very weak amount of infrared illumination is used, making the system perfectly safe.

B. Camera Specification

Specifications of the camera used to capture the iris are-

1. It takes approximately 3 seconds for recognition that is to capture the eye and check the data.
2. It can recognize up to 4000 irises i.e. 2000 persons. This accepts an ID of maximum 17 digits and a password of 10 digits.
3. The iris can be captured within a distance of 20 meters from control unit. Backup for iris recognition is password access by 10 key inputs.
4. The camera can be installed on the table with camera stand indoor application only and only in vertical direction.
5. It requires a power of 32v DC from control unit max. 20m, from control unit and 24v DC with power supply of unit max. Of 100m from control unit.
6. The operating temperature is from +zero deg c - +40 deg c and operating humidity is 20% to 80%.

B. Why Iris recognition preferred

Iris recognition is preferred as it is

1. Stable: The iris in human has a unique pattern hitch is formed by 10 months of age, and remains unchanged throughout one's lifetime.
2. Unique: It is impossible for two irises to produce the same code.
3. Flexible: Iris recognition technology easily integrates into existing security systems.
4. Reliable: Iris pattern is distinctive and is not susceptible to theft, loss or compromise.
5. Non-Invasive: Iris recognition is non-contact and quick, and offers unmatched accuracy when compared to any other security alternative, from distances as far as 3" to 10" unlike retinal screening.

IV. HOW IT WORKS

Iris recognition technology provides accurate identity authentication without PIN numbers, passwords or cards and the enrollment takes less than 2 minutes. Authentication takes less than 2 seconds. Producing a template to enroll has been made easy with the use of Video-based technology.

The terminology "iris-scanning" is often used when referring to iris recognition technology, but there is no scanning involved at all. Iris technology is based on pattern recognition and the pattern-capturing methodology is based on video camera technology similar to that found in camcorders commonplace in consumer electronics.

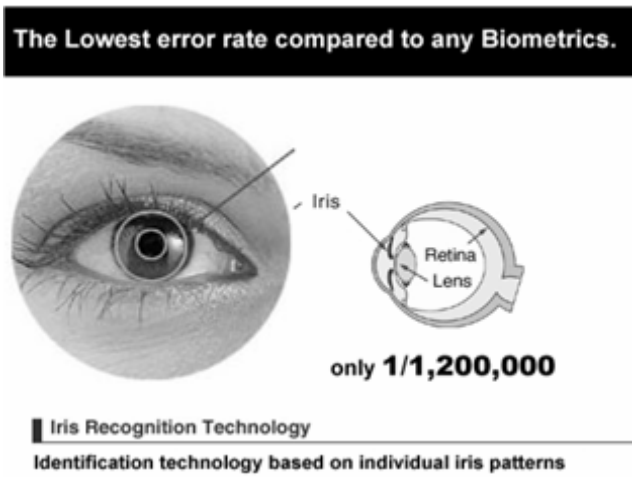

Figure 8 IRIS Ratio

B. Iris Scan

The camera has two apertures. The first contains a hologram that helps position the eye properly for registration or verification and performs the actual recognition. The second helps illuminate the eye to create an accurate image map of your eye as with the U. Are U system, enrollment is simple and straightforward. People wearing glasses need to take them off during enrollment, but they do not have to remove them later to be identified for login, according to the company.

We claim that we can replace any traditional authentication user ID and password schema with Iris recognition and iris authentication technology in any application, operating system or any web application. Retina is that reliable tool, that, any Organization, which is serious about protecting their network environment to help maintain network integrity.

B. Recognition

Recognition takes just 2 seconds. The proximity sensors activate the Remote Optical Unit (ROU) when the subject nears the operational range of the unit upon approaching a portal protected by iris access. The same mirror assisted, audio prompted interface that the subject became familiar with at enrollment helps ensure proper positioning and speedy recognition.

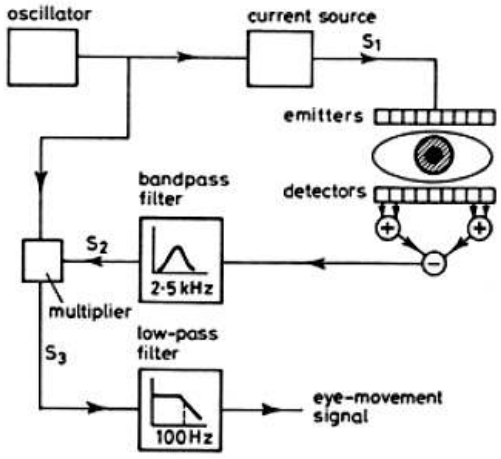

Figure 9 IRIS Scanning

To create, select and digitize an image to be compared against the stored value retained at enrollment the ROU uses the video and Frame grabbing method. The live presented value is compared against stored values at the Well-secured Identification Control Unit assigned to the portal. Once the iris is matched, Either a direct signal is sent to activate a door, or a Weygand signal sent to a central Access panel provides the drive to open the door to an individual authorized to enter.

C. *How Iris recognition compares to other Biometrics (Merits)*

Accurate: The iris recognition is the most accurate of the commonly used biometric technologies. There are a number of factors that weigh heavily in iris recognition's favor for applications requiring large databases and real-time authentication.

Every iris is absolutely unique. A subject's left and right iris is as different from each other as they are from any other individual's. The chance of finding two randomly formed identical irises has been calculated and is on an almost astronomical Order of one in 1078.

No human intervention is required to "set" thresholds for False Accept and False Reject performance is another differentiator affecting accuracy, while an unmatched EER (equal error rate) performance of 1 in 1.2 million is delivered.

The data-richness of the iris itself is at the root of iris recognition's accuracy. The Iris Access system captures over 240 degrees of unique characteristics in formulating it algorithmic template. Fingerprints, facial recognition and hand geometry have far less .Detailed input in template construction. Iris recognition can authenticate with confidence even when significantly less than the whole eye is visible.

Stability: Virtually every other biometric template changes significantly over time, detracting from overall system performance and requiring frequent reenrollment. Voices change. Hands and fingers grow. The type of labor one does, even weather temperature or one's medical condition can result in template changes in other technologies. Barring suffering and certain ophthalmologic surgery, the patterns in the iris are constant from age one to death.

Fast: No other biometric technology is designed to deliver 1-n searching of large databases in real time. A 2001 study conducted by the UK's National Physical Laboratory found iris technology was capable of nearly 20 times more matches per minute than its closest competitor was. By speed in conjunction with accuracy, there is no other technology that can deliver high accuracy authentication in anything close to the real-time performance of iris recognition.

Conversely, fingerprint searches are challenged by database size, adding time to searches or necessitating filtering as a search acceleration technique. Even so, fingerprint technology often returns multiple "possible matches," forcing introduction of human decision factors and increasing the potential for error in an authentication decision.

Scalable: As iris data templates require only 512-bytes of storage per iris, very large databases can be managed and speedily searched without degradation of performance accuracy.

Non-Invasive: In the imaging and iris authentication, bright lights or lasers are used. The user can stand as far as 10" away from the unit, and even wear glasses or contact lenses without compromising system accuracy. Unlike some other popular biometrics, iris authentication involves no physical contact. Not only does this mean "no touch" zero authentications, it also means the technology is ideally suited for use in environments where rubber gloves or other protective gear is used.

V. DISADVANTAGES

1. Fingerprint technology seems best suited for PC and network access.
2. Managing this convergence of physical and information security requirements now drives security system architecture design and implementation, and is an increasingly key factor in biometric technology selection.
3. Managing convergence will only become a more complex task because as the IT and communications becomes increasingly wireless, the need for robust identity management will become more acute.
4. Small target (1cm) to acquire from a distance (1m).
5. Moving target within another on yet another.
6. Illumination should not be bright or visible.
7. Obscured by eyelashes, lenses, reflection.

VI. APPLICATIONS

Iris technology is implemented in various places like offices, traffic control centers, airports, and at several public places

1. Offices: Data centers, material storage, safes, executive offices, secure meeting rooms
2. Laboratories and Factories: Drug or dangerous materials storage rooms, night or holiday entry control
3. Financial Institutions: Safes, safety deposit box room
4. Lifeline Facilities: Power generator rooms, dam management offices, gas company control rooms
5. Traffic Control Centers: Expressway administration centers, railroad dispatcher rooms
6. Airport and Harbor Facilities: Staff gates, immigration, workshops.

VII. CONCLUSION

The versatility of iris technology lends itself to virtually any application where identity authentication is required to enhance security, ensure service, eliminate fraud or maximize convenience.

Iris recognition applications are generally opt-in – there is none of the surveillance stigma sometimes affiliated with facial recognition, which scans crowds looking for individuals. Nor is there any tie –in to the large fingerprint databases maintained by law enforcement agencies, which often gives a negative stigma to fingerprint-based systems.

Today…

While the most common use of iris recognition to date is physical access control in private enterprise and government, the versatility of the technology will lead to its growing use in large sectors of the economy such as transportation, healthcare, and national identification programs. Although security is clearly a

prime concern, iris recognition is also being adopted for productivity-enhancing applications like time and attendance.

Tomorrow…

Enterprise and government both acknowledge the convergence of physical and information security environments, but there are new security challenges on the horizon – just-in-time inventory control, sophisticated supply chain management, and even a phenomenon called "coo petition"-in which companies that compete in some areas, cooperate in others.

REFERENCES

[1] P. J. Phillips, A. Martin, C.L. Wilson and M. Przybocky, "An Introduction to Evaluating Biometric Systems", IEEE Computer Magazine, February 2000, pp 56-63.
[2] UK BWG, "Best Practices in Testing and Reporting Performance of Biometric Devices", January 2000, web site: http://www.cesg. Gov.uk /technology/biometrics.
[3] A. Mansfield, G. Kelly, D. Chandler, and J. Kane, "Biometric Product Testing Final Report", issue 1.0, U.K. National Physical Lab, March 19, 2001 http://www.cesg.gov.uk/ technology /biometrics/.
[4] LibraryThinkQuest.org "Introduction to Biometrics". Retrieved March 29,2010 from http://library.thinkquest.org/28062/intro.html
[5] Tom Harris "How Fingerprint Scanners Work". Retrieved March 29,2010 from http://computer.howstuffworks.com/fingerprint-scanner4.htm
[6] WikTionary.org "biometrics". Retrieved March 29,2010 from http://en.wiktionary.org/ wiki/ biometrics
[7] It.Jhu.edu "biometrics". Retrieved March 29,2010 from http://www.it.jhu.edu/ glossary/ abc.html
[8] IdTeck.com "What is Fingerprint Recognition?" Retrieved March 29,2010 from http://www.idteck.com/support/w_fingerprint.asp
[9] BiometricNewsPortal.com "Fingerprint advantages". Retrieved March 29,2010 from http://www.biometricnewsportal.com/fingerprint_biometrics.asp
[10] IdTeck.com "What is Fingerprint Recognition?" Retrieved March 29,2010 from http://www.idteck.com/support/w_fingerprint.asp#1
[11] Britannica.com "Iris". Retrieved March 29,2010 from http://www.britannica.com/ Ebchecked /topic/294031/iris Vision.about.com "Iris". Retrieved March 29,2010 from http://vision.about.com/od/eyeanatomy/g/Iris.htm
[12] Daniel "Iris recognition at airports uses eye-catching technology". Retrieved March 29,2010 from http://www.howstuffworks.com/ framed.htm?parent=biometrics.htm&url=http://archives.cnn.com/2000/TECH/computing/07/24/iris.explainer/index.html
[13] Tracy V. Wilson "How Biometrics Works". Retrieved March 29,2010 from http://www.howstuffworks.com/biometrics4.htm
[14] DiscoveriesInMedicine.com "Retinography". Retrieved March 29,2010 from http://www.discoveriesinmedicine.com/Ra-Thy/Retinography.html
[15] WiseGeek.com "How does a Retinal Scan Work?". Retrieved March 29,2010 from http://www.wisegeek.com/how-does-a-retinal-scan-work.htm
[16] Ostaff, Courtney. (April, 2008) "Retinal Scans Do More Than Let You In The Door."
[17] Searchsecurity.Techtarget.com "Voiceprint". Retrieved March 29,2010 from http://searchsecurity.techtarget.com/sDefinition/0,,sid14_gci946211,00.html
[18] Tracy V. Wilson "How Biometrics Works". Retrieved March 29,2010 from http://science.howstuffworks.com/biometrics3.htm

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ENVIRONMENTAL IMPACT of Macrophytes on some Fresh Water bodies in washim District, MAHARASHTRA state, INDIA

Mukund Dhore, Manik Dhore, Dinesh Dabhadkar*

Abstract- Study of environmental impact of macrophytes on fresh water bodies in Washim district were undertaken during the year 2009 to March 2011. Ten species were observed belonging to different classes, out of which *Hydrilla verticillata* (L.F.) Royle*, Chara spp, Potamogteon pectinatus* L, *Najas minor* L. and *Ceratophyllum demersum* L. were found to be dominating. During most of the year, surface of the water, especially in the shallow areas were found to be covered with these macrophytes. However *Hydrilla verticillata* (L.F.) Royle, a rooted submerged weed was observed to be dominant on other weeds. Other less dominant macrophytes found in the fresh water bodies were *Ottelia alismoides* (L.) Pers*., Typha angustata* Bory and Choub*., Vallisneria spiralis* L. and *Limnophylla sessiflora* L.. These macrophytes were found to be responsible for reducing water storage capacity in the fresh water bodies and also cause tremendous loss of surface water of the dam through evapotranspiration. Macrophytes also reduce pond productivity by causing accumulation of silts. Due to excessive growth after death, the plants produce excess amount of nutrients which pollute the water and impart faul smell to the water. Therefore the rapid spread of aquatic weeds in the fresh water bodies in Washim district by vegetative and other means is creating serious socio-economic problems, causing enormous economic loss of water resources.

Index Terms- Environmental impact, Macrophytes, Aquatic weeds, Fresh water bodies

I. INTRODUCTION

Aquatic weeds referred to as Macrophytes constitute an important component of aquatic ecosystem. Their diversity and biomass influence primary productivity and complexities of tropic states (Kumar and Singh, 1987), Excessive growth of Macrophytes hinder navigation, choaking rivers, irrigation channels, dams and lakes etc., impede drainage; interfere swimming recreation on water bodies, bathing and fishing, increase silt-deposition (Mandal, 2007). These aquatic plant problems have arisen due to global mismanagement and pollution of the environment, which favors rapid colonization of aquatic bodies by aquatic plants and the complete absence of adequate strategies for proper harnessing and control of aquatic plants. When aquatic plants massively colonize water bodies, siltation, decline in fishing and fisheries activities, disruption in water transport, increased water accident due to blockages often resulting in loss of human life are common (Obot, 1985).

II. MATERIALS AND METHODS

The study area i.e. the Washim district is locted in western part of Vidarbha. The three fresh water bodies' Adan dam in Karanja tahsil, Ratanwadi Lake and Wai Lake in Manora tahsil of Washim district were selected for the present investigation in Washim district. All these water bodies supply drinking water to rural and urban areas and these water bodies are surrounded by small hills which drain water during monsoon. Collection of specimen was done with the help of hook then they were thoroughly washed and excess water soaked with a filter paper, kept in polythene bag and brought to the laboratory. Identification of the macrophytes was done with the help of literature following the methodology of Dawson and Robinson (1984), Olding, *et al.,* (2000).

III. RESULT AND DISCUSSION

The presence of excessive aquatic vegetation influences the management of water in natural waterways (Pandit and Ashok, 2002). All the aquatic weeds interfere with the static and flow water system (Murphy, 1988). In a very a few location where weeds are limited in number show some advantages like, maintaining O_2 – CO_2 balance, providing food to some herbivorous fishes and also provide protection to tiny fishes from aggressive varieties. But majority of these fresh water bodies covered by weeds which cause maximum damage to them. Out of these ten species *Hydrilla verticillata* (L.F.) Royle, *Potamogeton pectinatus* L., *Najas minor* L. Forsk., *Chara spp., Ceratophyllum demersum* L. observed to dominant. During most of the year except surface of the dam water, especially in the shallow areas, were found to be covered with these macrophytes. Other less dominant macrophytes found in the dam were *Ottelia alismoides* (L.) Pers., *Typha angustata* Bory and Chaub., *Vallisneria spiralis* L., *Limnophylla sessiflora* L. They all create situations which are disadvantageous to the water bodies like, choaking up the water body, compete for space with the fishes, disturb dissolved O_2-CO_2 of dam water and reduce pond productivity (Mandal, 2007). Due to excessive growth after death, the plants produce excess amount of nutrients which pollute the water and impart foul smell to the water (Oomanchan, 1988). Fresh water bodies which are places of recreational and aesthetic use are badly affected by unexpected growth of aquatic weeds. Therefore the rapid spread of aquatic weeds in the fresh water bodies by vegetative and other means is creating serious socio-economic problems, causing enormous economic loss of water resources. Considering the losses caused by aquatic weeds (Akbay, 1991) their management is of at most importance to

increase the availability of water from these sources to its end users. The present work ten species of aquatic weeds belonging to different classes were observed (Table- 1)

Table 1: Environmental effect of some macrophytes of fresh water bodies of Washim district

Scientific name	Family	Common Name and Type	Effect On dam water
Hydrilla verticillata (L.F.) Royle	Hydrocharitaceae	Hydrilla and rooted submerged	*Hydrilla* alone dominated the other plants; it did not allow other weeds to grow in dam water and restricted the movement of organisms mainly the fishes and also provided shelter to small size predatory fishes and insects.
Chara spp.	Characeae	Stoneworts / Macroscopic algae	An alga is responsible for depletion of oxygen and gives an undesirable appearance and also spoils the taste of drinking water.
Najas minor L.	Hydrocharitaceae	Brittle naiaid/ submerged species	They are fast growing and gives undesirable appearance because blue green algae grown on this plant and also undesirable smell to drinking water.
Potamogeton pectinatus L.	Najadaceae	Pond weed / shallow water rooted submersed species	They are capable of absorbing nutrients through leaves, stems and roots. Severe competition exists with planktonic algae for nutrients and results in Decreased pond production.
Aponogeton natans L.f.	Aponogetonaceae	Floating less plant /Submerged species	They choke up the water body and responsible for reducing dam productivity. They cause loss of water through eva-transpiration, in addition cause impediment in flow of water.
Ceratophyllum demersum L.	Ceratophyllaceae	Common hornworts /Coontail	It has allelopathic qualities as it excretes substances that inhibit growth of cyanobacteria or blue green algae.
Ottelia alismoides (L.)Pers.	Hydrocharitaceae	Shallow water rooted with floating leaves hydrophyte	The leaves of plants body lies above the surface of water i.e. (column water). They compete for space with the fishes. These weeds make loss of water through eva-transpiration and disturb dissolved $O_2 - CO_2$ of pond water.
Typha angustata Bory and Chaub.	Typhaceae	Cat-tail (Common cat-tail) / Marginal hydrophytes species.	Plants are found along the shoreline of water body. They provide shelter to small size predatory fishes and insects.
Vallisneria spiralis L.	Hydrocharitaceae	Eel grass or Tape grass / shallow water submerged species.	It grows well in fresh water, not more than 3 m deep. This weed damage maximum, because it is not visible on the surface and impedes the flow of water varying upon the degree of their intensity and growth.
Limnophylla sessiflora L..	Plantaginaceae	Asian ambulia / Asian marshweed	They are fast growing and are able to regenerate from fragments. This species clogs irrigation and flood control canals.

Figure 1: Photographs of some Hydrophytes in fresh water bodies in Washim district.

Hydrilla verticillata (L.F.) Royle

Vallisneria spiralis L.

Ceratophyllum demersum L.

Chara spp.

Potamogeton pectinatus L.

Limnophylla sessiflora L

REFERENCES

[1] Akbay, K.S. 1991. Using optimizatioin and simulatioin techeniques to estimate initial weevil population. Journal of aquatic plant management, 29: 21-24.
[2] Dawson, F. H. and Robinson, W. N. 1984. Submersed macrophytes sand the hydraulic roughness of a low land chalk stream. Verh. int.Ver. Limnol. 22: 1944–1948.
[3] Kumar, M. and Singh, J. 1987. Environmental impacts of Aquatic Weeds and their classification. Proceedings of the workshop on management of Aquatic Weeds, Amritsar, Punjab, India, 21st November.
[4] Mandal, R.C. 2007. Weed Weedicide and Weed Control:Principles and Practice. 1st edi: Delhi. p.128-154.
[5] Murphy, K.J. 1988. Aquatic weed problems and their management, a review. The worldwide scale of the aquatic weed problem. Crop Protection, 7:232-234.
[6] Obot, E.A. 1985. The Management of Aquatic Macrophytes for Livestock Fodder: A Case Study of Echinochloa stagnina (Retz) P. Beauv. in Lake Kainji Nigeria. Kainji Lake Research Institute, New Bussa, Nigeria.
[7] Olding, D. D., Hellebust, J. A. and Douglas, M. S. V. 2000. Phytoplankton community composition in relation to water quality and water-body morphometry in urban lakes, reservoirs, and ponds. Canadian Journal of Fisheries and Aquatic Sciences. 57(10): 2163–2174.
[8] Oomanchan, L. 1988. Macrophytes of the Bhopal lakes Proc. Nat. Symp. Past, Present and Future of Bhopal Lakes. P. 23-25.
[9] Pandit, and Ashok, k. 2002. Conservation of lakes in Kashmir Himalaya. pp. 291- 328. In Natural Resources of Western Himalaya (Ashok K. and Pandit ed.). Valley Book House Srinagar, J & K, India.

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ICT's Impacts on Social Networking Websites and Rate of People's Satisfaction of Facebook in MALAYSIA

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Abstract- In this study we have tried to estimate customer satisfaction in different features, facilities and services which Facebook has provided. During the last years public networking sites have widely spread between communities, and currently we can observe usage of these sites between different generations, so it is so important for famous companies to enter this market and have a specific share in the business. Of course Facebook has been a revolution in this industry but today it has strong rivals as MySpace, Twitter and specially Google +. Therefore Facebook has to improve its facilities and services.

Our group has tried to gather some useful information about Facebook user's satisfaction in Malaysia and of course their view about Facebook ICT facilities.

Index Terms- ICT, Social Network, Customer Satisfaction, Facebook, Twitter

I. INTRODUCTION

One of the most significant current discussions in the communications is technology. Information and communications technology is the collection of hardware, software, networking and communications, in order to achieve the desired information. Convergence between computers and communications shapes the structure of information and communication technology.

For the first time, related technologies to computer were used somehow in World War II. But its vast potential was obvious to everyone after two major developments in 1980.

First, there are development in semiconductors' industry (transistors, integrated circuits, micro-chips), which led to producing small and inexpensive computers and subsequent this massive evolution, possibility for wide-scale use of computers for the public.

And second major development was communicating between computers and establishing the computers networks. In a way that with help of multiple communication and telecommunication technologies, connectivity between computer networks, were provided. The above developments were the basis of the today's great revolution in Information and communications technology, and also basis for advent of multiple technologies in information and communication.

II. RESEARCH ELABORATIONS

A. Research Design and describe the Data Collection Method

The descriptive survey design was adopted for this study. In this survey of method questionnaire was used because the data collected was spread wide of variety people. The key variables measured in the study were Facebook facilities, users' age group .Respondents' biographic information such as: gender, age group, rate of the used of the Facebook, rate of secure in Facebook, used of other social network, they what information have revealed in their account and some like these questions which mentioned in our questionnaire (you can see in Appendix).

In present study, we collected data from so many people in variety level and different classes of society in the city and university about usage of social networks such as Facebook. Regarding to all of the methods that exist in collection data, we used of questionnaire as one of the Research Instruments, it has many profit in collected data.

In fact, we contact by users as face to face, first we divided questionnaires between some of the users as random.

B. Instrument and Analyzing Procedure

The key of success for drawing people collaboration is to be polite as could as possible. Then this will give a good impression and is likely to make people more generous with their time. At the beginning of the questionnaire we asked the people politely if they will answer a few questions. We asked something like:
"Good Morning/Afternoon Sir/Madam, Shall we take a few minutes of your time to answer some questions for our proposal research about customer satisfaction on the ICT facilities in the social networks? ''

We collected some information in our data with different questions about gender, age, and eighteen questions about percentage usage of social networks, rate of spend their time on the Facebook and ultimately rate of the satisfaction with Facebook.

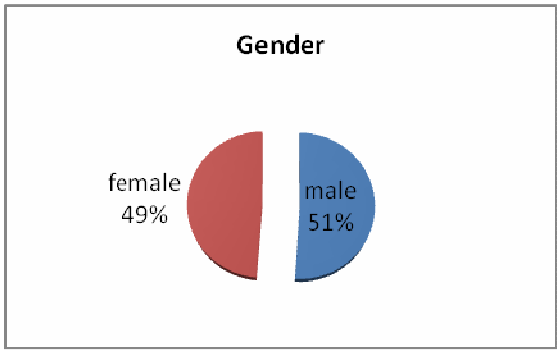
Firstly we put the university logo in our questionnaire form because when the people know that the questionnaire is for university research project they fill the form easier and they answer it correctly without any Prejudice.

C. Instrument and Analyzing Procedure

We assigned fifteen questionnaire forms for each supermarket and we collected our data of 500 people which means, 250 people of the men and 250 people women. We chose 500 customer satisfaction questionnaire form because we did not need to a big number of Interviewees because the answers of interviewees was approximately same, and the people who fill our survey form was not so much and we got perfect result from questionnaire forms.

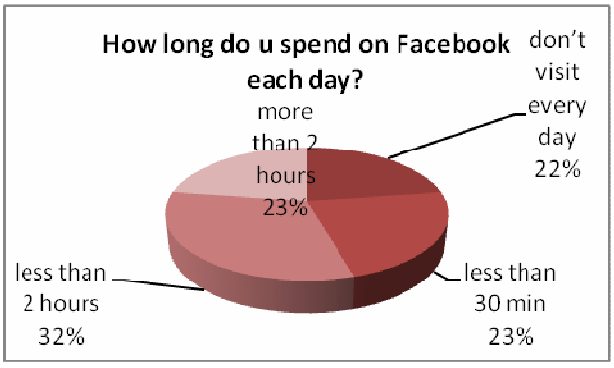
III. ANALYSIS AND RESULTS

In this chapter we are going to analyzing the result of our research about ICT and social network, and customer satisfaction on the ICT facilities, we chose Facebook website for our research, because nowadays it is one of the most popular networks, we collected our data from 500 survey form, that includes 230 male and 220 female, and 50 persons are not Facebook users. The diagram shows that 49% of Facebook users are female and 51% are male. We chose red color for female diagrams, blue color for male diagrams and orange color for total diagrams.

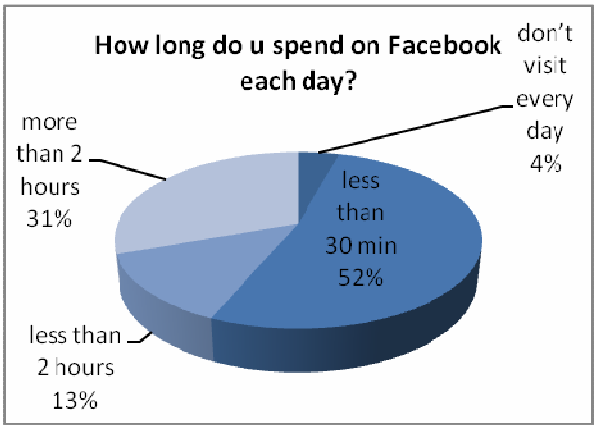


For analyzing the result first we analyses the result for each gender after that we analyses it totally.

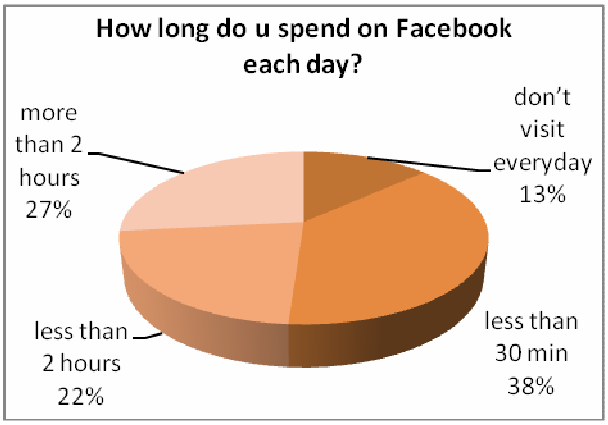
Firstly the analyses about that how long do the Facebook users spend in Facebook. The result shows that 22% of female Facebook users do not visit it every day, 23% use it less than 30 minutes, mostly use it less than 2 hours, 32% spend their time less than 2 hours and 23% present use it more than 2 hours, the result shows that 78% of Facebook users are visiting Facebook every day.



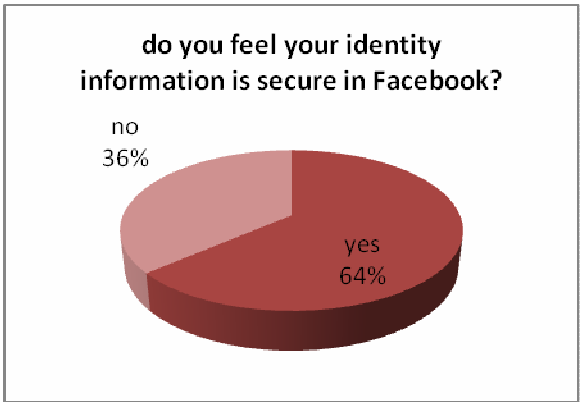
The results for males is different, only 4% don't visit Facebook every day, it means the men are more attracted on Facebook, but they spend their time less than women, 52% spend less than 30 minutes, 13% spend less than 2 hours and 31% spend more than 31%.



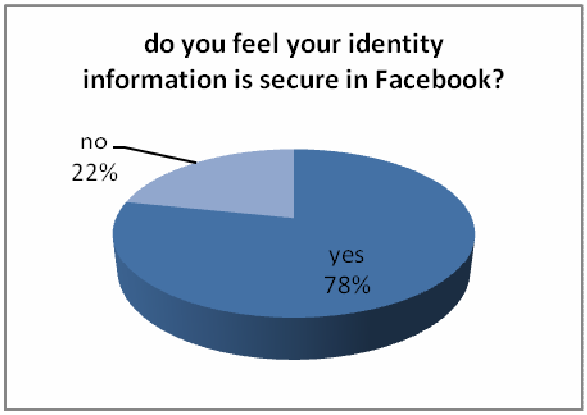
Total result shows that 13% of Facebook users don't visit it every day, 38% spend their time less than 30 minutes, 22% spend their time less than 2 hours, and 27% spend their time more than 2 hours. The result shows that 87% of Facebook users visit Facebook every day and mostly spend their time less than 2 hours.



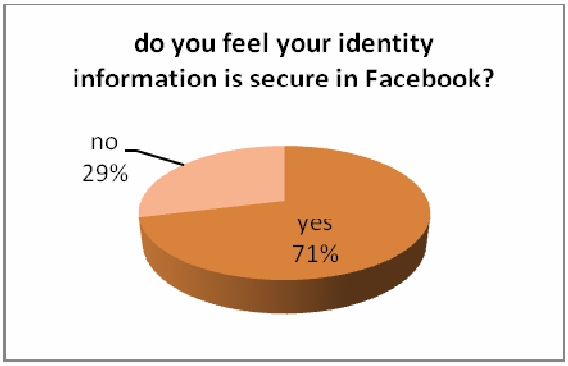
Secondly we analyses that do the people trust Facebook security? Is their Information secure in Facebook, and we analyses the result of female first, 64% of female trust Facebook and they think their information is secured in Facebook and 36% don't trust the web site and thinking their information is not secure in Facebook.



The men trust Facebook more than women, 78% answered yes they feel their identity information is secure in Facebook, and 22% think it's not.

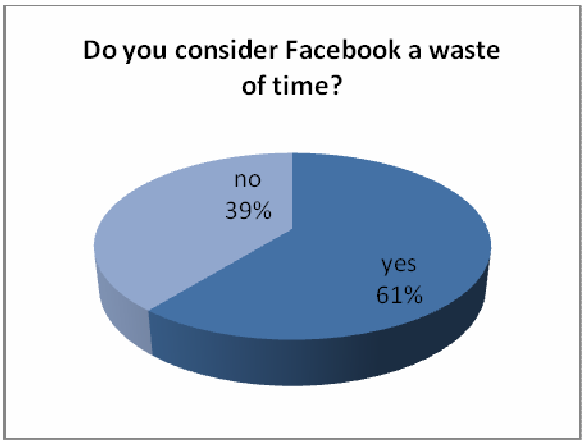


Total results show that 71% of Facebook users trust Facebooks security, and 29% don't trust it, Mostly put their personal information in Facebook, but nobody didn't put the mobile number in Facebook, but mostly put their name, email, pictures, birthday, home town, country, interests, favorite movies, favorite books, favorite TV shows and religion, it shows the people trust the Facebook's security.



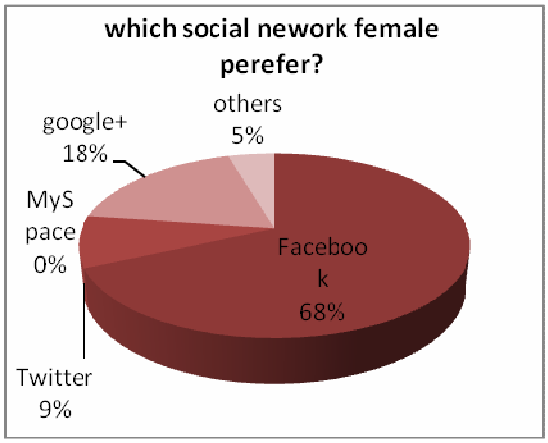
The results show that 59% of women considered Facebook a waste of time and 41% did not. Also more than 50% are using it more than 30 minutes a day. Then they know that they are wasting the time but they spend their time with Facebook.

61% of men consider Facebook as a waste of time, and around 43% spend more than 30 minutes a day and 57% use it less than 30 minutes or don't visit it every day.

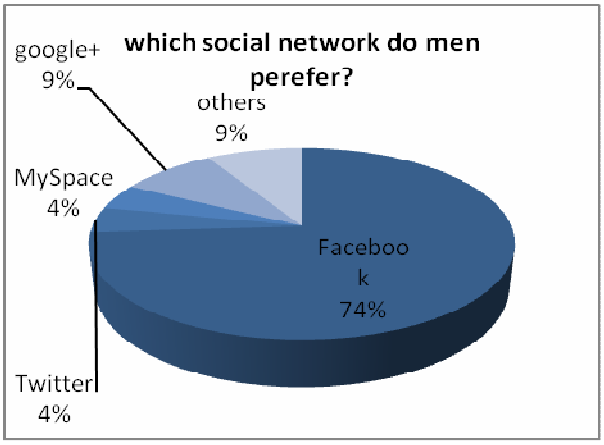


Analyzing the total result shows that 60% of people consider Facebook a waste of time, and 40% did not consider it a waste time.

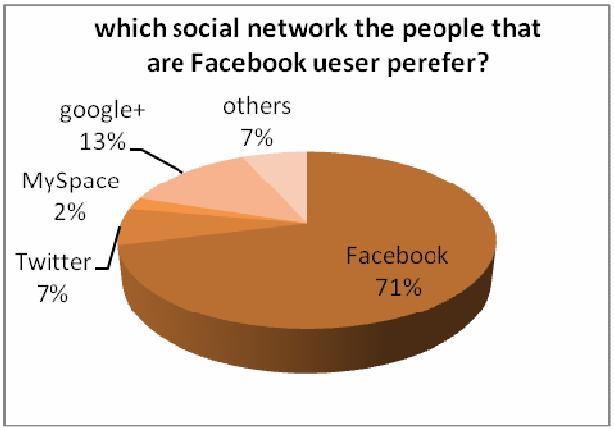
We asked the people which social network they prefer. The result shows that the people prefer Facebook, we have to consider it this result are collected from people that have Facebook, and based on our research only 10% of people does not have Facebook if we add it to the our result, the result does not change. 68% of women prefer to use Facebook, and 18% prefer use Twitter, 9% prefer MySpace, and 5% use other social network.



Analyzing data shows that 74% of men prefer Facebook, 9% google+, 9% prefer other networks, 4% MySpace and 4% twitter, the result shows that men like Facebook more than other social networks, and after Facebook they google+ has the best rank. However we have to analyses the total results that are next step.



The following diagram shows that 71% of people prefer to use Facebook, and it shows that Facebook is the most popular social network; also it was successful to attracting its users. Google+ is next rank, but only 13% prefer to use it, maybe in future this information change, but currently Facebook is the most popular social network.



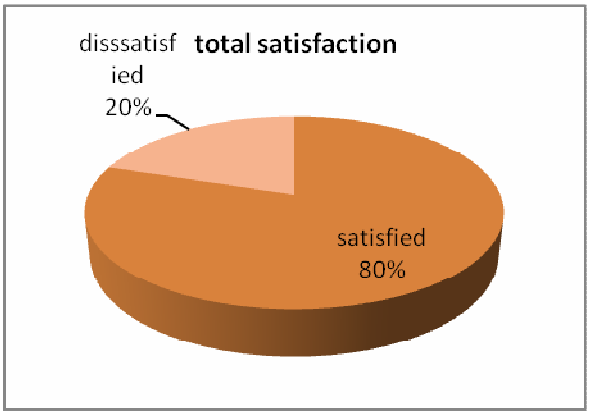
The result of satisfaction of female is as below:

77% of women are satisfied and 23% are dissatisfied. The result shows those women who are Facebook user are satisfied because they think Facebook is user friendly, and it does not have errors too much, and mostly think their information is secured in Facebook.

The result of men satisfaction is as following:

The information shows that 83% of the men are satisfied, and 17% are dissatisfied. In past diagrams we had some information that we can use here, the men use Facebook less than women, mostly think that Facebook is wasting the time and the satisfied men people percentage is more than women, also men trust Facebook security more than women all data shows that men are more satisfied.

In the last diagram we will analyses the total satisfaction (male and female), the following diagram shows that 80% of people are satisfied and 20% are dissatisfied. It shows Facebook is a successful social network.



IV. CONCLUSION

The results of this investigation show that currently Facebook has an acceptable situation between its rivals and most of our cases have Facebook account and use it as a daily requirement. Most of our respondents use Facebook facilities and have a positive vision about them.

Facebook has satisfied its user by its applications and services that of course work and based on Information and communications technology. For instance most of our respondents prefer to communicate with their colleagues and their friends via Facebook instead of using E-mail or other available services.

Facebook has achieved many successes by applying ICT advantages and currently we can observe role of ICT in most of Facebook's services and applications.

But it should not forget to focus on the weaknesses, especially in privacy and security sections to reach the best performance and earn the maximum user's satisfaction.

Currently Facebook has an impressive position between social networking websites and somehow consider as the leader and with resolving its few weaknesses and negligible issues

Facebook can hold its position for next years.

APPENDIX

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1. Do you use Facebook as a social networking website? (If yes, please continue with survey) Yes - no - I plan on getting one
2. What is your gender? Male – Female
3. What is your Age? Less than 16 – 16-20 – 20-30 – 30-45 – Over 45
4. How often do you visit Facebook per day? I don't visit Facebook everyday - Once – Twice – More than twice
5. How long do you spend on Facebook each day?
   I don't visit Facebook everyday - Less than 30 minutes – less than 2 hours – More than 2 hours
6. Do you feel that your identity information is secure in Facebook? Yes – No
7. Do you "Facebook" people more than you E-mail them? Yes – No
8. Do you consider facebook a waste of time? Yes- No
9. Are you OK with site's theme? (If No, What is your opinion about adding theme customizing feature?) Yes - Agree - Neutral - Disagree
10. Do you have any other social networking account? (If yes which one?) No - Facebook - Twitter - MySpace - Google + - Others
11. Which one of following social networks do you prefer to use? 1.Facebook 2. Twitter 3. MySpace 4. Google + 5. Others
12. Do you believe the site's privacy is good enough? Yes - No
13. Do you think Facebook is user-friendly enough? Yes - No
14. Have you ever encounter with errors? If yes, how often? No - Rarely - Often - Always
15. Do have Facebook E-mail? (If yes, how do you consider it?) No - Great - Good - Fair - Not good - Terrible
16. What have you revealed in your Facebook account?

☐ Name	☐ Gender	☐ Email	☐ Picture	☐ Phone Number	☐ Birthday	☐ Hometown	☐ High School
☐ Relationship Status	☐ Major	☐ Interests	☐ Political View	☐ Course Schedule	☐ Sexual Orientation	☐ About Me	☐ Website
☐ Physical Address	☐ Zip code	☐ School Information	☐ Country	☐ Favorite Music	☐ Favorite Books	☐ Favorite Movies	☐ Favorite TV shows
☐ Religion							

17. What type of applications have you added on Facebook?

No applications added	☐	Game applications	☐	Other applications:	
Forums/Questioners/Polls	☐	"fun wall"/"super wall" etc. application	☐		
"Graffiti" application	☐	"vampire/pirate/zombie" etc. application	☐		
Music applications	☐	Other Applications (please list in next column)	☐		

18. Overlay, are you satisfied with Facebook? Yes – No

Leave your comment …

Thank you for taking the time to fill out this survey. Your input is greatly appreciated.

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REFERENCES

[1] J. Sauve et. al, "An Introductory Overview and Survey of Business-Driven IT Management", Business-Driven IT Management,2006. BDIM '06.

[2] W. Zhen, Z. Xin-yu, "An ITIL-based IT Service Management Model for Chinese Universities", Software Engineering Research, Management & Applications, 2007. SERA 2007.

[3] ICT in Service Delivery in TNB by Norozinia 2008

[4] IMPROVING CUSTOMER SATISFACTION AND OPERATIONAL EFFECTIVENESS WITH THE USE OF AN ICT SERVICE MANAGEMENT BEST PRACTICE FRAMEWORK: ACTION RESEARCH IN THE SHARED SERVICE CENTRE, Supervisor: Dr. BC Potgieter (Waikato Institute of Technology) Academic Dean: Dr. Charlene Lew (Damelin International College of Postgraduate Business Sciences) March 2004

[5] Use of ICT & Customer Satisfaction Paper from Joint Rural Finance Thema tic Workshop ByMiriam Cherogony Africa
Microfinance Conference, 20th, August 2007 Kampala, Uganda

[6] European Primer on CUSTOMER SATISFACTION MANAGEMENT, 2008

[7] Elam, G. and Ritchie, J. (1997), Exploring Customer Satisfaction, Research Report No. 63, A report of research carried out by Social and Community Planning Research on behalf of the Department of Social Security, p. 81.

[8] Idowu, P.A., Alu, A.O. and Adagunodo, E.R. (2002). The Effect of Information Technology on the Growth of the Banking Industry in Nigeria. The Electronic Journal on Information Systems in Developing Countries, EJISDC, 10(2), 1-8. Website: Ige, O. (1995). Information Technology in a deregulated telecommunication Environment.

[9] McKenna, R. (1997). Real time: Preparing for the age of never satisfied customers. Harvard Business School Press. Rodie, A. R. and Martin, C. L. (2001).

[10] Salawu, R.O. & Salawu, M.K., (2007). The emergence of internet banking in Nigeria: An appraisal.

[11] Woldie, A. (2003). Nigerian Banks–Quality of Services. Nigerian Banks-Quality of Services.

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Measure of Customer Satisfaction in the hyper supermarkets in MALAYSIA

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Abstract- Nowadays some of the popular place for the shopping is supermarkets that are a self-service environment. All the supermarkets want to make a good relationship with their costumers and they want to save their costumers and their looking for the more costumers then they have to satisfy their costumer and increase their consumer target market, and they want to track the customer satisfaction in the supermarket surroundings that is very important.

The supermarkets have to appraisal the customer satisfaction after the buying their goods and for this purpose they want to make a feedback from their customers about their satisfaction or dissatisfaction of the buying. The customer buys emotionally when they have a need and have a hope while they are looking for it, and met it. Customer satisfaction in super markets means the supermarkets has to include the costumer hopes and needs, not only it is not everything in for analyze the customer satisfaction but also it is one of the most important part in customer satisfaction and it's the first step for satisfying the customers and attract the consumers, if the super markets cant supply their customer needs they disappoint their customer.

The most important think for companies is the customer satisfaction and most companies are focused on it, it does not matter what kind of business their doing, the strategic of all the companies are concentrated on it as a part of the customer behavior. Customer satisfaction ensures the companies about their successful in their business and their competitor's environment. The companies specially supermarkets can ensure their survival and develop their super markets based on customer satisfaction.

However, these studies focus on the development or the scale to measure customer satisfaction with the retailer or customer satisfaction with the difference of different types of retailer in Malaysia. The concept of customer satisfaction in a given marketing, customer satisfaction has attracted increasing attention from academics and practitioners around the world. Studies of customer satisfaction with the vendors is also a prosperous development models to measure customer satisfaction, customer satisfaction as measured based on the theory of service quality and size measures customer satisfaction of retail firms from macro perspective and it can be enhance day to day.

Index Terms- customer satisfaction, retailers, macro perspective, hyper supermarkets, customer behavior

I. INTRODUCTION

Nowadays some of the popular place for the shopping is supermarkets that are a self-service environment. All the supermarkets want to make a good relationship with their costumers and they want to save their costumers and their looking for the more costumers then they have to satisfy their customer and increase their consumer target market, and they want to track the customer satisfaction in the surroundings supermarket that is very important. Satisfaction customer is kind of customer service that all of the companies should attend to it. Therefore, potential customers in some of the places are more than other areas. The customer satisfaction has a dynamic forceful relationship with service quality.

For this reason, many competitions between supermarkets to offer better products and services and powered by law to obtain long-term relationship with customers to win their loyalty. Necessary for the key to satisfy consumer wants and needs. To achieve this goal, customer satisfaction and trust must be measured.

Customer Loyalty term physical and emotional commitment by the customer in exchange for their needs have been met. Those supermarkets treat customers the world over and over again related. Is important to keep a customer happy so he / she will be more business with him into supermarkets to buy is made in order to keep the customer for further business customer satisfaction, market needs to be guaranteed. In a competitive market provides everyone a better product and service quality will have an advantage over others. Customer satisfaction can be as a key element in the strategies that supermarkets can earn loyalty thought.

Gomez et al, (2003) analyzed the relationship between harvest storage characteristics and customer satisfaction, customer satisfaction and sales performance in retail food sector. Data collection consisted of six waves of customer satisfaction and sales for information on more than 250 stores period from 1998 to 2001 for publicly held supermarket. According to their results it was possible to identify the important connections between customer satisfaction and performance in retail stores selling food. Thus they include image of how food retailers can use these links to develop appropriate policies lead to increased customer satisfaction store sales use. Simon and Gomez (2005) conducted two studies to test three hypotheses: (1) competition is increasing customer Satisfaction Company, (2) competitors 'customer satisfaction is based on increasing customer satisfaction; (3) competitors' customer satisfaction reduces the sale company. First, they store data at the level of customer satisfaction with supermarket chain used. Next, they consider a wide range of industries, using the brand in customer satisfaction ratings from the American Customer Satisfaction Index. : Results of both studies provide support for both the second hypothesis, while it will only support the first hypothesis in the second study.

Quality and type of services will increase over time. Remember the market-driven, retail stores operate according to consumer preferences. Customer loyalty is a must for long term profits for retailers. Customer satisfaction depends on providing quality and affordable product and service base continues. In order to create an objective assessment of the competitive advantage from the perspective of consumers, we find that customer satisfaction is one of the key criteria for vendor performance.

At first, his problem was identified and defined as the evaluation of customer satisfaction than food and food and retail marketing strategies designed to increase customer happiness in certain situations with the help of the pilot. Researcher conducted this study to consider the need and importance of the study are presented. This has enabled researchers to easily determine the scope and purpose of this study. Descriptive approach ideal for studying it requires ever-changing view of the customers were considered.

Background of Supermarkets in Malaysia:

Supermarkets are one of the major parts in retailing process which supply usually various kinds of foods with different brands to answer extensive range of demands. The main operation in supermarkets is based on self-serving system. Mini-markets and groceries also work in this way but in smaller measures specifically in presenting the goods. Basically supermarkets provide daily needs consist of foods, and other necessities such as household cleaning products and personal care products.

Overall supermarkets in Malaysia divide into three main parts:

1) Private Stores

Actually they are mini-stores which manage privately by their owners and with limited services. These stores usually don't have any branches and during recent years the statistics have shown impressive decrease in number of them.

2) Express Stores

Express stores are launched in recent years. They are basically mini-supermarkets but with 24 hours opening property. These stores usually manage by a big company. For instance Seven Eleven is one of the most famous express shops in Malaysia.

3) Superstores

Superstores that we are going to discuss about them in this article are composed of several stores with huge range of goods and products.

These types of stores generally provide all of the daily needs for their customers and clients have this chance to purchase all of their stuffs in one place. Accordingly and as I mentioned in the past customers tendency for shopping, is turning from ordinary stores and mini-supermarkets to superstores.

In continue we will discuss further about causes of this phenomenon. Here there are histories and backgrounds of some major superstores and hypermarkets in Malaysia:

1) TESCO

Tesco is a global grocery and general merchandise retailer headquartered in CHESHUNT, United Kingdom. It is the third-largest retailer in the world measured by revenues (after Wal-Mart and Carrefour) and the second-largest measured by profits (after Wal-Mart). It has stores in 14 countries across Asia, Europe and North America and is the grocery market leader in the UK. The company was founded by Jack Cohen in 1919 and opened its first store in 1929 in Burnt Oak, Edgware, and Middlesex.

Each Tesco stores contain different areas such as the retailing of books, clothing, electronics, furniture, software, financial services, telecoms and internet services, DVD rental, and music store. Tesco has opened its first store in Malaysia in May 2002 with the opening of its first hypermarket in Puchong, Selangor.
Tesco currently operates 39 Tesco and Tesco Extra stores in Malaysia. Tesco stores by state in Malaysia are as following:
Selangor with 11 stores, Perak 6 stores, Johor 5 stores, Kuala Lumpur, Kedah and Penang 4 stores, Melaka and Negeri Sembilan 2 stores and Kelantan 1 store.

Tesco has partnership with Sime Darby Berhad, which has 30% of the shares in Malaysia. Also Tesco acquired the Malaysian operation of the wholesaler Makro, which was rebranded Tesco Extra and provides products for local retailers.
Tesco Malaysia supplies a value range, individual branded range, electronic goods, the loyalty club-card and clothing.
In 2007 Tesco Malaysia's introduced Green Club-Card Points that made Tesco Malaysia the first Tesco international business to introduce the scheme (Green Club-Card Points).

2) CARREFOUR

Carrefour S.A. is a French international hypermarket chain Headquartered in Levallois-Perret, France. Carrefour is one of the largest hypermarket chains in the world with more than 1395 hypermarkets at the end of 2010 and also the second largest retail group in the world in terms of revenue and third largest in profit after Wal-Mart and Tesco.
Carrefour operates mainly in Europe, Argentina, Brazil, China, Colombia and in the Dominican Republic, but also has shops in North Africa and other parts of Asia.
Carrefour established its first store in Malaysia in 1994 and continued its career in Malaysia up to now. Currently Carrefour has 22 hypermarkets and 5 supermarkets in Malaysia.
In 2010, Carrefour announced to leave Malaysia, Singapore, and Thailand. However, in November 2010, Carrefour sold its Thailand operations, but the Malaysian and Singaporean operations, will retain.

3) JUSCO

JUSCO is the acronym for Japan United Stores Company, a chain of hypermarkets which is the largest of its type in Japan.
The JUSCO companies are subsidiaries of ÆON Co. Ltd.

In 1984, in response to the Malaysian Prime Minister Dato' Seri Dr. Mahathir's request to help modernize retail industry in Malaysia by using the world's most advanced management expertise, Jaya Jusco Stores have been established in Malaysia. Dr. Mahathir believed that the modernization of the retail industry was crucial for the country's economic growth.

Following this, in 1985 the first JUSCO overseas store was opened, in Plaza Dayabumi, Kuala Lumpur, Malaysia, as a jointly-owned company with Cold Storage (Malaysia) and three local companies. Currently JUSCO has 21 stores and supermarkets in operation in Malaysia with another 3 confirmed openings and 2 planned stores by 2012.

The JUSCO store in Bukit Tinggi Shopping Centre in Bandar Bukit Tinggi, Klang in Malaysia is the largest JUSCO in Malaysia and Southeast Asia with over 2,100,000 square feet (195,000 m2) of built-up area and 5,000 car park bays.

II. LITERATURE REVIEW

Nowadays, the markets in the world are changing and its going to be supermarkets or chain supermarkets, currently people prefers to buy their goods from the supermarkets instead buying from a grocer on the street because of offers, the prices and the variety of goods in the supermarkets.

One of the features in customer satisfaction can imply to buy with MasterCard that help to their consumers in customer satisfaction scale , so most of the markets attract the customers with installation ATM device in their stores. it is comfortable for them because no need in per purchase the customer bring them cash. (Srinivasan et al., 2002, Semeijn et al., 2005)

The part of the customer Satisfaction consists of explanation and perception that the clients ensure of their purchases, because they like to return their costs after buying. moreover In each supermarket exist a important indicator as customer satisfaction that direct relation ship with selling success ,so retailers should improve part customer satisfaction in their super market (Jacka & Keller 2009).

The market place that supermarkets trade in has competitive marketplace that competitors are increase day to day and the competitors are near each other and the people can go to other supermarkets by walking, the supermarkets know that the customer will go to other supermarkets if they don't provide that thing the customers want because they find the supermarket that has the goods that they want easily (Codrington 2002).

Despite the grater important efforts to effect strongly on the consumers through wary research of the product, price, place and promotion in marketing mix, the supermarkets are under a keen research in this decade. The main point that has stress on the supermarkets and marketing issues (killbourne 2002) and the disregard of the well being consumers, and suggest the practices of marketing have to visit again (Weis 2002). Customer satisfaction is an important point in recent year and it gotten a huge attention in famous journals. Unfortunately, some companies are focused on the individual part of customer satisfaction more than the service or the relationship between loyalty of the stores, consumer satisfaction and service quality (Nennett and rundle-Theile 2004)

The customer like to go in Supermarkets where observe satisfaction customer and behavioral response, so it caused to increase the customers in a supermarket. (Bennett and Rundle-Thiele 2004),

In recent years many of the studies done concerning customer satisfaction but, unfortunately, not only it don't have improved but also in some of the place, customer satisfaction reduced. Actually it might be show off in part of the super markets and it can be dangerous because the consumers will be unreliable in loyalty supermarket, so it is important if supermarket managers concern to satisfaction customer (Wilson, 2002)

In last decade many countries around the world have, look on the supermarket's structure that is dominating in the retail segment. For example five huge supermarkets in the South Africa and these big supermarkets are gathered in one place without any distance near together and their offering same product and goods in their shelves. This is suggesting some different in their customer satisfaction and the result of service quality that increase the store loyalty (bell 2003).

The affects of the high customer satisfaction in survival's rules in the market place that is completely competitive is discussing frequently in this years (Du Vázqueza et al. 2003; Malan 2003; Nielsen 2002; Saxby 2003) gtbased on service quality, so the costumers earn more satisfy discriminating consumers (Ackermann 2002; Howardell 2003; Raijas 2003; Schwerdtfeger 2003). One of the features in customer satisfaction can imply to buy with mastercard that help to their consumers in customer satisfaction scale , so most of the markets attract the customers with installation ATM device in their stores, and customers can pay their bills by their master or visa card. it is comfortable for them because no need in per purchase the customer bring them cash. (Srinivasan et al., 2002, Semeijn et al., 2005)

The part of the customer Satisfaction consists of explanation and perception that the clients ensure of their purchases, because they like to return their costs after buying. moreover In each supermarket exist a important indicator as customer satisfaction that direct relation ship with selling success ,so retailers should improve part customer satisfaction in their super market (Jacka & Keller 2009).

Generally customer satisfaction is depend to service quality based on the premise that customer earn value from buying the goods in the supermarkets and it is increasing the satisfaction in this experience to make higher the feel of service quality with a prospect of customer loyalty.

It is need for the customer to conceptualize and measures customer satisfaction The in terms of service quality and Consumer satisfactions have been much discussed in the past (Bendall-Lyon and Powers 2004).

Store loyalty is therefore defined as a non-random behavioral response, expressed over time, which implies that one store is patronized rather than several others as a function of Complex psychological (decision-making and evaluative) processes. No wonder then that retailers purposely invest in their customer satisfaction through well-managed customer-retention programs (Malan 2003).

Emphasis that any evaluation of customer satisfaction that considers only individual variables is likely to be incomplete. A systems perspective thus provides a useful vehicle for interpreting the interrelated elements of customer satisfaction in a supermarket in terms of a total (whole) experience of service quality (Heylingen and Joslyn 2002). The systems perspective acknowledges the sequence, relationship, and interdependency of the fundamental elements of customer satisfaction as determinants of service quality. Elements of customer satisfaction are considered the inputs that are transformed into outputs, which are interpreted in terms of service quality.

The Elements of customer satisfaction within a Systems Perspective In this study, the elements of customer satisfaction are defined as all of the operational, physical or human resources/elements that may affect customers' perception of the service quality of supermarkets (Spears and Gregoire 2003) Place/Physical Surroundings. The store itself in terms of design, appearance, and image provides a fertile opportunity for market differentiation (Levy and Weitz 2002). Criteria for success may, for example, be aesthetic in nature and involve attention to detail such as store safety or parking facilities (Bloemer 2002; Malan 2003): customers apparently also desire hedonic experiences to satisfy multisensory, fantasy, and emotive aspects of consumption that extend beyond the purpose of acquiring merchandise (Arnold 2003; Thang and Tan,2003). Price, Pricing strategies are implemented to attract consumers and to sway buyer decisions (Levy et al. 2004; Zikmund and D'Admico 2001). Four of the prominent six supermarkets in South Africa are, for example, listed under the top 10 advertisers in 2004–2005 (Rapport 2005). Sales personnel actually represent their employers, the retailers (Saxby 2003). A customer-oriented approach that signifies empathy, expertise, and competence enhances customer satisfaction and store loyalty (Clopton et al. 2002) Processes and Policies.

Elements of customer satisfaction within the system landscape in this study are the elements of customer satisfaction, while all sources of operational, physical and human elements that may be perceived from the field of customer supermarkets (Spears and Gregoire 2003) and influenced has been defined may stimulate consumers consciously or unconsciously, a particular store to patronize (Asseal and Tan March 2003).

Consumers generally for evidence (text signs) that are visible from the approach to service is given, the intangible (Bitner) look at the experience. These tangible signs include: Products. Range, quality and availability of the product offerings in the supermarket as a core attraction to the store as a collection of utilities needed, satisfying (and Zikmund D 'Admico) are known. Package to assist decision-making process of a consumer because it determines the product image, product information exchange, product protection, shelf life determination, shows affordability, etc. (Van der Walt et al).

III. RESEARCH AND METHODODLOGY

A. Research Design and describe the data collection method

In present study, we collected data from three famous supermarket in Malaysia means, Jusco, Carrefour and Tesco in three time in day (morning, afternoon, night) and also Saturday night because most of the people go to buy in because this night is holyday night, moreover, in this super markets the plastic bag sold in Saturday 20 cent and it might be kind of dissatisfaction customer and effect in their responses.

We choose Tesco, Jusco and Carrefour because in Midvally they are near together and they are to competitor who approximately sell same goods and the prices are near together and we wanted to analyze the customer satisfaction in this supermarket and why people choose one of this to competitor, it means that why they are going to Jusco or Carrefour because of price? Promotions? Service quality? Shelves design?

In fact, we contact by customer as face to face, first we divided questionnaires between some of the consumer as random, in variety ages, variety nations and different classes of society, because Kuala Lumpur is a city that include different cultures and different bloods who all of this people are coming to supermarket for buying their goods and then we collected the information from this good source and analyze it and get good result.

B. Instrument and Analyzing procedure

Regarding to this research we used of questionnaire as one of the Research Instruments, it has many profit in collected data.

We chose several well-known hypermarkets from different companies and asked our questions from random clients (different age, gender).

The key of success for drawing people collaboration is to be polite as could as possible. Then this will give a good impression and is likely to make people more generous with their time.

At the beginning of the questionnaire we asked the consumers politely if they will answer a few questions. And told them maybe it would help the store to present better service quality and bring for them better shopping experience in the future. We asked something like:

"Good Morning/Afternoon Sir/Madam, Shall we take a few minutes of your time to answer some questions for our proposal research about customer satisfaction? ''

We collected some information in our data with different questions about gender, age, education level and occupation, and six questions. Firstly we collected information from the customer in the supermarket about the supermarket that they were shopping and our last question was about all the supermarkets.

B. Sample determination

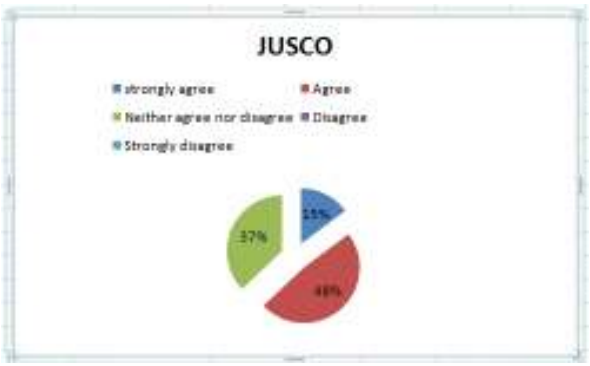
We assigned fifteen questionnaire forms for each supermarket and we collected our data of 450 people in three big supermarkets in Kuala Lumpur. We chose 450 customer satisfaction questionnaire form because we did not need to a big number of Interviewees because the answers of interviewees was approximately same, and the people who fill our survey form was not so much and we got perfect result from questionnaire forms.

IV. ANALYZING RESULTS AND DISCUSSION

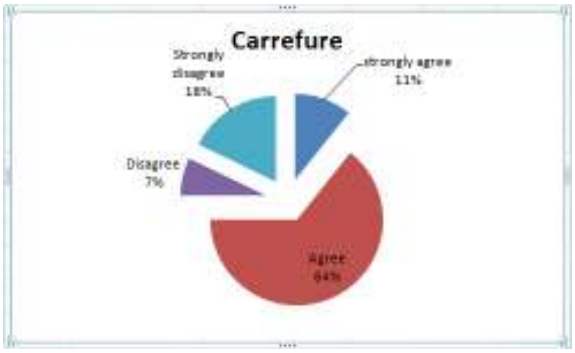
Firstly the results of the female participants are as following:

Customer satisfaction in JUSCO super market as following:

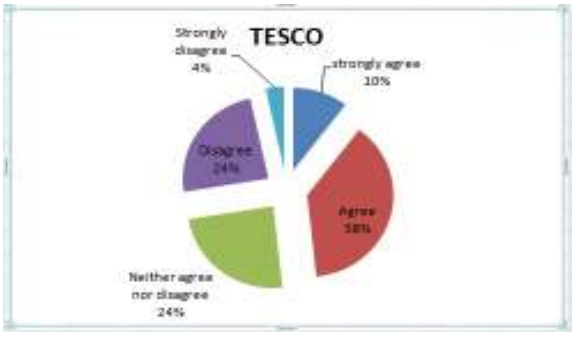
15% of women in the JUSCO are completely satisfy their strongly agree, 48% are agree and they are satisfied too, 37% of women do not have any idea, and 15% are strongly disagree, after adding the percents the results as following: 63% are satisfied of supermarket and the like buy their need in the supermarkets, but 37% are not satisfied and they don't like buy their need in the JUSCO.



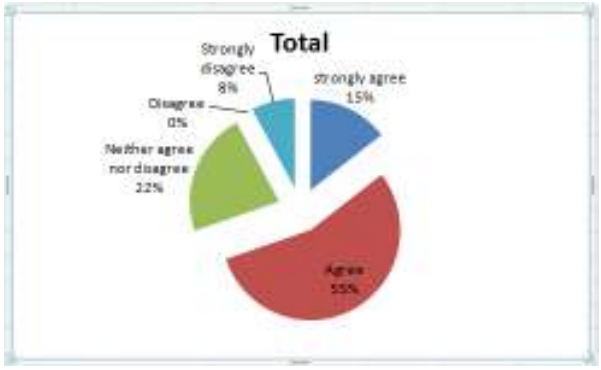
About Carrefour supermarket the result that came are a little different, 11% are completely satisfy and strongly agree,64% are agree, it means that they are satisfied too, but with lower level.7% of the women that we met were disagree and 18% were completely disagree. That means 75% are satisfied and 25% are no satisfied in the Carrefour and they don't buy their product from Carrefour.



TESCO result are a litlle different with JUSCO and Carrefour, 10% of women were strongly agree and satisfied in Tesco, 38% were agree and they like buy their need in the TESCO,24% did not have any idea about TESCO, 4% were dislike TESCO and they were disagree and 4% were disagree, it means that 48% of the women that buy from supermarkets are satisfied of buying their need in TESCO and 52% don't like buy their need in the TESCO it shows customer satisfaction in TESCO is lower of two other supermarkets.

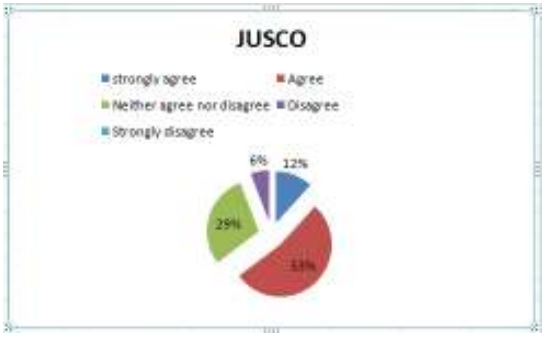


We visited forty five people include seventeen men and twenty eight women, that 13% of woman are strongly satisfied in supermarkets, 49% agree, 20% don't have any idea about supermarkets, 11% were disagree and no satisfied in the supermarkets and 7% are strongly disagree. When we add all the numbers the result shows 70% of women that buy their needs in the supermarkets are satisfied, and their customer satisfaction is in good level but 30% are not satisfied and they don't like buy their need from the supermarkets but some of them buy their need because of promotion and another group are coming to supermarkets because they don't have another choice.



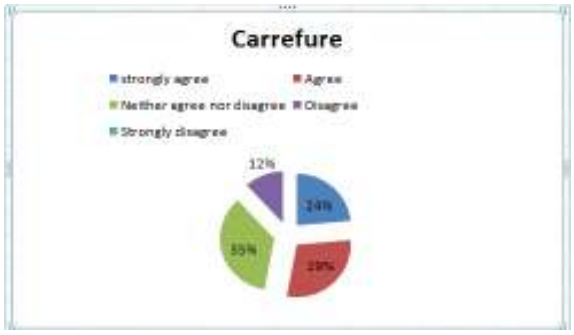
For the male gender the result are as following:

The result in jusc:12% of men are strongly agree and 53% agree that are satisfied, 29% do not have any idea about the JUSCO, 6% are disagree and 12% strongly disagree that means 65% men are satisfied and 35% are not satisfied, in compare with women, they approximately are in same level of satisfaction in JUSCO.



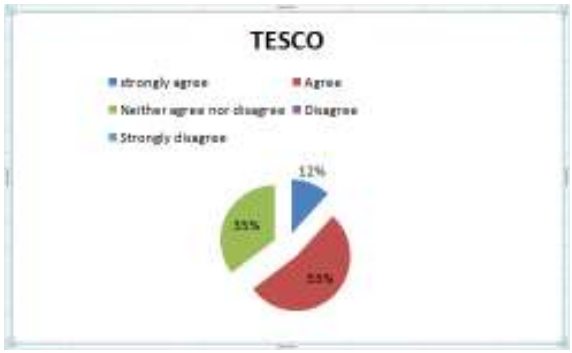
In care Carrefour the satisfaction is a little lower than the JUSCO, 24% of men are in good level of satisfaction and their strongly agree and 29% are agree, 35% did not have any idea and Carrefour had 12% are disagree, it means 53% of men that buy in Carrefour are satisfied and they are strongly agree and agree, 47% are not satisfied and its not a good level of satisfaction for the Carrefour in male gender.

In compare with women, the male gender are not satisfied as like as women in the Carrefour.



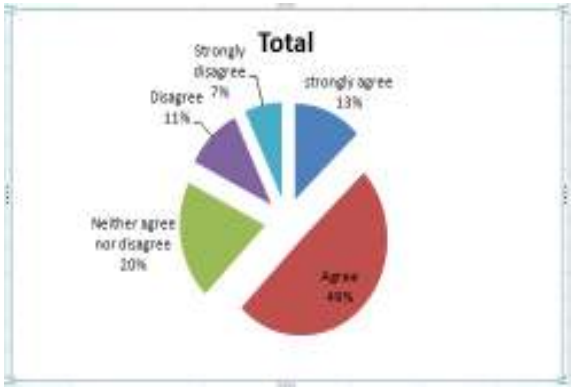
The results of male ganders in TESCO are following:

12% were strongly satisfied and 53% are agree this two grope are satisfied and 35% did not have any idea, that means they don't care about TESCO, 65% satisfaction percentage in men is more than women in the TESCO, and dissatisfaction percentage is lower than women in compare with them.

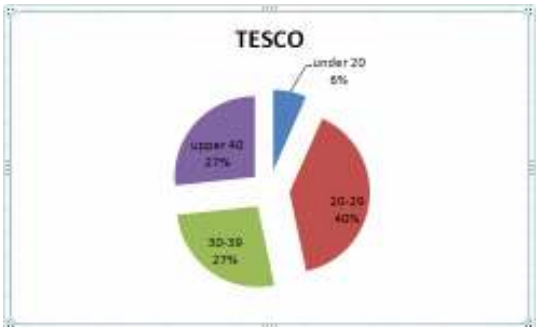


The collected result about JUSCO, Carrefoure and TESCO are as below.

13% of all the people that buy their need from three supermarket that we collected our data in them are completely satisfied and they are strongly agree with buying from supermarkets and 49% are agree and they are satisfied too, 20% don't have any idea, 11% disagree and their and 7%are strongly disagree, it means they are not satisfied, 62% are satisfied and 38% are not satisfied and in compare with women the satisfaction persentage in men is lower than women.



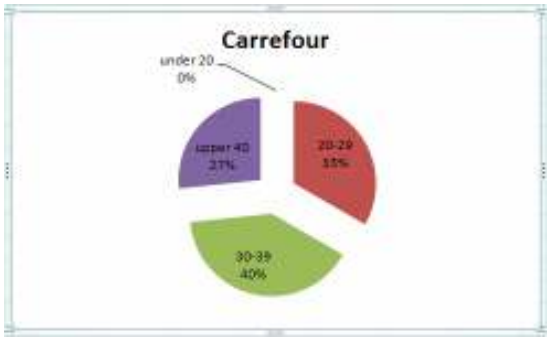
The below diagram shows biggest part of JUSCO customers are between 20 to 29 years old and minimum part of customers belongs to under 20 years old ages category.



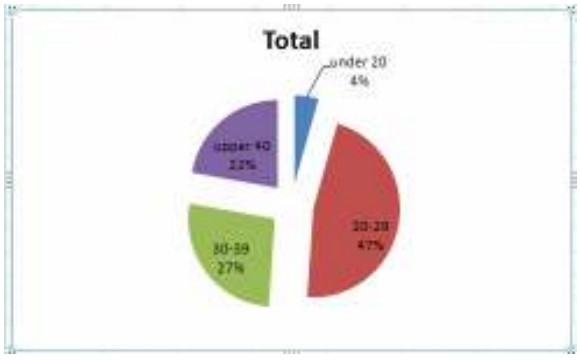
In TESCO percentage of customers in order are as below:

6% under 20 years old
40% between 20 to 29 years old
27% between 30 to 39 years old
27% more than 40 years old

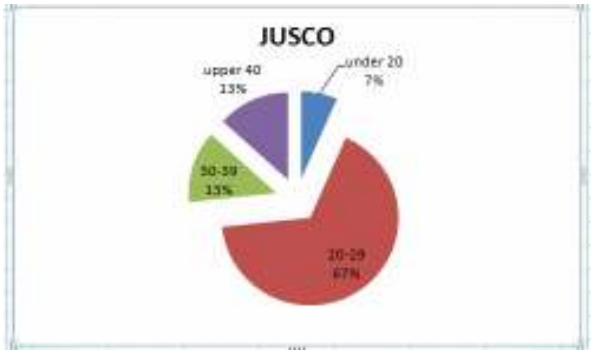
Also maximum part of customers in Carrefour is belongs to 30-39 age category but the percentage is close in other age categories.

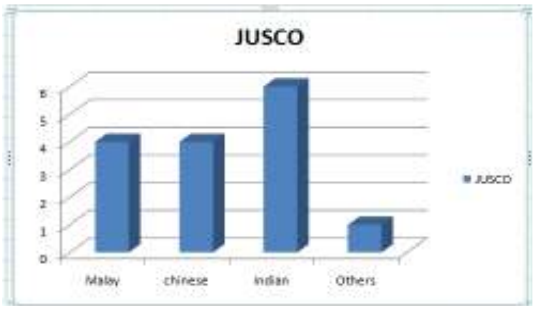


Overall and with considering the total statistic, maximum part of customers were belonged to 20-29 age category and the minimum part of them is related to under 20 years old group.
Hence with considering the statistics and discovering maximum visitors from age category sight, companies can schedule to present best possible service.

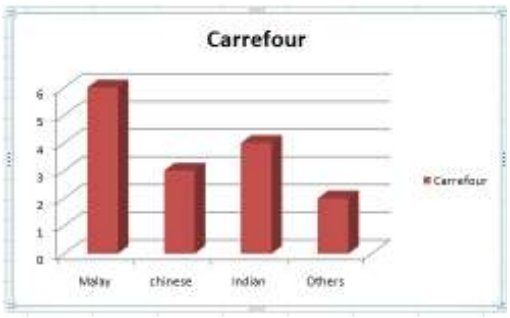


The statistics of nations on the table, The most people who are come to JUSCO are Indian and others are the lowest part in the JUSCO supermarkets. JUSCO supermarket can increase its customer satisfaction can prefer the goods that Indian buy, or use the color that Indian like in its shelves to earn more customer satisfaction.

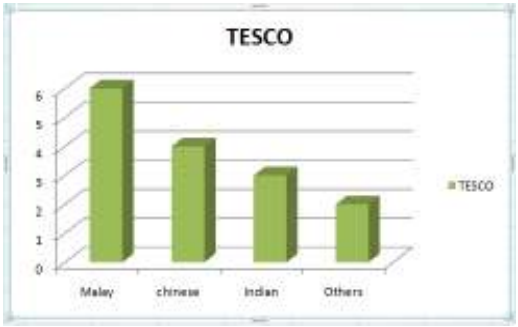




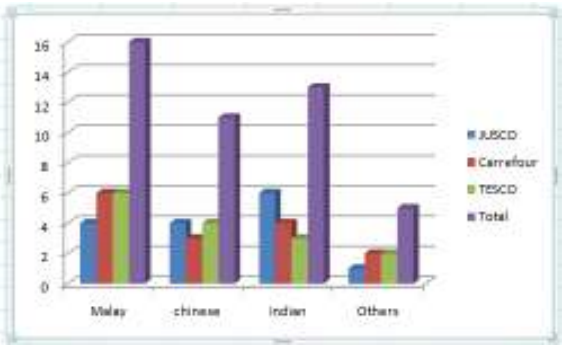
The biggest nations of customers in Carrefour are Malaysian people and the lowest group is other notions.



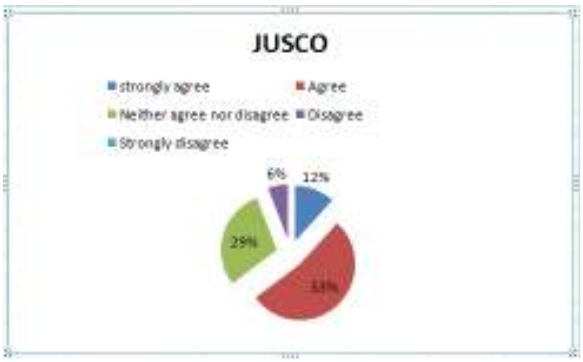
The most group of TESCO customer are Malaysian people and the lowest is others.



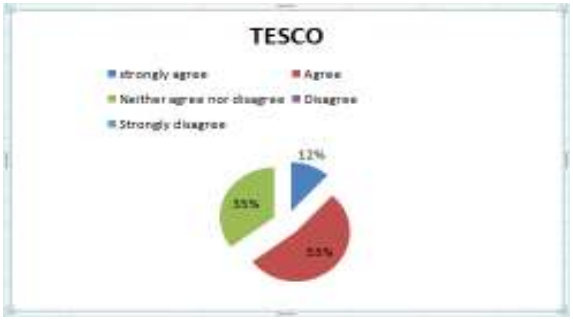
In this table we can see the entire supermarkets customer next to the total customers of the three supermarkets. The most customer are Malaysian, next are Indian, next Chinese and the others are the lowest group in the supermarkets.



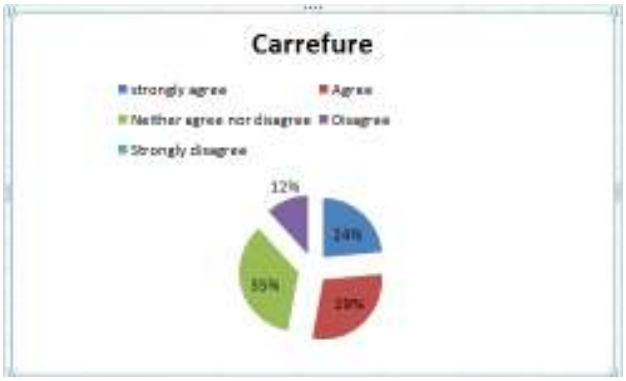
Next step is analyzing the customer satisfaction of supermarket in all data that we collected, 65% of JUSCO's customer are satisfied and their agree and happy from shopping in JUSCO, 35% were not satisfied in JUSCO



In the TESCO 65% of customer are satisfied and 35% are dissatisfied exactly as like as JUSCO
The detail of the percentage is in the table of customer satisfaction of TESCO.



The customer satisfaction in Carrefour is as following: 53% are satisfied in Carrefour and 47% are not satisfied.

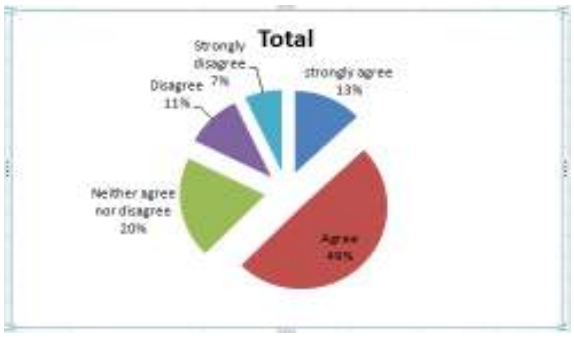


Totally the customer satisfaction in the three supermarkets that we collected our information in them is as follow:

13% are strongly agree and 49% are agree that are satisfied group it is 62% from 100% costumers that comes to supermarkets in Kuala Lumpur. It is not a high percentage for the big supermarkets that include all the goods and product that customers need.

The supermarkets have to focus more in customer satisfaction and they have to increase it with the recommends that we put in our recommendations.

20% do not have any idea, 11% disagree and 7% strongly disagree are including dissatisfaction part in customer of the under research supermarkets. It shows that 38% are dissatisfied from shopping in the supermarkets; it is a big percentage for the dissatisfied customer in supermarkets.



V. Conclusion and Recommendation

The last but not least, regarding to the our research, the most of supermarket's customer are agree from their loyal supermarket and they are satisfaction when they are buying their needs in their loyal supermarket, but the results show that the satisfaction percentage of the other supermarkets is not good, for example if a person buy from JUSCO his/her satisfaction is agree or strange agree, but currently his/her satisfaction about other supermarkets is lower than the JUSCO that the customer is go for shopping. Fortunately the supermarket's customers like to buy from the she super markets and the supermarkets could increase the customer satisfaction easily. The results show the customer satisfaction in Kuala Lumpur has good rate but it can has better percentage.

Increasing the operation hours of markets could be attracts more benefits and customer satisfaction but situations should be concern because in some cases it could be harmful.

online-shopping and telephone-shopping are two new methods of shopping in recent years which currently are not common in Malaysian markets, hence establishing these systems could draw more customer and subsequently increasing customer satisfaction.

Appendix

Acknowledgment

I would like to thank Prof. Dr.AHASANUL HAQUE, assistance, and guidance

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I also wish to thank A. Prof. Dr. Yong, who has all taught me techniques of programming and writing.

Special thanks should be given to my student colleagues who helped me in many ways. Finally, words alone cannot express the thanks I owe to Dr. Ebrahim Aghaei, my uncle, and Mr. Naser Aghaei, my father, for their encouragement and assistance.

References

[1] Ackermann, R. (2002), "The Table of Customer
[2] Areni, C. S. (2003), "Examining Managers' Theories of How Atmospheric Music Affects Perception, Behaviour and Financial Performance
[3] Arnold, M. J. (2003), "Hedonic Shopping Motivations,"
[4] Bennett, R. and S. Rundle-Thiele (2004), "Customer Codrington, G. (2002),
[5] Heylighen, F. F. and C. Josly (2002), "What is Systems Theory?"
[6] Hooper, J. (2002), "It's not Easy Being a Professional Adviser,"

[7] Howardell, D. (2003), "How to Improve Customer
[8] Killbourn, L. (2002), "New Millennium, New Consumer,"
[9] Morris, N. (2002), "Moral Marketing: Can Ethics and Profits Co-exist?"
[10] Nielsen, A. C. (2002), "What's Hot around the Globe,"
[11] Baltas, G. and Papastathopoulou, P. (2003)
[12] Hare, C. (2003), "The food-shopping experience: a satisfaction survey of older Scottish consumers", International Journal of Retail & Distribution Management
[13] Lawson, R. and Todd, S. (2003), "Consumer preferences for payment methods: a segmentation analysis
[14] McCollough. M., Berry, L. and Yadav, M. (2002), "An empirical investigation of customer satisfaction after service failure and recovery Fleming,
[15] J., C. Coffman, and J. Harter. 2005. Manage your human sigma. Harvard Business Review, July-August 2006.
[16] Wells.B.M. (2003), Advertising Principles and Practice, Pearson Education Ltd.
[17] Michels, P., H. Müller und A. Schmanke (2004): Strukturen der Nachfrage nach ökologischen Nahrungsmitteln in Deutschland. ZMP, Bonn.
[18] Rippin, M. (2006): Deutschland: Bio-Markt mit starken Zuwächsen. In: ZMP-Ökomarkt Forum,
[19] Henry Assael, (2004). Consumer Behaviour,
[20] Anderson, R., & Srinivasan, S. (2003). ―E-satisfaction and e-loyalty
[21] Cristobal, E., Flavian, C., Guinaliu, M. (2007), "Perceived e-service quality
[22] Fuentes, M., Gil, I., Berenguer, G., & Moliner, B. (2008). Measuring Multidimensional E-quality Service and its Impact on Customer Value Perceived and Loyalty
[23] Yang, Z., & Peterson, R. (2004). ―Customer perceived value, satisfaction, and loyalty Customer Satisfaction and Market Segmentation of Hong Kong Supermarket Industry (2004)
[24] Badre, A. (2002) Shaping Web Usability: Interaction design in context, Addison-Wesley, Boston,
[25] Retail Media (2002) Retail World Grocery Guide 2002, Retail Media, Malaysia.
[26] AUSTRALIAN ONLINE SUPERMARKET USABILITY(2002)
[27] Arnauld, E. J., Price, L.L., Zinkhan, G. M. (2002), Consumers, New York,
[28] http://www.tesco.com/
[29] http://eshopping.jusco.com.my/
[30] http://www.carrefour.com.my/

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A Novel Method for Analysis of Power Consumption in VLSI Global Interconnects

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Abstract- The analysis of effects induced by interconnects become increasingly important as the scale of process technologies steadily shrinks. While most analyses focus on the timing aspects of interconnects, power consumption is also important. We study the trends of interconnect power consumption based on current and figure technology node parameters. We know that 20%–30% of power is consumed by interconnect resistance in optimally buffered global interconnect system. We also study the analysis method based on a reduced-order model and discrete domain Z transform. The theoretical results can be used for any kind of linear circuits including RLC circuits.

Index Terms- Interconnect, Power consumption, Optimal, Buffered, Z transform

I. INTRODUCTION

As the scale of process technologies steadily shrinks and the size of designs increases , interconnects have increasing impact on the area, delay, and power consumption of circuits. Reduction in scale causes a continual increase in interconnect delays, although of course overall circuit performance continues to increase. As regards power, the situation is similar in that the portion of power associated with interconnects is increasing. This is an important fact because the conventional design, analysis, and synthesis of VLSI circuits are based on the assumption that gates are the main sources of on-chip power consumption. To analyze interconnects, extensive studies have been made of the use of model order reduction over the last few years, following the method for the power distribution analysis of an interconnect, based on a reduced-order model. It has been known that show power consumption can be computed efficiently in the *s*-domain using an algebraic formulation, instead of improper integration in the time-domain.[1] The theoretical results relies on the poles and residues of a transfer function, and can thus be used in any kind of model order reduction technique introduction of Asymptotic Waveform Evaluation [2]. Model order reduction is based on approximating the Z-domain transfer function of a linear (or linearized) network by a relatively small number of dominant poles and zeros. Such reduced-order models can be used to predict the time-domain or frequency-domain response of the linear network. Although there has been significant progress in the analysis and simulation of performance-related aspects of VLSI interconnects, less work has been devoted to the analysis of power consumption (or distribution) of interconnects. Furthermore, the analysis of power-related aspects of interconnects is limited to power distribution networks, and deals with quantities such as IR drop, ground bounce, and electro migration. In this paper, we introduce a method based on model order reduction technique & discrete domain Z-transform. We show that the power which involves improper integration can be derived from discrete domain Z-transform.

The remainder of the paper is organized as follows- In section II, power consumption of CMOS circuit, in section III, trends of interconnect power distribution, in section IV, analysis of interconnect power distribution, in section V, experimental result and in section VI conclusion of the paper is mentioned.

II. POWER CONSUMPTION OF CMOS CIRCUITS

It is a well known fact that there are three components of power consumption in CMOS circuits [3], which is given by

$$P_{tot} = P_{dp} + P_{stat} + P_{dyn} \quad \ldots\ldots\ldots (1)$$

where the first component is due to a direct current path from V_{DD} to ground when the pull-up and pull-down networks are both on for a short period of rising and falling transition. The second term is due to a leakage current that flows between the supply rails in the absence of switching activity. P_{dyn} represents a *capacitive dissipation* and the dominant factor in typical CMOS circuits. For example of cascaded inverters as shown in Fig. 1(a), the load seen by a driver is usually modeled as a lumped capacitance as shown in Fig. 1(b), where *Cg* denotes a gate capacitance of a receiver. During the rising transition, the total energy of $C_L V_{DD}^2$ is delivered by the source, the half is stored on C_L and the other half is dissipated by PMOS. The energy stored on the capacitor, $1/2 C_L V_{DD}^2$ dissipated by NMOS during the falling transition. Thus, the energy of $C_L V_{DD}^2$ is entirely dissipated by MOSFETs. The basic assumption of this model is that the interconnect resistance, denoted as R_I in Fig. 1(a), is *negligible* compared to *drain effective resistance* of MOSFETs. This is generally true in local interconnects where small MOSFETs, thus having large drain effective resistance, are connected through short wires, which have small wire resistance. However, the situation is different in global interconnect system, where large MOSFETs drive long (frequently in mm order) global interconnects, which implies small drain effective resistance and large wire resistance. This is very common in System-on-a-Chip (SoC) style integration, where many bus interconnects are implemented through long global wires Another example is a global clock [4], where global clock is constructed through huge clock buffers to simplify clock networks. The implication of this situation is that the traditional model for power analysis such as the one in Fig. 1(b) is not valid for an interconnect system where wire resistance is significant.

Thus, we need an RC (or even RLC) network such as the one infig.1(c).

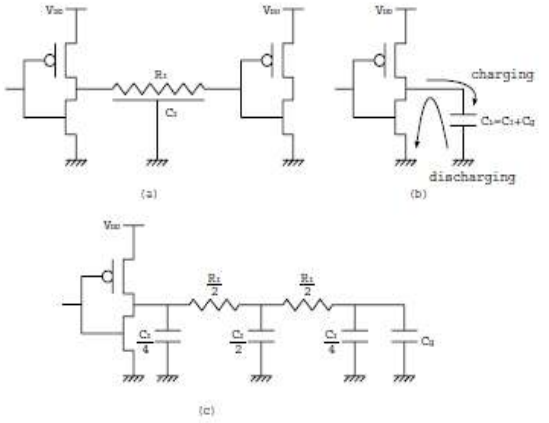

Fig. 1. (a) Two cascaded inverters, (b) lumped capacitance model for power estimation, and (c) RC tree model for interconnect.

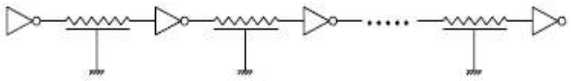

Fig. 2. Buffered global interconnects.

III. TRENDS OF INTERCONNECT POWER DISTRIBUTION

In order to investigate power consumption of interconnects, we consider a buffered global interconnect system as shown in Figure 2. Especially, we consider *optimally buffered interconnect*, where buffer size and interconnect length are determined in such a way that delay is minimized. The optimal buffer size end the optimal interconnect length can be derived from the delay equation of buffered interconnect [5], where the delay is from the input of the first buffer to the output of the last buffer:

$$t = k\left[p_1 \frac{r_i L}{k}\frac{c_i L}{k} + \frac{r_i}{h} h c_t + \frac{r_t}{h}\frac{c_i L}{k} + p_2 \frac{r_i L}{k} h c_t\right] \quad \ldots\ldots\ldots (2)$$

where k is the number of interconnect sections consisting of k+1 buffers, L is the total length of the interconnect, c_i and r_i are capacitance and resistance of the wire of unit length respectively, and c_t and r_t are gate capacitance and drain effective resistance of minimum size MOSFET respectively. The constants p_1 and p_2 depend on the switching model of the buffer, and are about 0.377 and 0.693 respectively, when 50% of the swing at the receiver side is of interest.

TABLE I
TECHNOLOGY PARAMETERS

Technology (nm)	V_{DD} (V)	T_{ox} (A)	r_t (kΩ)	c_t (fF)
180	1.8	40	3.3	1.18
130	1.5	33	3.5	0.79
100	1.2	25	3.6	0.59
70	1.0	16	4.3	0.44

TABLE III
PARAMETERS OF OPTIMALLY BUFFERED INTERCONNECT SYSTEMS

Technology (nm)	h_o	l_o (mm)	R_i (Ω)	C_i (fF)
180	169	1.76	38.7	271
130	182	1.23	38.1	194
100	203	0.94	34.8	161
70	259	0.80	32.8	154

By differentiating (2) in terms of h, setting the derivative equal to zero, and solving the equation for h, we obtain the optimal buffer size:

$$h_o = \frac{1}{\sqrt{p_2}}\sqrt{\frac{c_i r_t}{r_i c_t}} \quad \ldots\ldots\ldots (3)$$

Differentiating (2) again in terms of k, setting the derivative equal to zero, and solving the equation for k gives us the optimal number of stages for the interconnect of length L, denoted by ko. Dividing L by ko can be shown to give us the optimal interconnect length of each section.

$$l_o = \frac{1}{\sqrt{p_1}}\sqrt{\frac{r_t c_t}{r_i c_i}} \quad \ldots\ldots\ldots (4)$$

In order to project the optimal buffer size and the optimal interconnect length for the current and future technology generations, we use technology parameters extrapolated from BPTM [7], which are summarized in TABLE I. For each technology node, we obtain the optimum size of buffer and the optimum length of interconnect via (3) and (4), which are tabulated in TABLE II. The total resistance (Ri) and capacitance (Ci) of the interconnect are also shown in the last two columns of the table

For each technology node, we configure one section of the circuit (two buffers and interconnects between them) shown in Fig. 2 with parameters in TABLE II. The interconnect is approximated by 5 sections of π-ladder circuits [6]. We obtain the power consumption of the buffer, denoted as P_b, and that of the interconnect (sum of power consumption of 5 resistors in π ladders), denoted as Pi, through SPICE simulation. The ratio of power consumed by the buffer to the total power consumption is defined by

$$\eta_b = \frac{P_b}{P_b + P_i} \quad \ldots\ldots\ldots (5)$$

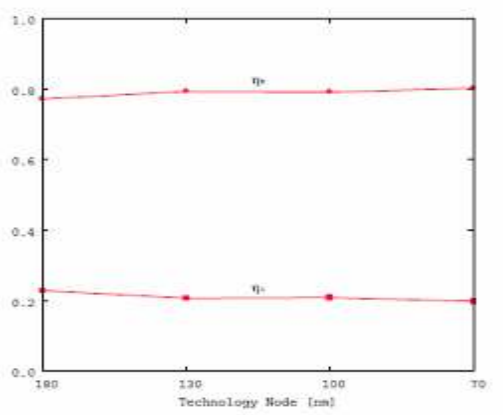

Fig.3 (a)

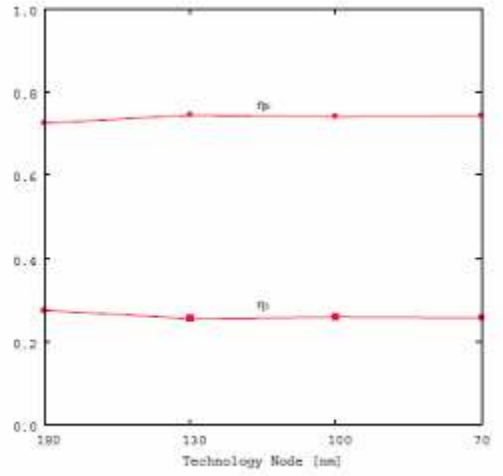

Fig.3 (b)

Fig. 3 Trends of power distribution of optimally buffered inter connect system when (a) Step (b) Clock is applied at the input of the buffer.

and similarly for η*i*. When the step is applied at the input of the buffer, the ratios of power are shown graphically in Fig. 3(a). Since we use the step at falling edge, most of power consumed by the buffer is due to PMOS operated in a linear region, thus we neglect the power consumed by NMOS, which consists of mostly leakage power. The trends show that about 80% of the total power is consumed at the transistor and the remaining power is changed to heat in the interconnect.

The trends do not change significantly when we use clock instead of step and taking all power components of the buffer into account as shown in Fig. 3(b). Since clock trees consume significant power and large buffer and long interconnect (even larger and longer than those for optimally buffered interconnect as presented in this paper) are frequently used to build clock trees [4], the power consumption of interconnects should be considered as an important factor in the design of clock distribution networks.

IV. ANALYSIS OF INTERCONNECT POWER DISTRIBUTION

In order to find the power consumption (or energy dissipation)' of a particular resistor element in a linear (linearized) circuit, we first obtain the reduced order model of current flowing through the resistor, denoted by J(s*)* (with the corresponding time-domain function j (t) *using* a model order reduction techniques. The approximate energy dissipated by R_i, denoted by E_i, during time period [t1 t2**]** is then given by

$$\hat{E}_i = R_i \int_{t_1}^{t_2} \hat{f}^2(t)dt$$

If we are interested in the total energy dissipated by a specific resistor element during signal transition, we can choose to consider semi-infinite interval of t, without loss of generality. We make t1 the time origin and t2 infinite time. Then J(t) will reach a steady state, provided that j (t) corresponds to the reduced-order model of an individual transition. This leads us to the improper integral.

$$\hat{E}_i = R_i \int_{0}^{\infty} \hat{f}^2(t)dt$$

It is very difficult to calculate the integration, so we use different approach. For this we use discrete domain Z-transform. the reduced order model of current following through resistor j(s) is converted into H(Z) using bilinear transformation where we put

$$S = \frac{2}{T}\ \frac{1 - Z^{-1}}{1 + Z^{-1}}$$

Where T is sampling time =1/ fs, fs=sampling frequency

Now after getting H (Z) we put $Z = re^{jw}$ where r=1, w = digital frequency =ΩT_s, Ω=analog frequency, T_s=Sampling time. For particular frequency we find the magnitude $H(e^{jw})$, which is the energy. As this is the r-c circuit it works as band pass filter. So at particular resonance frequency we find the value of $H(e^{jw})$, which is the same result of

$$\hat{E}_i = R_i \int_{0}^{\infty} \hat{h}^2(t)dt$$

But we find a range of frequency where the value is near about same of the original value in time domain. Now if we take time average then we can calculate power at particular register element.

Example:

$$H(S) = \frac{3S + 5}{(S + 1)(S + 2)}$$

We are taking f=4 KHz; f_s=8 KHz

$$T_s = \frac{1}{8 \times 10^3} sec$$

Now

$$S = \frac{2}{T_s}\left[\frac{1 - Z^{-1}}{1 + Z^{-1}}\right]$$

$$= \frac{2}{\frac{1}{8 \times 10^8}}\left[\frac{1 - Z^{-1}}{1 + Z^{-1}}\right]$$

$$H(Z) = \frac{3.16 \times 10^8 \left[\frac{1 - Z^{-1}}{1 + Z^{-1}}\right] + 5}{\left[16 \times 10^8 \left[\frac{1 - Z^{-1}}{1 + Z^{-1}}\right] + 1\right]\left[16 \times 10^8 \left[\frac{1 - Z^{-1}}{1 + Z^{-1}}\right] + 2\right]}$$

Putting $Z = re^{jw}$ where
$r = 1$

$w = \Omega T_s$

$$= 2.\pi.f\frac{1}{2.\pi.f_s}$$

$$= 0.5$$

So that
$Z = 1.e^{j.0.5} = \cos(0.5) + j\sin(0.5)$

$|Z| = 0.99996$

By putting the Z value at
$|H(Z)|$
. We find
$|H(e^{jw})| = 3.54$

Now if we calculate in the time domain, then

$$H(S) = \frac{3S + 5}{(S + 1)(S + 2)}$$

by taking inverse- Laplace transform we find

$$h(t) = 2e^{-t} + e^{-2t}$$

so that energy is

$$\int_0^\infty h^2(t)dt = 3.57$$

we showed that both result are near about same.

In order to verify the validity of the proposed analysis method, we implement a prototype tool written in C++, and based on the results presented in this section with moment matching-based model order reduction [2]. The program reads in a circuit in a SPICE-like format and outputs the power distribution of the interconnect. For the experiments, we randomly generate RC tree networks while varying the number of nodes from 100 to 500, and compare the energy distribution obtained by SPICE with that obtained by our method. As an example, Fig. 4 shows the result for a circuit with 300 nodes.

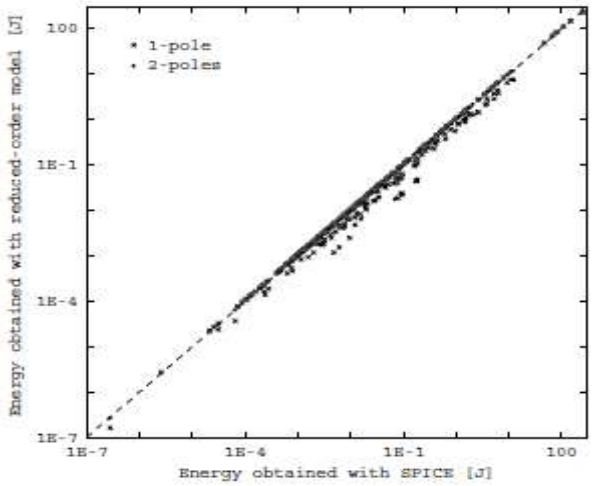

Fig-4 comparison of energy distribution for randomly generated circuit with 300 nodes.

V. CONCLUSION

We study the power consumption based on current and future technology parameters. the study shows 20-30% power is changed to heat in interconnects.

We describe a method for power distribution analysis of interconnects based on reduced order model. We show that power consumption can be computed efficiently in Z-domain using an algebraic formulation, instead of improper integration in time domain. The theoretical result relies on the pole and residues of transfer function and can be used in any kind of model order reduction technique.

ACKNOWLEDGMENT

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REFERENCES

[1] Analysis of power consumption in VLSI global interconnects by Youngsoo and Hyung-ok kim.
[2] L. T. Pillage and R. A. Rohrer, "Asymptotic waveform evaluation for timing analysis," *IEEE Trans. on Computer-Aided Design*, vol. 9, no. 4,pp. 352–366, Apr. 1990.
[3] J. M. Rabaey, A. Chandrakasan, and B. Nikolic, *Digital Integrated Circuits: A Design Perspective*. Prentice Hall, 2003.
[4] K. M. Carrig, N. T. Gargiulo, R. P. Gregor, D. R. Menard, and H. E. Reindel, "A new direction in ASIC high-performance clock methodology,"
[5] in *Proc. IEEE Custom Integrated Circuits Conf.*, 1998.T. Sakurai, "Superconnect technology," *IEICE Trans. on Electron.*, vol. E84-C, no. 12, pp. 1709–1716, Dec. 2001.
[6] Approximation of wiring delay in MOSFET LSI," *IEEE Journal of Solid-State Circuits*, vol. SC-18, no. 4, pp. 418–426, Aug. 1983.
[7] G. at UC Berkeley. (2004) Berkeley predictive technology model. [Online]. Available: http://www-device.eecs.berkeley.edu/˜ ptm.

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Folded Cascode OTA Using Self Cascode Technique

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Abstract- Low power has emerged as a principal theme in today's electronics industry. The need for low power has caused a major paradigm shift where power dissipation has become as important a consideration as performance and area. Many low voltage design techniques have been developed to meet the needs of present era of low power portable electronic equipment, which drove the analog designers to look for innovative design techniques like self cascode MOSFETs [1-5]. In this paper, we have investigated the merits and demerits of self cascode approach. For this aim in mind we designed a Folded Cascode using self cascode technique and analyzed its various properties through the Spice simulations for 0.13 micron CMOS technology from TSMC and the supply voltage 1.8V.

Index Terms- folded cascode OTA, self cascode, gain, low power.

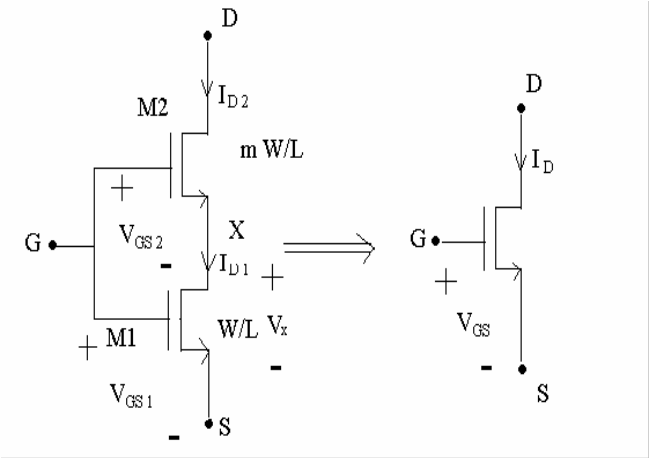
I. INTRODUCTION

In 2004, Comer [6,7] discussed the effects on the overall composite cascode circuit performance with one device operating in the sub threshold and the other device operating in the active region and suggested that this approach may result in a very high gain stage for use in op-amps, along with low power dissipation too [8,9]. To have high output impedance and thereby high gains, cascoding is done, where two MOSFETs are placed one above the other [10, 11–13]. The regular cascode structures are avoided as their use increases the gain of the structure. Self-cascode is the new technique, which does not require high compliance voltages at output nodes. It provides high output impedance to give high output gain and so it is useful in low-voltage design. Folded cascode OTA is used for high speed applications thanks to its capability to provide high gain and large bandwidth [14]. A self-cascode is a 2-transistor structure as shown in figure1 [1], which can be treated as a single composite transistor. The composite structure has much larger effective channel length and the effective output conductance is much low. The lower transistor M1 is equivalent to a resistor, whose value is input dependent. For optimal operation, the W/L ratio of upper transistor M1 is kept larger than that of lower transistor M2, i.e., m>>1. For the composite transistor to be in saturation region M2 have to be in saturation and M1 in linear region.

II. SELF CASCODE TECHNIQUE

The effective g_m for the composite transistor is approximated as

$$g_m(\text{effective}) = \left(\frac{g_{m2}}{m}\right) = g_{m1} \quad (1)$$



(a) (b)

Figure 1 (a) Self Cascode NMOS transistor. (Left)
(b) Equivalent NMOS transistor. (Right)

For the composite transistor to be in saturation region M2 have to be in saturation and M1 in linear region. For these transistors, the currents I_{D1} and I_{D2} are given as

$$I_{D1} = \beta_1\left(V_{in} - V_{TN} - (V_X/2)\right)V_X \quad \text{(Ohmic)} \quad (2)$$

$$I_{D2} = (\beta_2/2)(V_{in} - V_X - V_{TN})^2 \quad \text{(Saturation)} \quad (3)$$

and from this we get

$$I_{D2} = \left[(\beta_2\beta_1)/\left(2(\beta_2 + \beta_1)\right)\right][V_{in} - V_{TN}]^2 \quad (4)$$

$$\beta_{effective} = (\beta_2\beta_1)/(\beta_2 + \beta_1) \quad (5)$$

for

$$\beta_2 = m\beta_1 \quad (6)$$

$$\beta_{effective} = [m/(m+1)]\beta_1 = [1/(m+1)]\beta_2 \quad (7)$$

and for m >> 1,

$$\beta_{effective} \approx \beta_1 \quad (8)$$

where $\beta = \mu C_{ox}(W/L)$ and is called the trans-conductance parameter.

M1 operates in linear region, while M2 operates in saturation or linear region. Hence voltage between source and drain of M1 is small. There is no appreciable difference between the V_{Dsat} of composite and simple transistors and a self-cascode can be used in low voltage operation.

For a self-cascode

$$V_{Dsat} = V_{Dsat-M2} + V_{DS-M1} \quad (9)$$

The operating voltage of regular cascode is much higher than that of self-cascode and hence a self-cascode structure can be used in the low voltage design. The advantage offered by self-cascode structure is that it offers high output impedance similar to a regular cascode structure while output voltage requirements are similar to that of a single transistor.

III. PROPOSED FOLDED CASCODE OTA

The Proposed Folded Cascode OTA is shown in figure2. At input terminals self cascode is not used but on rest of the circuits self cascode is used because this whole circuit works as load. In this proposed circuit we take the value of m=2. In this circuit each transistor splits into two so that upper transistors are working in saturation region while other is in linear region to work this circuit properly. The simulation results are shown in Table I. The amplifier device sizes are shown in Table II.

IV. SIMULATION RESULTS FOR SELF CASCODE FOLDED CASCODE OTA

The simulations are done with 1.8V power supply. The simulations are done with the help of Tanner EDA tool T-SPICE and waveforms are analyzed on W-Edit. All designs are done using 130nm TSMC MOSIS Level-3 model file.

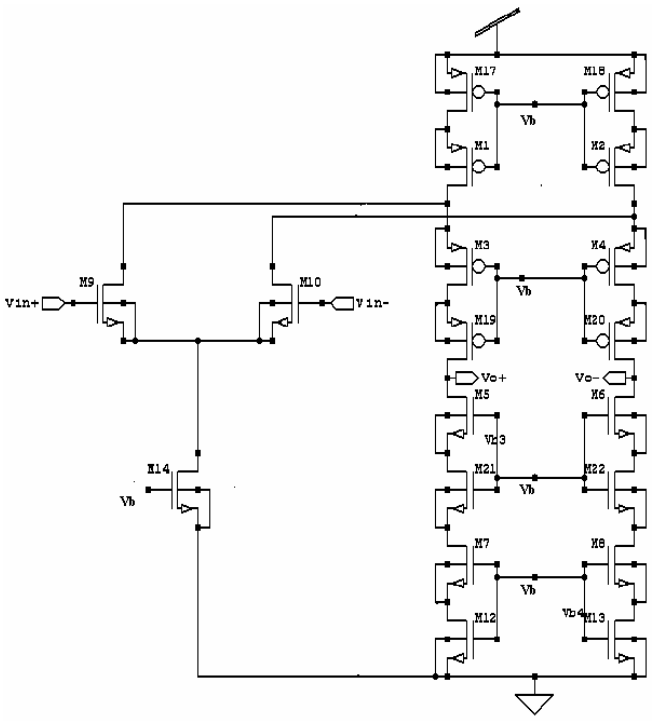


Figure 2: Proposed Folded Cascode OTA

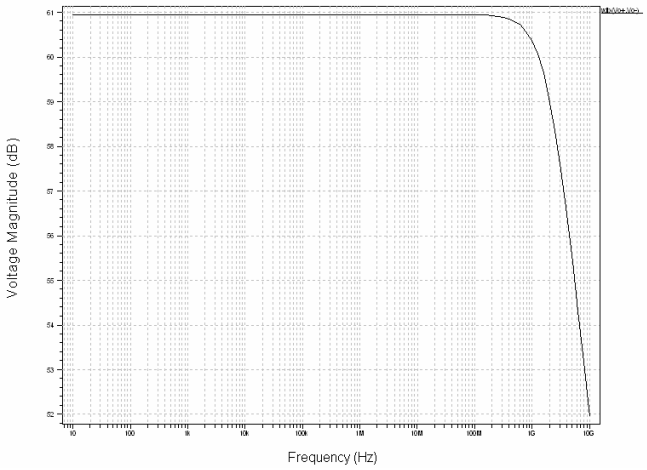


Figure 3: Voltage Gain of Proposed Folded Cascode OTA

V. CONCLUSION

In this paper, we have presented techn1iques which promise low voltage design with high gain. By using self cascode technique the gain of proposed folded cascode is increased about 19db as shown in figure3 with decrease in power consumption. The regular cascode structures are avoided as their use increases the gain of the structure, but decreases the output signal swing. Self-cascode is the new technique, which does not require high compliance voltages at output nodes. It provides high output impedance to give high output gain and so it is useful in low-voltage design. By increasing the value of m, we can further increase the gain of the folded cascode OTA with low power

consumption. But the condition of self cascode should be maintained. The effect of temperature is comparatively less in comparison to the conventional folded cascode OTA as shown in figure4. Noise effect is also less in proposed Folded Cascode OTA. This folded cascode circuit have been employed in a variety of situations -from increasing the gain in amplifiers with medium available bandwidth. The channel lengths and widths of the two transistors can be optimized for the largest increase in the output resistance.

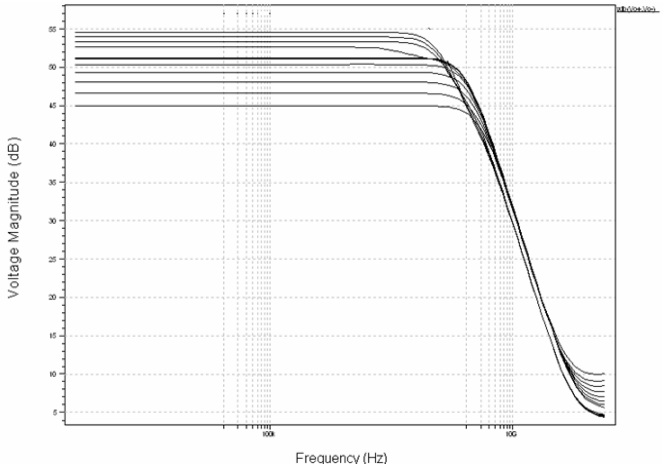


Figure 4: Effect of Temperature on Proposed Circuit.

Table I: Simulated Results of Proposed Folded Cascode OTA

Characteristics	Simulated results
Power Supply	1.8V
Power consumption	1.038075e-002 W
Open loop gain	60.96 dB
Temperature Effect	Less

Table II W/L for various transistors (µm)

DEVICE	Type	Proposed FCA
M1/M2	PMOS	105.6/0.5
M3/M4	PMOS	105.6/0.5
M5/M6	NMOS	28/0.5
M7/M8	NMOS	20.8/0.5
M9/M10	NMOS	10/0.18
M12/M13	NMOS	10.4/0.5
M14	NMOS	19.8/0.5
M17/M18	PMOS	211.2/0.5
M19/M20	PMOS	52.8/0.5
M21/M22	NMOS	14/0.5

They can extensively be used where power supply requirements are not the constraint and that high gain is of utmost importance.

REFERENCES

[1] X. Xie, M.C. Schneider, E. Sanchez-Sinencio, and S.H.K. Embabi, "Sound design of low power nested transconductance – capacitance compensation amplifiers," *Electronic letters*, Vol. 35, pp 956-958, June 1999.
[2] Yan Shouli, Sanchez-Sinencio Edgar, "Low voltage Analog Circuit Design Techniques", *IEICE Transactions: Analog Integrated Circuits and Systems*,vol EOO +A, no.2, pp1-3, Feburary 2000.
[3] G.Givstolisi, M. Conscione and F. Cutri, "A low-voltage low power voltage reference based on sub-threshold MOSFETs", *IEEE J. Solidstate circuits* 38, pp- 151-4, 2003.
[4] S.S. Rajput and S.S. Jamuar, " Low voltage analog circuit design techniques", IEEE circuits systems Magazine 2, pp- 24-42, 2002
[5] Alfonso Rincon M. Gabriel, "Low Voltage Design Techniques and Considerations for Integrated Operational Amplifier Circuit", *Georgia Institute of Technology*, *Atlanta, GA, 30332*, May 31, 1995.
[6] D.J. Comer and D.T. Comer, *Fundamentals of electronic circuit design*. New York: John Wiley & sons Inc. 2003.
[7] D.J. Comer and D.T. Comer, and C.petrie, " The utility of the composite cascade in analog CMOS design," *International Journal of Electronics*, vol.91,no.8, pp.491-502, Aug.2004.
[8] P.Gray and R. Meyerce, *Analysis and design of analog integrated circuits*. New York: John Wiley & sons, 1977
[9] V.I. Proddanov and M.M. Green, "CMOS current mirrors with reduced input and output voltage requirements." *Electron. Lett.*, vol. 32, pp. 104–105, 1996.
[10] E. Sanchez-Sinencio, "Low Voltage Analog Circuit Design Techniques", *IEEE Dallas CAS Workshop*, 2000.
[11] S. S. Rajput and S. S. Jamuar, "Design Techniques for Low Voltage Analog Circuit Structures", *NSM 2001/IEEE*, Malaysia, November 2001.
[12] S. Yan and E. Sanchez-Sinencio, "Low Voltage Analog Circuit Design Techniques: A Tutorial", *IEICE Transactions on Fundamentals*, vol. E83–A, February 2000.
[13] E. Sanchez-Sinencio and A. G. Andreou, ed., *Low Voltage/Low Power Integrated Circuits and Systems*. IEEE Press, 1999.
[14] M. Kumar, "Design of fully differential operational amplifier with high gain, large bandwidth and large dynamic range", thesis, 81 pages, 2009.

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Brain-Compatible Activities for EFL Vocabulary Learning and Retention

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If the learner is confident, learning increases.
If the learner believes in the teacher, learning increases.
If the learner thinks the subject is important, learning increases.
If the learner believes it will be fun and valuable, learning goes up!

Jensen (2000:115)

Abstract- The purpose of this study was to investigate the effects of brain-compatible activities (BCA) on the vocabulary learning and retention of the 31 third-year undergraduate students taking English for Tourism after taking the course using the BCA. Data, gathered from pre-test, immediate post-test, 2 delayed post-tests, and semi-structured interview, were quantitatively and qualitatively analyzed. The results of the study indicated that the students significantly learned the target words while taking the tourism course using the BCA. Moreover, the vocabulary they learned was retained at least 6 weeks after the instruction.

Index Terms- brain-based learning, brain study, vocabulary learning, memory, EFL

I. Introduction

Tourism is one of the major sources of income in Thailand and it is unavoidable to train students to be good tour guides and become ambassadors of the country. To accomplish such goal, students need to learn the important vocabulary that could help them achieve their potential. To enhance such learning, it is necessary for the teachers to find an effective way to teach and train the students. In this study, Brain-based Learning principles were seriously taken into consideration to help the students learn the words needed in their field in a natural way. These principles can be considered as the students' gateway in achieving the desired outcome in becoming effective tour guides.

The brain itself has been the subject of centuries of study. Neuroscientists, psychologists, and educators all played a part in the growing number of research done in this field. These research studies provided a wealth of resources (Willis, 2008) on brain activity and how it learns (Jensen, 2000, 2005; Caine and Caine, 1994; Sprenger, 1999, Sousa, 2001). The brain-compatible classroom activities are one of the results of the studies made about the brain and its ability to learn. These activities have been carefully planned and are considered very helpful for the language learning development of the students.

A. Related Literature

Brain-based Learning is about the brain's structures and functions. Every human being has a brain and thus is capable of learning (Hart, 1999). However, if the learning situation hampers the person's opportunity to learn, it would be difficult for any learner to register the things that are supposed to be important for them. It is certainly appropriate for every learner to be able to express themselves in the favorable way they can without fearing of being criticized, judged or mocked upon. It is also critical for teachers to energize the learners' brain to keep them moving and growing more knowledge. Brain-based Learning is focused on the reality that everybody learns and that the brain has an immense power to process that learning. Thus it helps provide the opportunity for students to enhance their learning capability by energizing the brain through activities in the classroom to make it expand its storage capacity to uphold knowledge and help the learner reach a maximum potential about the subject matter. Integrating brain-based principles in English for Tourism lessons is fascinating since this course requires hands-on experiences which can activate the brain and thus engage it with the task at hand.

Caine and Caine (1994:69) attest that "learning is positively affected by relaxation and challenge and inhibited by perceived threat and fatigue. Stress is considered harmful in learning." A pleasant atmosphere should be experienced in the classroom where the students learn so that they will be free from inhibitions and be able to express themselves well. Sprenger (1999) notes that there is a great need for students to participate in a realistic environment where they can try new things. Merely showing something to the students is not enough for effective learning to occur. It is important for them to do hands-on learning as they connect the existing information to the current knowledge they gain and be able to retain them for future use (Wolfe, 2001; Caine and Caine, 1994).

As students learn in a sensible and meaningful way, the information learned is retained in their memory bank (Sousa, 2001; Sprenger, 1999). That means, when teaching the students, the teacher should associate the words with something concrete like real life situations or real objects to provide meaning in remembering since the human brain is both visual and textual and can remember better when the words are aided with objects (Paivio and Csapo, 1973). As a facilitator of the students' learning in the classroom, the teacher's challenge is in choosing the right activities and materials to develop retention among the students. Such activities should help the students keep the

information and knowledge they have learned in class from their short-term to their long term memory, thus, enabling them to draw such knowledge from their brain whenever the situation calls for it.

Memory, either short-term or long-term, is essentially about the brain. The students' ability to store information and recall it later can certainly affect their performance in learning. Jensen (2005) states that the "only way we know that students have learned something is if they demonstrate recall of it" (p.125). Matured and independent students can connect past experiences with the present which eventually lead to better understanding of the task at hand (Caine and Caine, 1994; Sprenger, 2005). Still, in vocabulary learning, many students tend to remember the words that they use very often, eventually forgetting those words that are used infrequently. However, if they understand the importance of the new words given for them to learn and the words' impact to their future career, they would be able to refocus and internalize the new knowledge they are gaining while taking English for Tourism.

Though many people believe that brain development is only for children, several studies have been found proving that it is a lifetime growing matter. Concurring with Caine and Caine's (1997:2) brain learning principles that "learning is developmental" these researchers (Tompkins, 2007; Lin, 2010; Chang, 2004; Bayindir, 2003) have proven that the brain continues to work wonderfully even when the person is already beyond the so-called critical period. No matter how old a person is, learning continues to occur. With that, this research is focused on the area of vocabulary learning, since words are essential in developing fluency in language development. This poses as a challenge to the researcher as to the extent of the learning that the students would gain especially on the retention of words and on recalling them after a period of time.

B. The 12 Principles of Brain-Based Learning (BBL)

In this study, the twelve brain-based principles were considered as the framework in which the lessons and the activities were created. A lesson plan was created for every class session based on the brain-learning principles by Caine and Caine (1997) as follows:

- The brain is a parallel processor.
- Learning engages the entire physiology.
- The search for meaning is innate.
- The search for meaning occurs through "patterning".
- Emotions are critical to patterning and drive our attention, meaning and memory.
- The brain simultaneously perceives and creates parts and wholes.
- Learning involves both focused attention and peripheral perception.
- Learning involves both conscious and unconscious processes.
- We have at least two types of memory: spatial and rote.
- We understand and remember best when facts are embedded in natural, spatial memory.
- Learning is enhanced by challenge and inhibited by threat.
- Each brain is unique.

Caine and Caine (1994) suggested three important phases of the learning and teaching process that are very valuable in developing lessons for the learners. These are: orchestrated immersion, relaxed alertness, and active processing. Each phase is not a separate entity from the others. Each has a distinct role in the teaching and learning process by which students comprehend the lessons in a non-threatening way.

Each lesson plan in this study was created by connecting the BBL principles with the three important phases of learning and teaching. In the phase of orchestrated immersion, the students were asked questions and shown pictures in order to set their mood on the things that they were about to discuss for the day. Moreover, it gave them an overview of what was going to happen during the particular session. The last part of this phase is the introduction of the words that they needed to learn for a certain session. It connected to the BBL principle stating that *emotions are critical to patterning and drive our attention, meaning and memory*. Since the teacher gave the students the idea on what to study and what it does to their life, this connects to BBL principle stating that *the search for meaning is innate*. In the phase, relaxed alertness, the students got involved with activities that led them to understanding the lessons and made them use the words they learned in the first phase. Since the students were involved, the researcher believed that it would be easier for the words to sink into their memory as they use them while playing games. This connects to BBL principle that says *learning engages the entire physiology*. The third phase, active processing, involved production. The students needed to plan for a presentation like role playing. They had to use most if not all the words they learned in class for the day. This is in conjunction with the BBL principle that states, *we understand and remember best when facts are embedded in natural, spatial memory* and *learning is enhanced by challenge and inhibited by threat*.

C. Brain and Learning

By paying more attention on the brain and its faculties, vocabulary learning will probably no longer become a difficult task for every second language learner. The students' awareness of learning consciously will be enhanced knowing that they are learning for a valuable reason. Yet, one should know the brain first and how it functions in order to use it for optimal learning.

The human brain is basically responsible for all the things we learn in life. However, there are certain things that are focused on how the brain works with environmental influences in order to become more efficient in learning. Educators would find it easy and fun to teach when the students' brains are engaged – that is when all their senses are involved. When students are focused on the things that they are concerned with, they will be able to link the new information to their previous experiences, thus creating more meaning to what they are learning at present. They are believed to respond positively in classroom activities which they could make sense of and where their five senses are working actively. Classrooms that promote brain-compatible teaching and learning allow students to experience challenges. Challenging activities make the students think and be active in class. As they participate in the activities, they would have a feeling that they belong since emotional well-being allows the intellectual capacity of the students to function well (Marchese, 2002). The absence of threat and a state of relaxed alertness

(Caine and Caine, 1994) is one of the characteristics of brain compatible learning. The students interact well when they know they are respected and will not be laughed at even when they commit a mistake, thus giving them the courage to participate in class. In this approach, feedback should be provided immediately in order for the students to know where they are at in terms of learning.

Brain learning leans more on the way the students learn. It centers on the things that the teacher, as a facilitator, needs to do in order to enhance the knowledge of the students in a certain way. It facilitates the capability or ability of the brain in storing data and information and recalling them when necessary. When students fail to remember the things they have learned in class, it means that their learning is only skin-depth or that it could have been interfered with. Knowing the storage in our memory and how to facilitate the transfer of learning to attain retention serves as a valuable tool in helping the students make use of the brain faculties to learn and remember what they learned.

D. Vocabulary Learning and Its Importance

It is very important to learn vocabulary when learning a foreign language since vocabulary plays a major role in language comprehension and production (Read, 2000). It is "central to language and of critical importance to the typical language learner" (Zimmerman, 1997:5). Educators are often faced with the challenge of how to teach vocabulary to learners comprehensively making them able to recall the words they learned when the situation calls for it (Sokmen, 1997).

Nation (2001) believes that a large amount of vocabulary can be acquired with the help of vocabulary learning strategies. The skills learned along the way prove useful for students of different language levels. Fluent target language users usually internalize the use of the language by committing as many words as they can to their memory. The more words they commit to their long term memory, the more confident they become and the easier it is to learn new words. For students to be proficient and competent EFL (English as a Foreign Language) learners and language users, they need a large, rich vocabulary and the special ability and skills to use those words adequately (Pikulski and Templeton, 2004). However, learning vocabulary in EFL contexts is quite challenging because students rarely have opportunities to use them. As a result, it is easy to forget the words. Many students employ different strategies to improve their vocabulary learning and memorizing (Schmitt, 1997; Nation, 2001). Each strategy is considered helpful in some way.

II. METHODOLOGY

A. Research Method, Instruments, Participants, and Data Collection Procedures

This study used a pre-experimental research design. There were three instruments used in this study. First were the vocabulary tests. They contained 30 words (see appendix A) that the students needed to use in tourism in the local area of the Northeast province of Thailand. A group of students were given four tests which were a pre-test and an immediate post-test to measure the vocabulary gained through BCA in English for Tourism course. And the other two delayed post-tests two weeks and three weeks after the immediate posttest to measure the students' retention of the words learned in class. Second were lesson plans for four class sessions or twelve hours of instruction which were designed based on 12 principles of BBL (discussed earlier). Last was the semi-structured interview which was conducted with one-third of the total number of students after the whole experiment was completed.

There were 31 participants of this study. They were the third year undergraduate students who were taking English for Tourism as one of the required foundation courses. The researcher decided to conduct this study with only one group of students to track their changes very carefully, from the day they started taking the course using BCA until they finished.

Data for this study was gathered for a ten-week period during which the researcher taught the class using the BCA in the classroom for three sessions. The fourth session was done on-site where the participants acted as tour guides and another group of students from the same university were invited to be the tourists.

B. Findings and Discussion

Data from different instruments will be used and presented together to clearly and comprehensively illustrate the findings.

1. The Effects of BCA on vocabulary learning

The effect of BCA on vocabulary was measured by comparing the scores from the pretest and immediate posttest. The findings were shown in Table 1 below.

Table 1 Results of the students' pretest and immediate posttest

Participants	Pre-test Mean	SD	Post-test Mean	SD	Sig.
31 students	3.61	1.58	14.29	3.37	.013

Significance level is at .05

As seen in Table 1, the students' scores in the pre- and post-tests were compared using the statistical tool. It was found that the mean scores of the posttest (14.29) was significantly higher than that of the pretest (3.61) which means that the students learned many target words at the end of the sessions using BCA. Based on the results of the pre- and post-tests, it can be claimed that BCA was effective in the students' vocabulary learning. It appears that the activities helped them understand the words and their usage.

Before BCA started, the students barely knew most of the words included in the pre-test since very few or none of them were able to answer them correctly. Please see Table 2.

Table 2 Scores of each word used in BCA sessions

Vocabulary List	Scores in Pre-test	Scores in Immediate Post-test
extinct	11	26
archeological	13	26

commemorate	4	27
isolated	1	10
summit	4	10
gallery	9	25
original	11	18
magnificent	7	29
craft	0	12
alley	1	5
annually	12	28
sanctuary	10	18
restore	2	11
attraction	14	25
replica	2	12
century	14	19
monument	11	24
pediment	7	24
lintel	5	17
sandstone	17	26
carved	5	19
arrangement	4	19
competition	12	22
excavate	10	20
stairway	12	18
laterite	10	17
explore	4	13
itinerary	7	17
procession	11	19
region	2	8

It can be seen in Table 2 that the students scored very low during the pre-test. While their scores were higher during the immediate post-test, it can also be seen that some of the target words have very low scores like region (2,8) and alley (1,5). Such results could be attributed to the students' interest or lack thereof in knowing the words and using them in order to remember them longer. It could also be the result of a friendlier environment as a result of using BCA in class. Here are some of the results during the students' interview:

"*I did not like to study before, but it is very fun to study in this class…." (S16)*

"We enjoy to study in this course and I learn many words." (S22)

"Before, I shy very much and don't know how to speak English. But my friend is friendly and teacher is friendly so I try. I learn how to present with tourists and with friend in Phanom Rung." (S31)

2. The Effects of BCA on Vocabulary Retention

After two weeks, the first retention test was administered to measure if the students would still be able to remember the words that they learned. Consecutively, three weeks after, the second retention test followed. The scores of the students were calculated and analyzed. The scores of both retention tests were compared with the immediate posttest. The summary of the results is shown in Table 3.

Table 3: The retention test scores

N	Posttest Mean	SD	Delayed Post-test 1 Mean	SD	Delayed Post-test 2 Mean	SD	Sig.
31 students	14.29	3.37	13.35	3.67	13.13	3.83	.000

Significance level is at .05

As seen in Table 3, there was very little difference between the mean of the immediate post-test (14.29), first delayed post-test (13.35), and second delayed post-test (13.13) respectively. Statistically, it shows that there was a significant difference between the means of the abovementioned tests. These findings also suggested that the students remembered most of the words that they learned in class for at least five weeks after the classes ended as evident in the result of their interview:

"I like the activities in class… I like the field trip more because we go to the place and use what we learn in class and we become tour guide for one day. We remember the vocabulary and use them for the tourists. It was fun and exciting to go there and see Phanom Rung and describe Phanom Rung to the students who are tourists." (S21)

"I like.. game in class...about lesson... everybody funny and relax. On field trip day, we use the words that we learned and it was exciting." (S16)

These interview results show the students' positive feelings about remembering the words and using them in the actual situation. Some of the students did not have the same feeling as the rest of the class. They feel that there were just too many words for them to remember. Their nuances are shown below:

"I forget some of the words but my friend help me to remember and use them when we have our field trip. We are tour guides in the field trip and I have to talk about Phanom Rung to tourists." (S3)

"So many words to remember in every lesson. I get confuse sometimes and I cannot remember."(S22)

"I am difficult to remember the words because they are many."(20)

These could be reason why a slight decline was noticed even though most of the words learned in class were retained in the students' memory. It could also be due to the time and the use of these words. It could mean that some of the words/knowledge they gained about the words learned in class did not sink deeply into their long term memory, hence the unavailability of such knowledge when they were trying to use it. However, it was surprising to see that 90% of gained vocabulary could be retained

effectively. There was only 10% loss of retention. This could confirm the effectiveness of the BCA in teaching vocabulary.

III. Discussion

The BCA done in class helped provide the better atmosphere among the students which led to gaining vocabulary knowledge and retention. Beginning with the class sessions where each one would get a glimpse of the things they would be studying for the day which confirms the brain learning principle stating that "the brain simultaneously perceives and creates parts and wholes" (Caine and Caine, 1994). As the learners anticipate the entirety of what they would be learning for the day, they were also creating expectations in their heads. Meeting such expectations or even exceeding them was a challenge to the teacher since they might get bored if done otherwise, and which would hamper learning.

Repetition played a vital role in students' retention of the words taught in class. The more the students used the words in various activities, the more they stayed in their memories. Sprenger (2005:105) states that "long-term memories are networks of neurons that have been strengthened through repetition". As neurons would continually communicate with each other in various ways, retention would follow.

Emotion also affected the students' learning in different ways. The kind of emotion that flows to our brain would either inspire or suppress attention which would lead to effectively comprehend the lesson or completely turn away from it (Sprenger, 2005; Jensen, 2005). In this study, BCA sessions led to positive emotions among the students, towards their teacher and the course they were taking. These good emotions resulted from the friendly atmosphere they were in and the awareness of what they were learning as they connected it with what they wanted in their life. According to Sprenger (2005:22), "emotions and emotional states are patterns of response that lead to behavior". Since emotion affects our brain and entire body, providing good experiences could greatly help the students in remembering what they have learned.

The feedback given by the teacher to the students when they committed mistakes or when they were doing right was very helpful in their understanding of the course. Sprenger (2005:83) explains that "feedback as reinforcement offers encouragement and the opportunity to fortify what the students understand". Feedback helped build-up the students' comprehension and corrected their wrong assumptions before keeping such knowledge to their long-term memory. (Sprenger, 2005). It invigorated those who grasped the concept of the things they were learning while inspired those who needed reassurance and more support. It also served as a guide to the teacher in knowing which area of the course was understood and which one needed to be further reiterated.

Nemati (2009) made a research regarding the impact of teaching through memory strategies with 310 Indian pre-university females. In this study, the researcher taught the students the meaning of new vocabulary by using acronyms and imagery. The participants were divided into experimental and control groups. They were given a pre-test, a post-test and a delayed post-test to check their long-term retention. The results showed that the experimental group scored higher and that they were forgetting less as compared to the control group. The researcher believed that the memory strategies used for vocabulary retention was effective both in restoring and retrieving.

IV. Pedagogical Implications and Suggestions for Future Research

The findings of this study suggest that brain learning is effective not only with the children but with the university students as well. The BCA done in the classroom could be helpful for the teachers who are open to challenges and are motivated to create different strategies with the aim of helping the students achieve their full potential in learning a language. The teacher's role in this approach is more of a facilitator. Students in BCA classrooms are encouraged and guided to be more cooperative and be more interactive.

Since Brain-based Learning is generic for all kinds of education, they could be integrated into many subject areas of instruction. Therefore, teachers of math, science, and so on, should try to use these principles to design their lessons. Research on the topics will be of great useful for effective classroom instruction.

The following topics can be suggested for further research: brain-compatible activities for other language skill development such as writing composition or speaking. Different areas of research can be focused on, like learning a foreign language, English for specific purposes, or retaining information in long-term storage using the first language of the learners as the language of teaching.

References

[1] Bayindir, H. (2003). An investigation of students' attitudes towards brain-based applications in English Composition Skills II course: A case study. A Master's thesis. Middle East Technical University.
[2] Caine, R. N., & Caine, G. (1997). Mind/Brain learning principles. New Horizons for Learning. WA:USA. Available at http://www.newhorizons.org/neuro/caine/htm.
[3] Caine, R. N., & Caine, G. (1994). Making connections: Teaching and the human brain. Menlo Park, CA: Innovative Learning Publications.
[4] Chang, S. (2004). A Brain-compatible vocabulary teaching strategy applied to underachieving students. A Master's thesis: Ming Chuan University.
[5] Hart, L. (1999). Human Brain and Human Learning. WA: Books for Educators.
[6] Jensen, E. (2000). Brain-Based Learning. Del Mar, Calif.: Turning Point Publishers.
[7] Jensen, E. (2005). Teaching with the Brain in Mind. Alexandria, Va.: ASCD.
[8] Lin, M. (2010). The effects of whole language approach and brain-based learning instruction on students' GEPT test performance. A Master's thesis. National Yunlin University of Science and Technology. Taiwan, Republic of China.
[9] Marchese, T. J. (2002). The new conversations about learning: Insights from neuroscience and anthropology, cognitive science and workplace studies. New Horizons for Learning. WA:USA. Available online: http://www.newhorizons.org/lifelong/higher_ed/marchese.htm
[10] Nation, P. (2001). Learning vocabulary in another language. Cambridge University Press.
[11] Nemati, A. (2009). Memory vocabulary learning strategies and long-term retention. International Journal of Vocational and Technical Education Vol.1 (2), pp. 014-024. Available online at http://www.academicjournals.org/ijvte
[12] Paivio, A., & Csapo, K. (1973). Picture superiority in free recall: Imagery or dual coding?. Cognitive Psychology, *5*, 176-206.

[13] Pikulski, J. and Templeton, S. (2004). Teaching and developing vocabulary; key to long-term reading success. Houghton Mifflin Company.
[14] Read, J. (2000). Assessing Vocabulary. Cambridge University Press
[15] Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt & M. McCarthy (Eds.). Vocabulary: Description, Acquisition and Pedagogy. Cambridge University Press, pp. 199-227.
[16] Sokmen, A. J. (1997). Current trends in teaching second language vocabulary. In N. Schmitt and M. McCarthy (Eds.). Vocabulary: Description, Acquisition and Pedagogy. Cambridge University Press.
[17] Sprenger, M. (2005). How to teach so students remember. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).
[18] Sprenger, M. (1999). Learning and Memory: the brain in action. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).
[19] Sousa, D. (2001). How the brain learns: A classroom teacher's guide. Thousand Oaks, CA: Corwin.
[20] Tompkins, A. W. (2007). Brain-Based Learning Theory: An Online Course Design Model. Doctoral Dissertation. Liberty University. VA: USA.
[21] Willis, J. (2008). Teaching the Brain to Read. Strategies for Improving Fluency, Vocabulary, and Comprehension. Alexandria, VA: ASCD.
[22] Wolfe, P. (2001). Brain matters: Translating research into classroom practice. Alexandria, VA: Association for Supervision and Curriculum Development.
[23] Zimmerman, C. (1997). Do reading and interactive vocabulary instructions make a difference? An empirical study. TESOL Quarterly. 31 (1): 121-40.

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Design and implementation for identification of Moisture content in cotton bale by Microwave Imaging

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Abstract- Understanding of cotton quality is important in order to properly identify the moisture content .Measurement of moisture is difficult particularly at harvest and through the gin, because of the influence these processes have different fibre quality. Dry cotton can be harvested cleanly and efficiently but may suffer undue damage in the gin. On the other hand harvesting and ginning wet cotton leads to significant issues in processing and quality. A number of methods are used to measure moisture in seed cotton, lint and fuzzy seed, each has its varying advantages. As moisture variation of the bales that is not monitored from the outside of the bale. This research examines a new microwave imaging technique to view the internal moisture variations of cotton bale. Tests on the developed imaging sensor showed the ability to resolve small structures of parameters, against a low standard background, that were less than 1 cm in width. The accuracy of the sensing structure was also shown to provide the ability to accurately determine parameter standards. A preliminary test of the imaging capabilities on a wet commercial bale showed the technique was able to accurately image and determines the location of the wet layer within the bale.

Index Terms- Bales, fibre, gigging, moisture, microwave imaging.

I. INTRODUCTION

In cotton grading the quality of cotton is identified by steple length, moisture level strength of cotton thread present all these parameter are identified manually, by the operator. In order to standardize this process the cotton project is intended. This project is focused on identification of moisture level in the cotton bale and generates appropriate result. The final stage in the cotton processing stream is the cotton bale packaging system. Recent innovations have shown that the use of cotton moisture restoration systems both reduce stress on the bale packaging system as well as add additional weight to the bales. As cotton is sold on a wet basis, these systems were beginning to proliferate through the ginning industry. The research is needed because the excess moisture in the bales will cause fiber degradation and color-grade changes. This issue has become so important that it prompted the Cotton industry to make a recommendation for bales to be limited not to be less than 7.5% moisture.

II. APPROACHES IN MEASURING MOISTURE

The methods for measuring moisture in cotton lint can be classified into six groups based on the technique and on the type of cotton material being tested, such as compacted or loose seed cotton, loose lint moved by air in ducting or compressed baled lint. Moisture measurement methods can be based on:

1. Thermal drying.
2. Chemical.
3. Spectroscopy.
4. Measurement of electrical or dielectric properties.
5. Compression properties of cotton lint.

In Thermal drying methods involve heating a pre-weighed fibre or seed-cotton sample to dryness for a prescribed period and then weighing the dried sample. The regain or moisture regain is then expressed as the ratio of mass of absorbed water to oven-dry mass of fibre. Moisture content is the ratio of mass of absorbed water to the total fibre mass on wet-basis.

In Chemical analysis for moisture content involves a colorimetric or volumetric titration measurement of moisture that has been extracted from the fibre and/or seed. The most widely used chemical method is the Karl Fischer titration measurement of moisture content, which allows the moisture content of the captured specimen to be maintained and measured in sealed test bottles. But these automated versions are expensive and not trivial in their methodology.

In Spectroscopic method for moisture determination involve the use of a spectrometer to measure the amount of electromagnetic energy of particular wavelengths absorbed (or reflected) by water molecules in different bonding states within the sample. The quantity of moisture is measured by the intensity of the moisture absorption (or reflectance) spectra.

In Electrical methods for measuring moisture in lint or seed-cotton specimens are based on measuring changes in electrical charge due to the moisture content of cotton and to some extent the presence of mineral salts in water and on the cotton. Electrical charge is typically measured in terms of resistance or permittivity (measured in relation to micro and radio-wave transmission).As conductivity is low (resistance is high) in very dry cotton but is higher in cotton with some moisture.

In compression method the measurement of pressure differences required to compress dry and wet cotton bales has also been used to predict the moisture content of cotton in bales as moisture content affects the compressing ability and resilience of cotton.

III. MICROWAVE IMAGING METHOD

This method involving the transmission of microwaves (electromagnetic radiation) signal of range between 2400-2480 MHz signal through the bale to determine change of signal in

order to penetrate the these signal through a cotton bale without interrupting of signal to detect the change in phase and signal strength at receiver end.

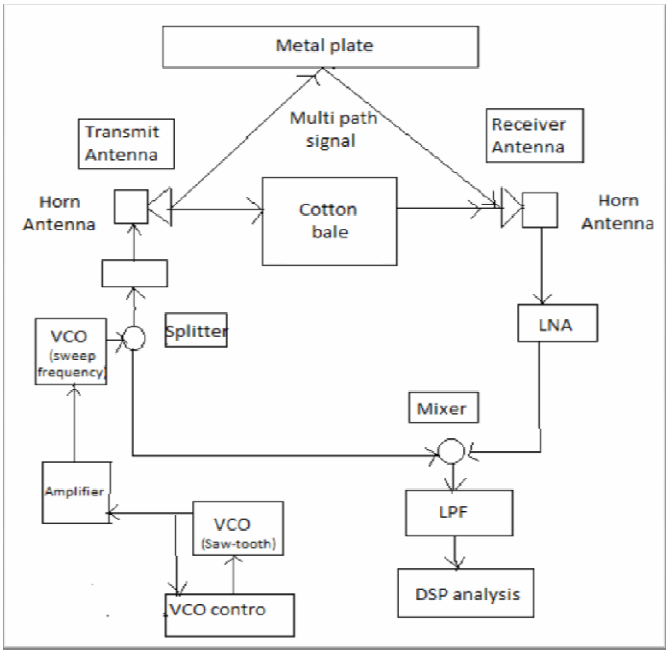

Fig.1 Schematic layout of detection of moisture content in cotton bale using microwave method.

Role of CC2500 module

C2500 is a Low-Cost Low-Power RF Transceiver.
It functions in 2400- 2483.5 MHz frequency band and provides an excellent option for WSN applications because of its low-power characteristics and SRD (Short Range Device) frequency band
This chip has 20 pins as,

- 2 for connecting a (mandatory) 26MHz external Crystal oscillator.
- 2 for connecting the antenna.
- 10 for powering the chip.

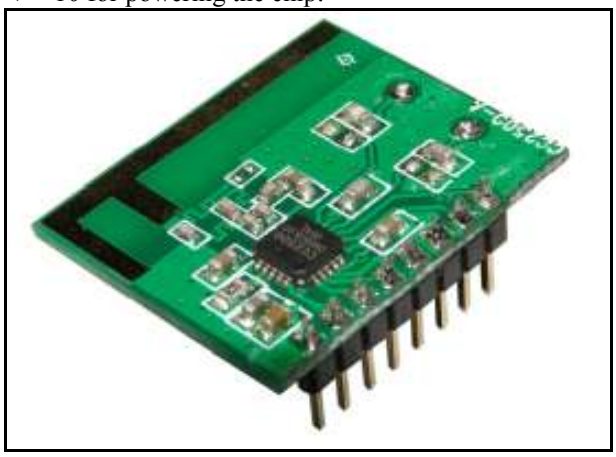

Figure CC2500: Transceiver module

- 6 for digital communication with the Microcontroller.
- The chip contains 47 registers to configure operating frequency, modulation scheme, baud rate, trans- mission power, etc. Because these registers are erased during power down, the MSP430 should configure all of them at startup.
- 13 commands allow the Microcontroller to control the state of the CC2500 (transmit, power Down, receive, etc.).

The RF transceiver is integrated with a highly configurable baseband modem. The modem supports various modulation formats and has a configurable data rate of up to 500 k Baud. CC2500 provides extensive hardware support for packet handling, data buffering, burst transmissions, clear channel assessment, link quality indication, and wake-on-radio. The main operating parameters and the 64- byte transmit/receive FIFOs of CC2500 can be controlled via an SPI interface. In a typical system, the CC2500 will be used together with a microcontroller and a few additional passive components.

Pin Configuration of CC2500

Pin No.	Name of Pin
1.	SCLK
2.	SO(GD01)
3.	S1(GD02)
4.	GVDD
5.	DCOUPLE
6.	GD00(ATEST)
7.	CSn
8.	XOSC_Q1
9.	AVDD
10.	XOSC_Q2

Pin diagram of CC2500

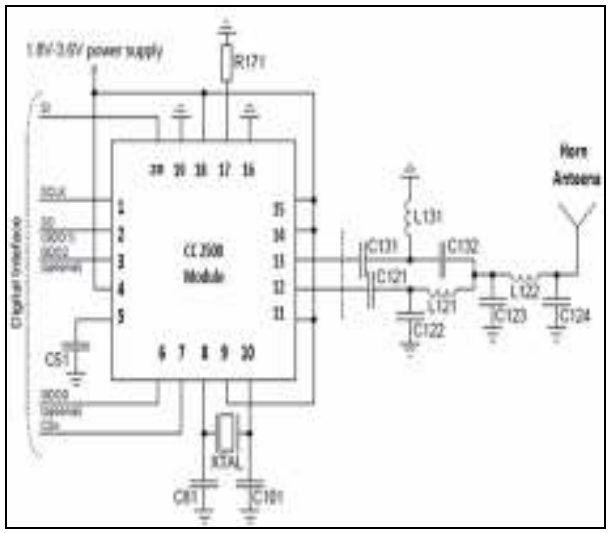

Figure 2: Pin diagram of CC2500 module.

What is SPI-Interface

Most of the communication between the controller and the CC2500 is done using industry standard SPI-interface. Controller provides SPI-master hardware blocks that work reliably with CC2500. However, the SPI-interface of the CC2500 requires a chip select -signal which must be generated on software. In addition to the SPI-interface, the CC2500 also provides two extra signals GD0 and GD2. Function of these signals can be selected rather freely (see datasheets of the CC2500 for details). In the most basic design hese signals are used to signal the Controller when a) a valid packet has been received and b) transmit is complete. In this design, handling these signals is done completely using software. Among other options, these signals can also be used to transmit and receive asynchronous data up to 250 kbps.

RF Performance

- High sensitivity (–104 dBm at 2.4 kBaud, 1% packet error rate).
- Low current consumption (13.3 mA in RX, 250 kBaud, input well above sensitivity limit).
- Programmable output power up to +1 dBm.
- Excellent receiver selectivity and blocking performance.
- Programmable data rate from 1.2 to 500 kBaud.
- Frequency range: 2400 – 2483.5 MHz.

Analog Features

- OOK, 2-FSK, GFSK, and MSK supported.
- Suitable for frequency hopping and multichannel systems due to a fast settling frequency synthesizer with 90 us settling time.
- Automatic Frequency Compensation (AFC) can be used to align the frequency synthesizer to the received centre frequency.
- Integrated analog temperature sensor.

Digital Features

- Flexible support for packet oriented systems: On-chip support for sync word detection, address check, flexible packet length, and automatic CRC handling.
- Efficient SPI interface: All registers can be programmed with one “burst” transfer.
- Digital RSSI output Programmable channel filter bandwidth.
- Programmable Carrier Sense (CS) Indicator.
- Programmable Preamble Quality Indicator (PQI) for improved protection against false sync word detection in random noise.
- Support for automatic Clear Channel Assessment (CCA) before transmitting (for listen-before-talk systems).
- Support for per-package Link Quality Indication (LQI).
- Optional automatic whitening and de-whitening of data.

Low-Power Features

- 400 nA SLEEP mode current consumption
- Fast startup time: 240 us from SLEEP to RX or TX mode (measured on EM design)
- Wake-on-radio functionality for automatic low-power RX polling
- Separate 64-byte RX and TX data FIFOs (enables burst mode data transmission)

General

- Few external components: Complete on chip.
- Frequency synthesizer, no external filters or RF switch needed.
- Green package: RoHS compliant and no antimony or bromine
- Small size (QLP 4x4 mm package, 20 pins)
- Support for asynchronous and synchronous serial receive/transmit mode for backwards compatibility with existing radio communication protocols.

IV. CONCLUSION

The design and implementation of this project is helping the cotton industry to design a particular criterion to purchase the moisture free cotton from the market and accordingly increasing the quality, accuracy and precision of the cotton for further processing.

The use of microwave imaging is becoming more prevalent for detection of interior hidden defects in manufactured and packaged materials. In applications for detection of hidden moisture, microwave imaging technology can be used to image a bale and then perform an inverse calculation to derive an estimate of the variability of the hidden interior moisture, thereby alerting personnel to damaging levels of unseen moisture before fibre degradation occurs.

The use of sensors is very costly and sensor based technic is with the packaging utilizes metal strapping ties, as the metal bale ties combine to create significant Mie scattering that causes destructive and constructive interference as the material is conveyed past the imaging antenna array, where the use of cc2500 module is that work on radio frequency act as a trans

receiver and gives precise and accurate response.

In the previous technics used the different manually operated chemical methods are used so it makes it complicated from the efficiency point of view. The previous methods are some where dependent methods of operations which will make the process poor in detections of moisture in the bale. The measurement of moisture via microwave transmission through modules and bales stands as a relatively accurate and robust method. Accurate, in-line methods for measuring the moisture of material during harvesting and particularly ginning will become increasingly important as energy costs and fibre quality premiums rise.

REFERENCES

[1] Anthony, W.S. 2003a. Impact of Moisture on Baled Cotton. American Society of Agricultural Engineers Meetings Papers. Paper No. 031167, 37pp.
[2] Anthony, W.S. 2003b. The Impact of Excess Moisture in The Bale On Fiber Quality. National Cotton Council Belt wide Cotton Conference.
[3] Baker, K.D., Hugh's, S.E., McAlister, D.D. 2005. Bale moisture addition with a rotor spray system. In: Proceedings of the Belt wide Cotton Conference, January 4-7, 2005, New Orleans, Louisiana. p. 808-812. 2005
[4] R.K. Byler and W.S. Anthony, 1995. Development of a moisture sensor for gin use. Proc. Belt wide Cotton Conf., San Antonio, TX. 4-7 Jan. 1995. Natl. Cotton Counc. Am., Memphis, TN.
[5] R.K. Byler and W.S. Anthony, 1997. Measurement Concepts in a gin process control system, Proc. Belt wide Cotton Conf., New Orleans, LA. 7-10 Jan. 1997. Natl. Cotton Counc. Am., Memphis, TN.
[6] Byler, R.K., Anthony, W.S. 2003. Measurement Of Bale Moisture Content Based On Bale Compression Pressure. 2003 Belt wide Cotton Conference.
[7] Mangialardi, G. J. Jr., and A. C. Griffin, Jr. 965. Moisture restoration to cotton at the gin: effects n fiber and spinning properties. USDA Report o. 08. Washington, D.C.: USDA.
[8] Mangialardi, G. J. Jr., and A. C. Griffin, Jr. 1977. A method for restoring moisture to cotton at gins. Transactions of the ASAE 20(5).
[9] Shepherd, J. V. 1972. Standard procedures for foreign matter and moisture analytical tests used in cotton ginning research. USDA Agricultural Handbook No. 422. Washington, D.C.: USDA.
[10] Pelletier, M.G. 2005b. Bale moisture sensing: Field Trial. 2005 Belt wide Cotton Conference.

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Promoting ICT enhanced Constructivist Teaching Practices among Pre-service Teachers: a case Study

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Abstract- The accelerated growth of information communication technology (ICT) and its wide application in our personal as well as professional life has made the teacher educators think seriously about creating ICT enhanced learning context for pre-service teachers to develop their understanding about role of ICT in providing constructivist learning experiences to their students. The reflections of the researchers on the need for developing new understanding about growing involvement of ICT in teaching and learning process and relation between technology and pedagogy while integrating ICT in instructional practices among the pre-service teachers motivated researchers to take a proactive action in this direction. This resulted in the development and implementation of a ICT mediated language education project for Std 7th school students in which twelve pre-service teachers were involved as co -researchers.

This paper describes the project experiences of Pre-service teachers in terms of their perceptions about utility of ICT in creating constructivist learning environment in the classroom.

Index Terms- Constructivist Classroom, ICT Integration, ICT mediation, Pre-service Teachers

I. Introduction

With the extensive infusion of technology in our personal and professional lives, teacher educators in teacher preparation programs are challenged to provide learning environments where pre-service teachers learn how to learn and learn how to teach, with and through information communication technology (ICT). Within the framework of their teacher education programs, how are teacher educators to design intentional learning environments, where pre-service teachers develop new understandings of learning and teaching with rapidly evolving ICT? How are teacher Educators to assist pre-service teachers in developing an understanding of the critical relationship between pedagogy and technology, in fostering the integration of pedagogy and technology? These were some of the questions made us reflect and motivated to take some proactive action in this direction.

As teacher educators within the Bachelor of Education program at the K. J. Somaiya College of Education and Research, Mumbai, we (both the authors) worked as co-researchers with a group of 12 preservice language teachers in a ICT mediated language teaching project. During the project, pre-service teachers explored how children cope and respond to ICT mediated learning situations. ICT was integrated throughout various stages in the inquiry to gather information, to make decisions, to communicate, to collaborate, and to represent school children's understandings. This paper describes the project experiences of Pre-service teachers in terms of their perceptions about utility of ICT in creating constructivist learning environment in the classroom.

This study was based on two premises. The first concerns the implementation of the ICT- enhanced constructivist learning today in classroom. The second refers to the emerging need for the appropriate teacher education and professional development as a presupposition for the implementation of constructivist innovation in classrooms.

II. Theoretical Framework

ICT and the constructivism paradigm

There is wide consensus in education that learning is no longer seen simply as the result of a transmission of knowledge. Nowadays pedagogical strategies employed in the current ICT-based learning are linked to constructivism paradigm.

According to constructivism, knowledge is considered to be socially as well as individually constructed; learning is the acquisition of meaningful competences in a realistic context; learning is advanced through interactive and authentic experiences that match with the interests of the student. So the focus of teaching should be on the development of a suitable environment for constructing knowledge rather than for its transfer. In such an environment the use of ICT can help to promote constructivist innovation in the teaching learning process, contributing to the realization of meaningful authentic, active-reflective and problem-based learning. It will help the students to "learn how to learn". Students here will be able to seek solutions to real world problems. The ICT based technological and pedagogical framework will help to engage students' curiosity and initiate learning, leading to critical and analytical thinking. Thus the constructivist education philosophy aims at creating a learning context in a school where students learn how to learn, in a learner-centered environment with emphasis on learning through discovery and exploration and experiences and teacher as a facilitator is expected to play a major role in this process.

The emerging need for preparing teachers for ICT-enhanced constructivist teaching: ICT-enhanced constructivist classroom practices demand that teachers play a new role. This means that opportunities, like exposure to a number of critical examples and experience in designing ICT-based activities and integrating them in their classroom practice in constructivist ways are of great priority. The aim is to convince teachers for the potentiality of ICT as constructivist learning tool. This has to be done through their experiences of their professional preparation

framework. For this reason the development and implementation of appropriate learning opportunities is very important for the teachers' professional development and crucial for the success of innovative approaches using ICT. Teachers need to go beyond traditional approaches and become acquainted with new methods in order to get a clear understanding of the educational functionality of technological tools in their instructional practices. The approaches to ICT integration in Pre-service Teacher Education Program should include the need for awareness of the advantages and possible difficulties of the proposed instructional practices for classroom teaching and learning and usage of sociological and psychological settings and technological tools for fostering active learning among the learners in constructivist way.

III. Research Elaborations

Designing ICT mediated Constructivist Teaching Experiences for the Pre-service Language Teachers:

Under the pre-mentioned theoretical framework, a ICT mediated collaborative language teaching project for Std 7 school students was designed in which 12 pre-service language teachers were involved as the project participants. Their participation in the project was voluntary. The group of pre-service teachers consisted of one male and 11 females with the age ranging from 22 to 31 years. Out of these participants 4 were post graduates while 8 were graduates. All the participants were ICT natives and used digital technology effectively.

Context of the Project:

The project started with the idea of bringing together the selected Schools' students and pre-service English language teachers in an ICT mediated learning environment and create learning situations, which sees the technology as a means of enhancing oral and written communication between students and teachers as well as among themselves. The study has gone beyond the traditional classroom activities because of intending to provide a ICT-supported collaborative learning environment. Thus, the project aimed at : providing the pre-service teachers with the opportunity to use ICT for Creating constructivist learning environment for language learning among the 7th std students and Studying their perceptions about usefulness of ICT mediation in creating constructivist learning environment for learning English language.

The Research Questions:

The study is centered on the following research problem:
What according to pre-service teachers perceived potential educational value of ICT in creating constructivist learning environment?
The following research questions have been developed to address the research problem:
1) What are the perceptions of the pre-service teachers about the educational usefulness of ICT in the teaching - learning process?
2) What are the experiences of pre-service teachers about ICT mediated language instruction provided through the project?
3) What are the positive pedagogical issues identified by the pre-service teachers in the ICT mediated language learning strategy designed by them?

Methods:

According to Windschitl (1998), qualitative approaches to classroom research are appropriate because they employ a variety of methods that can help clarify phenomena, add valuable contextual information, emphasize discovery (rather than verification), and describe what is happening to study participants. In particular, case studies are well suited to in-depth examination of educational practice (Merriam, 1998; Patton, 1990; Windschitl, 1998). The study described here was qualitative in nature and employed a case study methodology. It took the form of teacher research, which we, like many educators (e.g., Baumann, Shockley-Bisplinghoff, & Allen, 1997; Cochran-Smith & Lytle, 1990) value as a form of systematic, intentional inquiry about classroom dynamics. Quantitative methods were used in conjunction with qualitative to triangulate findings and strengthen the study (Patton, 1990).

Study Setting:

A week long project was applied after getting the academic support from the pioneering schools which adopted a policy of supporting ICT Mediated communication for different academic and administrative purposes. For this three near by schools were chosen according to appropriateness of its technical Infrastructures and whole hearted cooperation of the staff.

Organization of the Project:

In the organization of the project, two English method masters (who were the co-researchers), twelve pre-service teachers (facilitators), English language teachers, ICT center staff and school principles took part.

Facilitators:

As mentioned earlier the 12 prospective English language teachers of K. J. Somaiya college of Education were assigned the job of the facilitators of students' engagement in ICT mediated language learning. They worked in 3 schools. Each school was allotted one group of 4 teachers. Each group was given the responsibility of one division of std 7. Further, the students in the allotted class were divided into subgroups. These groups were made as per the activity selected by them. Each sub-group had one leader, two content managers and two technologies managers. Each sub- group worked under the pre-service teachers who functioned as facilitators for their projects.

Student Participants:

The student participants of the project consisted of - 7th-std students from selected three schools. Throughout the project, students improved their ability to investigate specific topics, analyze and synthesize the findings. In addition, students worked cooperatively in groups to attain academic as well as affective and social goals.

ICT centre staff:

Each selected school had an A.V. room supervised by a trained staff that used to help the students and prospective teachers in case any technological problem arose.

English Language Teachers:

Language teachers controlled the relevance of selected instructional materials and tasks and their appropriateness for the students ' age and prior language competences.

English Method Masters:

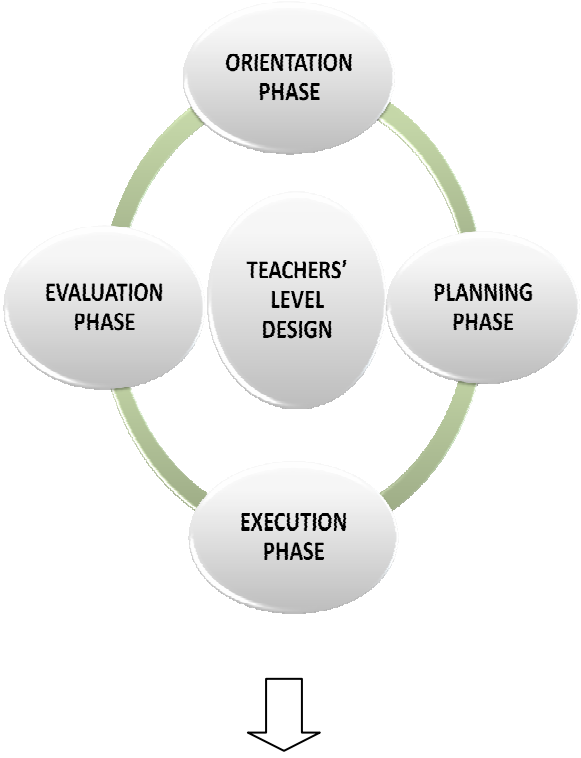
Two English method masters were of K. J. Somaiya college of Education and Research had designed the 2 phase instructional module for providing the pre-service teachers the learning opportunity of using ICT for creating constructivist learning environment for language learning. They guided the pre-service teachers in planning, executing and evaluating the module.

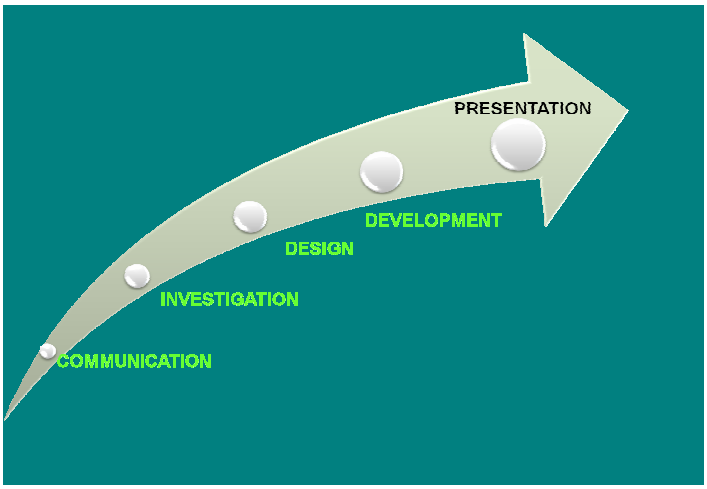
Principals of the Schools:

They were all expected to provide the administrative support for the project by making necessary adjustments in school schedules and coordinating project and school activities.

Project Design:

The team of the researchers had designed a 2 stage module for this project. The first stage dealt with the prospective teachers' level, while the second stage was related to the students' level. The module can be diagrammatically shown as follows-





A. Teachers' Level Design:

At this level the design had the following objectives

1. To design a training module for the pre-service teachers for:

a. Developing understanding about theoretical background of constructivism and its application in language learning,

b. Developing technological and pedagogical knowledge for building a technological and pedagogical framework for transacting the selected language content in ICT mediated learning environment**.**

2. To scaffold the developing of the instructional materials for promoting standard 7 students engagement in language learning in ICT mediated language learning environment.

This level design had the following phases:

a) Orientation phase - At this phase the prospective teachers were oriented to constructivism as a learning theory and constructivist instructional strategies , need for ICT mediation for enhancing students learning and need for using ICT for creating constructivist learning environment for language learning.

b) Planning phase- The team of researchers under the guidance of English method masters selected 3 areas of language learning namely- writing composition, poetry comprehension and creative writing. School group 1 of pre-service teachers selected "My favorite place" as a topic for written expression. But the forms of written expressions were beyond the traditional writing of compositions. The sub- groups of the students in the class chose to write issue based news paper articles, compose poetry depicting the glory of the place and TV narratives. All these products were developed with ICT applications. The second school group decided to work on in depth poetry comprehension. The sub- groups were expected to develop concept webs, literary analysis and effective recitations of the given poems. The third school group worked on creative story writing, converting the plots into scripts and make ICT supported animated presentations of the scripts in the form of E-comics. Here the English method

masters along with the prospective teachers planned the daily sessions, instructional materials, rubrics and concept webs.

c) Execution phase- A detail schedule of 4-5 days comprising of 5 stages was chalked. These stages included- communication, investigation, design, development and presentation. The detailed explanation of these stages is given in the second phase.

d) Evaluation phase –

- The evaluation of the project was based on
- A 5-point Likert scale measuring the degree to which pre-service teachers agreed or disagreed with four statements regarding the educational usefulness of ICT based on the project experiences.
- Answers and explanations on open ended questions given in written form asking them to identify and mention any positive educational issues they had found in ICT mediated learning.
- Three collaborative project reports about the results and experiences of the pre-service teachers and school students about the project.

B. Design at the students' level:

At this level the design had the following objectives-

1. To develop an instructional design for promoting std 7th students
   engagement in learning language in ICT mediated environment,
2. To facilitate the students language learning in ICT mediated learning environment by:
   1. Fostering inter group and whole class communication.
   2. Encouraging them to investigate with respect to their selected language tasks.
   3. Facilitating students' designing, developing and presenting stages of language learning tasks by providing appropriate technological and pedagogical support.

There were 5 stages students entered throughout the project; communication, investigation, design, development, and presentation. Each phase approximately lasted for one day.

IV. RESULTS

To study perceptions of the pre-service teachers about educational value of the ICT mediation in creating the constructivist learning environment the data was collected with the help of:

- A 5-point Likert scale measuring the degree to which pre-service teachers agreed or disagreed with 5statements regarding the educational usefulness of ICT
- Answers and explanations on open ended questions given in written form asking them to identify and mention any positive educational issues they had found in the ICT mediated language instruction project,

Three collaborative reports about the results and experiences of the pre-service teachers and school students about the project:

- Focus group interviews of the pre-service teachers
- Reflection logs of the pre-service teachers.

The collected data was analyzed quantitatively as well as qualitatively. Based on this analysis the attempt is made to answer the following research questions:

R.Q. 1.What is the perceptions of the pre-service teachers about the educational usefulness of ICT use in teaching –learning process?

To answer this question A 5-point Likert scale measuring the degree to which pre-service teachers agreed or disagreed with 5 statements indicated in table 1 regarding the perceived educational usefulness of ICT.

Table 1: Pre-service teachers' perceptions about the usefulness of ICT

Sr. No.	Statements,	Strongly	Agree	No Comment	Disagree	Strongly Disagree	Total
1.	I feel ICT mediated language teaching is better than traditional method of teaching languages:	8	2	1	1	-	12
2.	ICT helps to make learning interesting	9	2	1	-	-	12
3.	ICT facilitates students learning	7	3	1	1	-	12
4.	ICT helps to create active learning environment for the students inside or out side the classroom	6	5	-	1	-	12
5.	ICT is useful for teaching all the aspects of language instruction	5	4	1	2	-	12

This table shows that majority of the pre-service teachers had positive perceptions about ICT use in classroom.

Out of 12 pre-service teachers 10 strongly agreed or agreed that ICT mediated language teaching is better than the traditional method of teaching .One of them disagreed and another had no comment. This shows that still few were not convinced about the superiority of ICT over the traditional method. Out of 12 11 pre-service teachers were of the opinion that ICT makes learning interesting, while one did not comment on this. 11 out of 12 pre-service teachers positively responded about ICT facilitating students' learning but, one still was not agreeing to it and another did not want to comment about it. 11 out of 12 pre-service teachers felt that ICT helps to creat active learning environment inside as well as outside the classroom and only one were not convinced about it. 9 out of 12 pre-service teachers found ICT useful for teaching all the aspects of language instruction but 2 of them did not agree to this and one did not want to comment. This analysis is creating positive picture about the prospective teachers' perceptions about ICT use. This finding is supporting the findings of earlier researchers who have shown the favorable attitude toward and positive perceptions about ICT use among pre-service teachers as a result of intentional learning opportunities for ICT integration in Teacher Education (Lee, Teo, Chai, Choy, Tan, 2007; Gill & Dalgarno,2008; Yasemin Gülbahar,2008).

R.Q.2 what are the experiences of pre-service teachers about ICT mediated language instruction provided through the project?

To answer this question the data was gathered from three collaborative project reports, the reflection logs of the pre-service teachers and focus group interviews of the pre-service teachers.

Case study of group 1:

Group 1 consisted of 4 pre-service language teachers and 45 Class 7 students. Out of 4 teachers 2 had previous teaching experience in schools while the other two had only experience of field teaching practice of 10 language lessons. All of them were enthusiastic. The only difference between the experienced and inexperienced teachers was that initially the former were hurrying to do direct teaching rather than playing the role of the facilitators. The school where the group conducted the project was one of the good schools in the vicinity having a computer lab. But the administrative authority was very rigid. The principal initially opposed the idea of the project as according to her it was a shear waste of time. The first of the 4 days of the project was full of disappointments for the pre-service teachers. They themselves were finding it difficult to play the role of the facilitators. They were rather unsure about the students' active participation in the project. The school students too were also inactive and waited for the instructions from the teachers' mouths. The teacher pupils interaction pattern changed slowly with more and more engaging the students in the process of learning through ICT mediation. As described earlier the group worked on writing activity. The topic chosen was "My favorite place". The presentations of issue based newspaper article, TV narrative and a group composed poem was done with the help of ICT application. The principal who was initially so skeptic about the project happened to be there when the students' presentations were going on. She appreciated the students and the pre-service teachers saying that she could never imagine that her students could do so much.

Case study of group 2:

The second group of pre-service teachers worked with the 50 class 7 students. This school too had good infrastructure. The school authority was flexible and easy to approach. They were very receptive to innovative practices. But the students wanted to know whether this activity will give them mark, if they will be escaped from periodical test, if the entire group members will be graded same etc. This shows that students are still bothered about the grades or marks rather than getting involved in the creative task.

The pre-service teachers could establish good rapport with the language teacher and the students from the school. Here too the first day ended with lot of confusion on the part of students. But the task gained momentum from the next day. By the end of the project the cooperative and collaborative spirit among the participants was significantly increased. The group of pre-service teachers was inexperienced in terms of school teaching. All of them were very young and friendly in nature. The pre-service teachers as well as students had sound knowledge and skills of ICT. This group decided to work on in depth poetry comprehension. The sub- groups were expected to develop concept webs, literary analysis and effective recitations of the given poems. The ICT assisted presentations of the students were very much appreciated by the school teachers and principal.

Case study of group 3:

The 3rd group of the pre-service teachers was allotted a school with appropriate technical facilities. Unlike other 2 groups this group of pre-service teachers themselves was apprehensive about the use of ICT mediation in fostering creative writing among 47 class 7 students. They were also unsure about the students' readiness for working collaboratively in constructivist learning environment. But the response they received on the first day of the project proved to be the eye opener for them. This group worked on creative story writing, converting the plots into story maps and further into scripts and make ICT supported animated presentations of the scripts in the form of E-comics. They shared these comics with students from other divisions of the school.

All these case studies help us to observe the following:

The school authorities are not sure about the potential of the students to construct knowledge, the prospective teachers still have apprehensions about their role that of facilitators. See the following remarks from their reflection logs:" I was wondering how the small children can analyze the poem"…," I feel the teacher should give them the points for the newspaper write up"…, " I do not think the students will be able to create a story plot"…It was interesting to see the changes in their notes after the projects. See some of the following remarks:

Group 1:

"The students were so committed on their tasks; they fulfilled their responsibility of the group project very well"

"The students after an initial frustration showed great interest in the project work and great commitment to their tasks all of them reached sufficiently good results".

"They were engaged in an exploratory way of learning very different from what they were used to so far".

Group 2:

Evaluating their students' work the group notes that "students participated actively in the whole learning process", "it was very productive for students to see their work being displayed on the screen ". They observed that "what students liked more in this project was the opportunity they had to work with autonomy, to make decisions and act on them without having to listen passively to teachers." They concluded that "it was a self-regulating process for students facilitating learning through exploration and discovery".

Group 3:

As mentioned earlier the members of the group were very skeptic about the potential of students in working independently in cooperative and collaborative manner and do creative story writing with ICT application. The same group mentions in the report the following:

"The students were showing great interest and enthusiasm in preparing the story plot."" It was a great pleasure to see the creative story ideas pouring in from the students. "Overall activity acted very positively for student learning and that "the traditional teaching approaches cannot help students in the development of creative way of thinking… "It is very important for students to be engaged in problem solving in a creative, not mechanistic way working collaboratively in the class…"

These last points imply a remarkable shift from their initial skepticism to a more positive attitude to ICT mediated constructivist learning, indicating a positive effect that the project work had on them.

All the three case studies indicate that our pre-service teacher succeeded in implementing in their groups ICT mediated language learning activities in a constructivist way. They seem through his report to recognize in their students' reactions and behavior in the classroom some of the expected outcomes of the constructivist learning approach. They also seem to appreciate this kind of learning as exploratory, self-regulating and different from the teaching methods they and their students used to have experienced till then.

R.Q. 3 what are the positive pedagogical issues identified by the pre-service teachers in the ICT mediated language learning strategy designed by them?

To answer this question the pre-service teachers were asked to answer one open ended question.

Question: What positive educational issues did you find, if any, in ICT mediated language learning project? Explain your opinion in brief.

Answers and Explanations to open ended question:

The pre-service teachers' responses were analyzed and categorized as follows:

Table 2: Positive Educational Issues Identified by the Pre-service Teachers:

Sr. no	Response	Frequency
1.	Evokes enthusiasm	8
2.	Leads to creative learning	6
3.	Is captivating and interesting for students	8
4.	Fosters learning through exploration and discovery	9
5.	Facilitates the effective understanding of concepts	10
6.	Facilitates active learning of the students	9
7.	Gives opportunity to rectify students' mistakes and improve them	4
8.	Develops students' imagination and creativity	11
9.	Nurtures inquiry skills	4
10.	Enhances motivation for learning	3
11.	Crystallizes abstract notions into concrete things	1
12.	Is useful as an assignment after teacher's presentation only	1
13.	no specific response	2

Positive educational issues identified by pre-service teachers: (open question) (N=12)

All the 12 students answered the open question. The answers to question were analyzed and categorized qualitatively according to the educational issue mentioned by pre-service teachers. The emerged categories are presented on the table 2 (most of the pre-service teachers mentioned features belonging to more than one category). The majority of them (9/11) could identify and mention several constructivist issues belonging to or approaching constructivist ideas ("leads to creative learning", "active learning by the students", "opportunity to learn from mistakes" etc). They seemed to have been influenced and understood the educational meaning of the activities. This was more obvious in the following representative answers and explanations:

"…the students are involved in a creative process that requires deep thinking and use of their Imagination to come out the final product".

"…The students are able to observe their mistakes and are able to correct them".

"…In this way students are constructing their knowledge through exploratory work instead of simply passively receiving information from a teacher"

"…Students can approach literary concepts and tasks in a more creative, joyful way"

"…Students are active, they use their imagination and cultivate their creativity"

"… It helps students to put themselves in the position of a journalist" Two pre-service teachers could not mention any specific educational characteristics and answered in very general and unclear terms. For example: "This method is good", "This

method is interesting" etc. Three others re-confirmed that the method was useful and interesting but they would prefer the traditional method of classroom teaching before this kind of activity. As one of pre-service teachers mentioned "…we should first present the poem and then apply this activity for better comprehension".

Another pre-service teacher mentioned " First I would explained the students how to write a story then discuss with them the plot and then suggest them the correct way to write the story".

Though such replies were very few (2) still they indicate that, a lack of clarity and misunderstanding of the pedagogic rationale of constructivist approach of our project and shows their conviction about the traditional way of the teacher-led instructional practices for teaching the new concepts instead of the proposed knowledge construction by students themselves.

V. CONCLUSION

The conclusions drawn from the data presented in this paper indicate that the inclusion of ICT mediation in the field experiences of pre-service teacher education programmed in a constructivist way helped pre-service teachers to identify the pedagogical potential of ICT for students' constructivist learning. Although there were some confusion in the students' mind and few cases of misunderstanding were noticed, overall the whole project seems to have had a significant impact on the majority of pre-service teachers. This impact included acquaintance of the pre-service teachers with the constructivist learning strategy through their own concrete personal experience of an exploratory and constructivist teaching that can inspire their future teaching methodology and convinced them to use ICT as a constructivist learning tool. Although the findings from this study may not be generalized beyond this study's population because of the small sample size and the fact that the pre-service teachers were volunteers to participate in the study, the study does provide suggestions on how pre-service teachers can be prepared for using ICT as a teaching and learning tool for constructivist learning environment.

REFERENCES

[1] Allington, E., & Cunningham, P. (2002). Schools That Work: Where All Children Read and Write, Boston: Allyn and Bacon.

[2] Burris.N;Nathan.R;Temple.C;Temple.F.(1987).The Beginnings of Writing. Published by Allyn and Bacon, Inc.

[3] Cresswell, J. (2007). Qualitative Inquiry & Research Design. (2nd Ed.). Thousand Oaks, CA: Sage.

[4] Gay,L.R.(1990).Educational Research: Competencies for Analysis and Application .Merrill Publishing Company, New York.

[5] Kenner, R., & Richards, G. (1980). A Home Made Package for Use in the Language Lab. NALLD Journal, 15 (1),31-34.

[6] Tunnicliffe, S.(1984). Poetry Experience: Teaching and writing poetry in secondary schools. Published by Methuen Co. Ltd. Creswell: Sage

[7] Voss,F.R.(1985). Elements of Practical Writing.CBS college Publishing, New York.

[8] www.idrc.ca/cp/ev-155557-201-1- retrieved on 27th January, 2011

[9] www.idrc.ca/cp/ev-155557-201-1 retrieved on 30th January, 2011

[10] rtmindia.com/ict.in.education%2520RTM retrieved on 5th February, 2011

[11] ijedict.dec.uwi.edu/include/get.doc.ph retrieved on 6th February, 2011

[12] www.ict4lt.org/en/en mod1-4.htm retrieved on 8th February, 2011

[13] www.pixelonline.net/ICT4LL2011/programme retrieved on 9th July, 2011

[14] www.ict4lt.org/en/en_mod2-1.htm retrieved on 25th August, 2011

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AN EFFICIENT INTRUSION DETECTION BASED ON DECISION TREE CLASSIFIER USING FEATURE REDUCTION

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Abstract— Large computational value has always been a restraint in processing huge network intrusion data. This problem can be extenuated through feature selection to abbreviate the size of the network data involved. In this paper, we first deal existing feature selection methods that are computationally executable for processing vast network intrusion datasets. In this paper, we study and analysis of four machine learning algorithms (J48, BayesNet, OneR, NB) of data mining for the task of detecting intrusions and compare their relative performances. Based on this study, it can be concluded that J48 decision tree is the most suitable associated algorithm than the other three algorithms with high true positive rate (TPR) and low false positive rate (FTR) and low computation time with high accuracy.

Index Terms- Intrusion Detection; Machine Learning; Decision Tree; Bayes Net; NB; KDD 99

I. INTRODUCTION

Recently research on machine learning for intrusion detection has standard much attention in the computational intelligence community. In intrusion detection algorithm, immense strengths of audit data must be analyzed in order to conception new detection rules for increasing number of novel attacks in high speed network. Intrusion detection algorithm should consider the composite properties of attack behaviors to improve the detection speed and detection accuracy. Analyze the large volume of network dataset and the better performances of detection accuracy, intrusion detection become an important research field for machine learning. In this work we have presented J48 decision tree algorithm for intrusion detection based on machine learning. The Intrusion Detection System (IDS) is Process of monitoring the events occurring in a computer system or network and analyzing them for signs of possible incidents. IDS was first introduced in 1980 by James. P. Anderson [3] and then improved by D. Denning [4] in 1987.

They are two basic approaches for Intrusion Detection techniques, i.e. Anomaly Detection and Misuse Detection (signature-based ID) [17]. Anomaly Detection is basically based on assumption that attacker behavior is different from normal user's behavior [1]. In this paper, we present the application of machine learning to intrusion detection. We analyse four learning algorithms (J48, BayesNet, OneR and NB) for the task of detecting intrusions and compare their relative performances. There is only available data set is KDD data set for the purpose of experiment for intrusion detection.KDD data set [2] contain 42 attributes. The classes in KDD99 [18] dataset can be categorized into five main classes (one normal class and four main intrusion classes: probe, Dos, U2R and R2L)

II. RELATED WORK

Intrusion detection started in 1980's and since then a number of techniques have been introduced to build intrusion detection systems [12], [13], [14]. In 2007, Panda and Patra [10] determined a method using naive Bayes to detect signatures of specific attacks. They used KDD99 dataset for experiment, in the early 1980's, Stanford Research Institute (SRI) developed an Intrusion Detection Expert System (IDES) that monitors user behavior and detects suspicious events. Meng Jianliang [6] used the K Mean algorithm to cluster and analyze the data. He used the unsupervised learning technique for the intrusion detection. Mohammadreza Ektefa et al., [8] in 2010, compared C4.5 with SVM and the results revealed that C4.5 algorithms better than SVM in detecting network intrusions and false alarm rate. Zubair A.Baig et al. (2011) proposed An AODE-based Intrusion Detection System for Computer Networks. They suggested that the Naive Bayes (NB) does not accurately detect network intrusions [7]. In 2010, Hai Nguyen et al. [5] applied C4.5 and BayesNet for intrusion detection on KDD CUP'99 Dataset. Jiong Zhang and Mohammad Zulkernine [9] done the intrusion detection using the random forest algorithms in anomaly based NIDS. Cuixio Zhang, Guobing Zhang, Shanshan Sun [15] used the missed approach for the intrusion detection. He designed the mixed combining the anomaly detection and misuse detection in this model the anomaly detection module is built using unsupervised clustering method and the algorithm is an improved algorithm of K means clustering algorithm. The new algorithm learns the strong points from the k-means and improved relations trilateral triangle theorem. Gary Stein [11] applied the genetic algorithm and the decision tree algorithm for the intrusion detection. He used the genetic algorithm technique for the feature reduction.

III. METHODOLOGICAL APPROACH

Decision tree technology is a common, intuitionist and fast classification method [21]. Its construction process is top-down, divide-and-rule. Essentially it is a greedy algorithm. Starting from root node, for each non-leaf node, firstly choose an attribute to test the sample set; Secondly divide training sample set into several sub-sample sets according to testing results, each sub-sample set constitutes a new leaf node; Thirdly repeat the above

division process, until having reached specific end conditions. In the process of constructing decision tree, selecting testing attribute and how to divide sample set are very crucial. Different decision tree algorithm uses different technology. In practice, because the size of training sample set is usually large, the branches and layers of generated tree are also more. In addition, abnormity and noise existed in training sample set will also cause some abnormal branches, so we need to prune decision tree. One of the greatest advantages of decision tree classification algorithm is that: It does not require users to know a lot of background knowledge in the learning process. As long as training samples can be expressed as the form of attribute-conclusion, you can use this algorithm to study. But decision tree technology also has a lot of deficiency, such as: When there are too many categories, classification accuracy is significantly reduced; It is difficult to find rules based on the combination of several variables. At present, there are a lot of decision algorithms, such as: ID3, SLIQ, CART, CHAID and so on. But J48 algorithm is the most representative and widely used. It is proposed by Quinlan in 1993.

A Naive Bayes classifier [19] is a simple probabilistic classifier based on applying Bayes' theorem (from Bayesian statistics) with strong (naive) independence assumptions. A more descriptive term for the underlying probability model would be "independent feature model". In simple terms, a naive Bayes classifier assumes that the presence (or absence) of a particular feature of a class is unrelated to the presence (or absence) of any other feature. For example, a fruit may be considered to be an apple if it is red, round, and about 4" in diameter. Even if these features depend on each other or upon the existence of the other features, a naive Bayes classifier considers all of these properties to independently contribute to the probability that this fruit is an apple Depending on the precise nature of the probability model; naive Bayes classifiers can be trained very efficiently in a supervised learning setting. In many practical applications, parameter estimation for naive Bayes models uses the method of maximum likelihood; in other words, one can work with the naive Bayes model without believing in Bayesian probability or using any Bayesian methods.

Information Gain by an Example Data Set

The proposed feature reduction technique can be easily understood by the following example. To demonstrate efficiency of the proposed technique, we have used customer database [20] to calculate information gain.

TABLE I. CUSTOMER EXAMPLE DATASET

RID	Age	Income	Student	Credit Rating	Class:buys
1	Youth	High	No	Fair	No
2	Youth	High	No	Excellent	No
3	middle_aged	High	No	Fair	Yes
4	Senior	Medium	No	Fair	Yes
5	Senior	Low	Yes	Fair	Yes
6	Senior	Low	Yes	Excellent	No
7	middle_aged	Low	Yes	Excellent	Yes
8	Youth	Medium	No	Fair	No
9	Youth	Low	Yes	Fair	Yes
10	Senior	Medium	Yes	Fair	Yes
11	Youth	Medium	Yes	Excellent	Yes
12	middle_aged	Medium	No	Excellent	Yes
13	middle_aged	High	Yes	Fair	Yes
14	Senior	Medium	No	Excellent	No

Table I. presents a training set, D, of class-labelled tuples randomly selected from the All Electronics customer database. In this example, each attribute is discrete-valued. The class label attribute, buys computer, has two distinct values (namely, yes, no); therefore, there are two distinct classes (that is, m = 2).Let class C1 correspond to yes and class C2 correspond to no. There are nine tuples of class yes and five tuples of class no. A (root) node N is created for the tuples in D. We compute the information gain of each attribute. We first compute the expected information needed to classify a tuple in D:

Info (D)= - 9/14 log2 (9/14) –5/14 log2 (5/14)=0.940 bits....(1)

Next, we need to compute the expected information requirement for each attribute. Let's start with the attribute age. We need to look at the distribution of yes and no tuples for each category of age. For the age category youth, there are two yes tuples and three no tuples. For the category middle aged, there are four yes tuples and zero no tuples. For the category senior, there are three yes tuples and two no tuples. Now we calculate the Info for an attribute Age. The expected information needed to classify a tuple in *D* if the tuples are partitioned according to age is:

Info age (D) = 5/14 × (- 2/5 log2 2/5 – 3/5 log2 3/5) + 4/14 × (-4/4 log2 4/4 -0/4 log2 0/4) + 5/14 × (-3/5 log2 3/5 – 2/5 log2 2/5)

= 0.694 bits..... (2)

Hence, the gain in information from such a partitioning would be equation (1) – (2)

Gain (age) = Info (D) – Info age (D)

= 0.940 – 0.694

= 0.246 bits

Similarly, we can compute Gain (income) = 0.029 bits, Gain (student) = 0.151bits, and Gain (credit rating) = 0.048 bits

Using the method above for calculation of information gain, we calculate the info gain of the all the attribute of the KDD99 data set. The info gain of the all the attribute is given below in table I. In our proposed technique we are using the KDD99 dataset with these selected features and train and test the algorithm. For the testing we are using the 10 fold cross validation. Features selection techniques have been employed by Researchers. In other domain to extract important features.Skurichina and Duin [16] suggested that predictive accuracy can be improved by combining feature sets.

TABLE II. A SAMPLE CONFUSION MATRIX

	Predicted Class Positive	Predicted Class Negative
Actual Class Positive	a	b
Actual Class Negative	c	d

In this confusion matrix, the value a is called a true positive and the value d is called a true negative. The value b is referred to as a false negative and c is known as false positive.

True Positive Rate,Fale Positive Rate

In the context of intrusion detection, a true positive is an instance which is normal and is also classified as normal by the intrusion detector. For a good IDS TP rate should be high. False positive means no attack but IDS detect the attack. For a good IDS FP should be low.

Accuracy

This is the most basic measure of the performance of a learning method. This measure determines the percentage of correctly classified instances. From the confusion matrix, we can say that:

$$\text{Accuracy} = \frac{a + d}{a + b + c + d}$$

This metric gives the number of instances from the dataset which are classified correctly i.e. the ratio of true positives and true negatives to the total number of instances.

Algorithm

J48_Tree, generate a decision tree from the given training data
Input: training sample set T, the collection of candidate attribute attribute_list
Output: a decision tree.

- Create a root node N;
- IF T belongs to the same category C, then return N as a leaf node, and mark it as class C;
- IF attribute_list is empty or the remainder samples of T is less than a given value, then return N as a leaf node, and mark it as the category which appears most frequently in attribute_list, for each attribute, calculate its information gain ratio.
- Suppose test_attribute is the testing attribute of N, then test_attribute = the attribute which has the highest information gain ratio in attribute list:
- If testing attribute is continuous, then find its division threshold;
- For each new leaf node grown by node N { Suppose T' is the sample subset corresponding to the leaf node. If T' has only a decision category, then mark the leaf node as this category; Else continue to implement J48_Tree (T ', T'_attributelist) . }
- Calculate the classification error rate of each node, and then prune the tree.

IV. RESULT ANALYSIS

The Tables III, IV and V Shows the performance of four classification methods based on correctly classified Instances, incorrectly classified Instances ,Kappa statistic, Mean absolute error, Root Mean Squared Error and Relative Absolute Error and Root Relative Squared error and Time taken to build the models respectively. The comparison is performed for 41 and 11 attributes. The four classifier models on the dataset are built and tested by means of 10-fold cross-validation. The Java Heap size was set to 1024 MB for WEKA 3.6.2, the simulation platform is an Intel™ Core i3-2100 processor system with 3 GB RAM under Microsoft Windows XP™ Service Pack-2 operating system, 3.10 GHz with 500 GB memory.

TABLE III. COMPARISION OF THE RESULTS FOR J48, BAYESNET, ONER AND NB WITH ALL ATTRIBUTE

Parameter	**Classifier**			
	J48	***BayesNet***	***OneR***	***NB***
Correctly Classified Instances	99.5594 %	96.5624 %	96.1893 %	89.5919 %
Incorrectly Classified Instances	0.4406 %	3.4376 %	3.8107 %	10.4081 %
Kappa statistic	0.9911	0.9307 %	0.9237 %	0.7906 %
Mean absolute error	0.0064	0.0378 %	0.0381 %	0.1034 %
Root mean squared error	0.0651	0.175 %	0.1952 %	0.3152 %
Relative absolute error	1.2854 %	7.6037 %	7.6566 %	20.7817 %
Root relative squared error	13.059 %	35.0792 %	39.132 %	63.1897 %

TABLE IV. COMPARISION OF THE RESULTS FOR J48, BAYESNET, ONER AND NB WITH 11 ATTRIBUTE

Parameter	**Classifier**			
	J48	***BayesNet***	***OneR***	***NB***
Correctly Classified Instances	99.9039 %	99.1073 %	97.6761 %	92.697 %
Incorrectly Classified Instances	0.0961 %	0.8927 %	2.3239 %	7.303 %
Kappa statistic	0.998	0.982	0.9529 %	0.8551 %
Mean absolute error	0.0006	0.004	0.0093 %	0.0297 %
Root mean squared error	0.019	0.056	0.0964 %	0.1641 %
Relative absolute error	0.2997 %	2.0366 %	4.7346 %	15.144 %
Root relative squared error	6.0564 %	17.8797 %	30.7728 %	52.3814 %

From table III and IV.It is clear that The J48 gave the best performance.

Now we compare the result of the J48, BayesNet, OneR and NB algorithms. Firstly we compare the result after run the algorithm with all attribute. Secondly we compare the result after run the algorithm with reduced 11 attribute than only we

conclude that which one algorithm is good best for the intrusion detection.

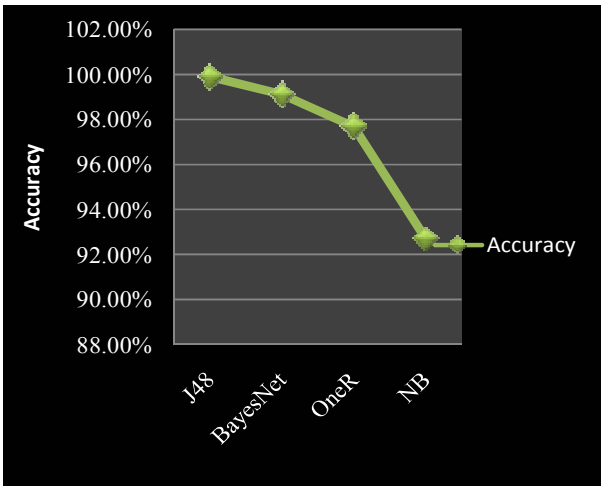

Figure 1. Comparison of accuracy for J48, BayesNet, OneR and NB.

From above figure 1. It is clear that information gain feature reduction method gives the better accuracy which is desirable for good Intrusion Detection System. Especially in the case of J48 accuracy is 99.9%.

Now we compare the TPR of the J48, BayesNet, OneR and NB algorithm with all attribute and with selected 11 attributes.

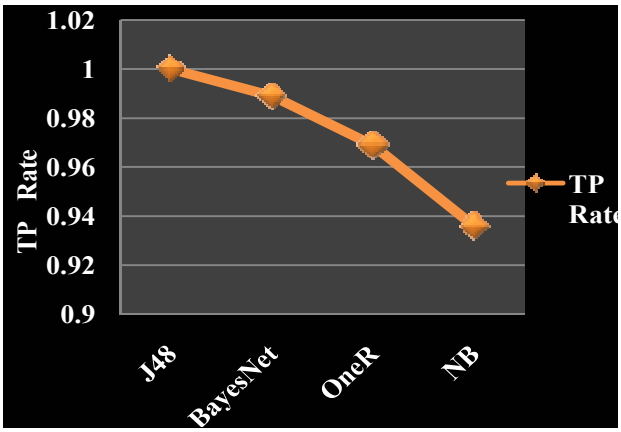

Figure 2. TPR comparison of J48, BayesNet, OneR and NB.

For a good IDS TP Rate should be high. Above figure 2. Shows that TP Rate of the J48 algorithm is higher when we reduce the feature of the data set using information gain. Especially in the case of J48 TPR is 1

Figure 2 and Figure 3 above shows the TPR (True Positive Rate) and FPR (False Positive Rate) of the J48, BayesNet, OneR and NB algorithm when run with the all attributes of the data set. Figure 2. Shows that TPR of the J48 is higher than the remaining three algorithms which is desirable. Figure 3. Also shows that FPR of the J48 is almost zero which is desirable for a good intrusion detection algorithm.

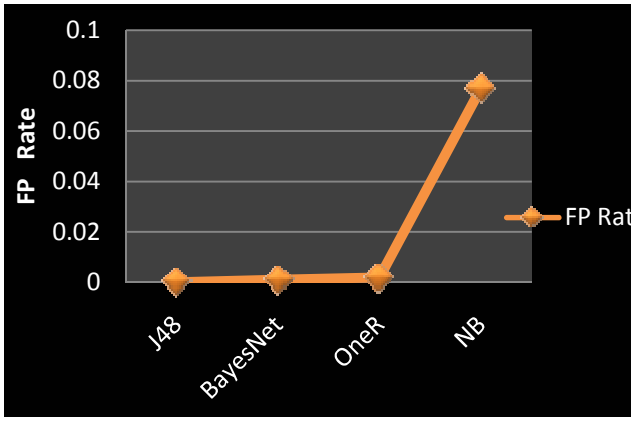

Figure 3. FPR comparison of J48, BayesNet, OneR and NB.

For a good IDS FPR should be low. Above figure 3 shows that FPR of the J48 algorithm is lower when we reduce the feature of the data set using information gain. Especially in the case of J48 FPR is 0.In the case of BayesNet, OneR and NB algorithm FPR of the greater than 0. From above figures 1, 2 and 3 it is clear that J48 algorithm Accuracy, TPR and FPR is better than other three algorithms. So we can say that reduction of the feature using information gain is better technique.

The experimental results shows that Performance Evaluation of four classification models, J48 have much better performance than other three methods and it is also observed that the overall performance of J48 classification has increased their performance using feature reduction method a notable improvement in their classification, means the classification accuracy increases better after feature selection.

In this paper, the performance of four well known data mining classifier algorithms namely J48, BayesNet, OneR and Naïve Bayes are evaluated based on the 10-fold cross validation test, Experimental results using the KDD CUP99 IDS data set demonstrate that while J48 is one of the most effective inductive learning algorithms, decision trees are more interesting as far as the detection of new attacks is concerned.

TABLE V. COMPARISION OF THE RESULTS FOR J48, BAYESNET, ONER AND NB

Feature Used	**Classifier**	**Accuracy**	**normal**		**dos**		**probe**		**r 2 l**		**u 2 r**	
			TP Rate	FP Rate	TP Rate	FP Rate	TP Rate	FP Rate	TP Rate	FP Rate	TP Rate	FP Rate
11	J48	99.9039%	1	0.002	1	0	0.971	0	0.75	0	0.2	0

11	Bayes Net	99.1073%	0.989	0.001	0.996	0.001	0.951	0.006	0.824	0.001	0.6	0.001
11	OneR	92.697 %	0.969	0.002	0.999	0.035	0.682	0.001	0.794	0	0	0
11	NB	92.697 %	0.936	0.077	0.917	0.015	0.811	0.007	0.824	0.019	0.6	0.007

V. CONCLUSIONS

In this paper, we reduced the features of the data set using information gain of the attributes. This study is approached to discover the best classification algorithm for the applications of machine learning to intrusion detection. Our simulation results show that, in general, the J48 has the highest classification accuracy performance with the lowest error rate. On the other hand, we also found that drastically decreased in learning time of the algorithm and increase in accuracy and TPR. Comparison shows that reduction of the feature using information gain technique is suitable for the feature reduction. Using Weka, we analysed four algorithms towards their suitability for detecting intrusions from KDD99 dataset. We showed that machine learning can be effectively applied to detect novel intrusions and focused on anomaly detection. The four learning algorithms J48, BayesNet, OneR and NB were compared at the task of detecting intrusions. J48 with an accuracy rate of approximately 99% was found to perform much better at detecting intrusions than BayesNet, OneR and NB Based on the experiments done in the paper and their Corresponding results, we can state the following: Machine learning is an effective methodology which can be used in the field of intrusion detection.

References

[1] Lida Rashidi,Sattar Hashem and Ali Hamzeh, "Anomaly detection in categorical datasets using bayesian networks," AICI'11 Proceedings of the Third International Conference on Artificial Intelligence and Computational Intelligence, Volume Part II, Springer-Verlag, Berlin ,Heidelberg, 2011, pp.610–619.

[2] Knowledge Discovery in Databases DARPA archive. Task Description ,KDDCUP 1999 DataSet, http://www.kdd.ics.uci.edu/databases/kddcup99/task.htm

[3] James P. Anderson, "Computer Security Threat Monitoring and Surveillance," Technical Report, James P.Anderson Co.,Fort Washington, Pennsylvania, USA , pp.98–17, April 1980.

[4] Dorothy E. Denning,"An Intrusion Detection Model," IEEE Transaction on Software Engineering (TSE), volume–13, No.2, pp.222–232,February 1987.

[5] Hai Nguyen, Katrin Franke and Slobodan Petrovi'c, "Improving Effectiveness of Intrusion Detection by Correlation Feature Selection," International Conference on Availability, Reliability and Security, pp. 17–24, IEEE 2010.

[6] Meng Jianliang, Shang Haikun, "The application on intrusion detection based on K-Means cluster algorithm," International Forum on Information Technology and Application, 2009.

[7] Zubair A. Baig, Abdulrhman S. Shaheen, and Radwan AbdelAal, "An AODE-based Intrusion Detection System for Computer Networks," pp. 28–35, IEEE 2011.

[8] Mohammadreza Ektefa, Sara Memar, Fatimah Sidi, Lilly Suriani Affendey,"Intrusion Detection Using Data Mining Techniques," Proceedings Of IEEE International Conference on Information Retrieval & Knowledge Management,Exploring Invisible World, CAMP'10,2010, pp.200-203.

[9] Jiong Zhang and Mohhammad Zulkernine, "Anomaly based Network Intrusion detection with unsupervised outlier detection," School of Computing Queen's University, Kingston, Ontario, Canada. IEEE International Conference ICC 2006, Volume-9, pp. 2388-2393, 11-15 June 2006.

[10] M. Panda, and M. R. Patra, "Network intrusion detection using naive Bayes," International Journal of Computer Science and Network Security (IJCSNS), Volume -7, No. 12, December 2007, pp. 258–263.

[11] Gary Stein, Bing Chen," Decision Tree Classifier for network intrusion detection with GA based feature selection," University of Central Florida. ACM-SE 43, Proceedings of 43rd annual Southeast regional Conference. Volume-2,2005.ACM,New York,USA.

[12] Shai Rubin, Somesh Jha, and Barton P. Miller, "Protomatching Network Traffic for High Throughput Network Intrusion Detection," In Proceedings of the Proceedings of the 13th ACM conference on Computer and Communications Security, pages 47–58. ACM, 2006.

[13] Marco Cova, Davide Balzarotti, Viktoria Felmetsger, and Giovanni Vigna. Swaddler, "An Approach for the Anomaly-Based Detection," Symposium on Recent Advances in Intrusion Detection(RAID*)*, pages 63–86. Springer, 2007.

[14] Pavel Kachurka, Vladimir Golovko, "Neural Network Approach to Real-Time Network Intrusion Detection and Recognition," The 6th IEEE International Conference on Intelligent Data Acquisition and Advanced Computing Systems: Technology and Application,15-17 September 2011, pp. 393–397, IEEE 2011.

[15] Cuixiao Zhang, Guobing Zhang, Shanshan Sen., "A mixed unsupervised clustering based Intrusion detection model," Third International Conference on Genetic and Evolutionary Computing, 2009.

[16] M. Skurichina and R.P.W. Duin, "Combining feature subsets in feature selection," Lecture Notes in Computer Science, Vol. 3541,pp-165-175,Springer Verlag, Berlin, 2005.

[17] LI Min and Wang Dongliang, "Anomaly Intrusion Detection Based on SOM," IEEE WASE International Conference on Information Engineering, IEEE Computer Society, 2009, pp. 40-44.

[18] Mahbod Tavallaee,Ebrahim Bagheri,Wei Lu, and Ali A.Ghorbani, "A Detailed Analysis of the KDD CUP 99 Data Set," Proceedings of the 2009 IEEE Symposium on Computational Intelligence in Security and Defense Application(CISDA 2009),IEEE 2009.

[19] R.Dogaru,"A modified Naive Bayes classifier for efficient implementations in embedded systems," Signals Circuits and Systems (ISSCS), IEEE 10th International Symposium on Lasi, June 30,2011-July 1, 2011, pp.1–4.

[20] Jiawei Han and Micheline kamber, "Data Mining Concepts and Techniques,"Second Edition,University of Illinois at Urbana-Champaign The Morgan Kaufmann Series in Data Management Systems,Elsevier 2007.

[21] Juan Wang, Qiren Yang,Dasen Ren, "An intrusion detection algorithm based on decision tree Technology,"Asia-Pacific Conference on Information Processing,APCIP 2009 ,Shenzhen,IEEE 18-19 July 2009. pp. 333–335.

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Consumer Socialization of Children: A Conceptual Framework

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Abstract- Children constitute a significant marketing zone. Today they not only make purchases for themselves but also influence family purchase decisions. The purchase behaviour is ruled by the way they have been socialized to act as consumers. This research looks at available literature with respect to children influence in family purchase decision. Media, family and peers are the key socializing agents that build in children the knowledge, skills and attitudes required to function in market place. This paper highlights the research done in last two decades on consumer socialization of children and identifies areas for future research with India as focus.

Index Terms- media, peers, purchase decisions, significant marketing zone, socialized

I. INTRODUCTION

World has witnessed a tremendous change in past decades. India has been a part of these changes too. With modernization and urbanization, Indian consumer profile has under gone a change. Exposure to globalized world, rise in disposable incomes and changing family profile has given a big push to Indian consumerism and today Indian consumer is totally different from the Indian consumer in last two decades. Arrival of niche channels like Cartoon Network, Hungama and Tanami have contributed a lot in Kids power in India and today children have been recognized as a significant and different consumer market. There are three markets in one; the current market for their existing product desires, future market for all products and influential market where they influence their parents to spend on different products [1]. This segment becomes very important from an Indian perspective as 30% of our population is below the age of 15 years (Census, 2011). Hence proper understanding the consumer socialization of Indian children is important for the marketer who wants to reach out to this segment.

II. LITERATURE REVIEW

Consumer socialization as per Ward & Wackman, [2], as cited by Kaur & Singh, [3] "is the process by which young people acquire skills, knowledge and attitudes relevant to their functioning in the market place". The process of consumer socialization starts in children while accompanying their parents to stores, malls etc [1]. In the beginning the children make requests for their preferred products, but as they grow older they start making their own choices in the store. At the age of five most of the children make purchases with the help of their parents and grandparents and by eight years they become independent consumers [1]. The socialization agents for children are family, peers and media in which the family sex role orientation, parental style and communication pattern have main impact on children's purchase behaviour [3].

III. FAMILY AS A SOCIALIZATION AGENT

Family influences both directly and indirectly in consumer socialization and parents impart their individual values about consumption in their children in early childhood. Dotson & Hyatt, [4] revealed that parents act as main socializing agents until the child reaches adolescence. Children from single parent would prefer to go to shopping with his/ her parent where they would get a chance to acquire knowledge of shopping from their parents compared to children from dual income families [4]. Mothers act as main socializing agents in the early stages of child decision making particularly the negotiation stage, but their influence declines and become equal to other family members in the outcome stage [5].

Socialization of children is a function of parental style [6]. Differences in parental style reflect differences in shopping behaviour of children. Becker, [7], as cited by Carlson & Grossbart, [8] categorized parents based on style in to Rigid Controlling, Authoritarian, Organized Effective, Overprotective, Democratic, Indulgent, Anxious Neurotic, and Neglecting. Baumrind, [9] classified parents as—Authoritarian, Authoritative, and Permissive. Macoby & Martin, [10] integrated these two approaches so as to generalise the parental classification to all families. They revealed that parental style is a function of two dimensions like responsiveness and demandingness, and thus classified parents in to Indulgent, Authoritative, Authoritarian, and Neglecting. Grossbart & Stuenkel, [11] publicized that parental style provides the main basis for explaining the differences among parents regarding how they socialize their children and incorporate the consumer knowledge and skills in them.

Childers & Rao, [12] studied the family influence on children with respect to different products and discovered that family influence will be more for privately consumed luxury and necessity (mattresses), but will be less for publically consumed luxury (golf clubs) and necessity (wrist watches) and children learn price sensitiveness and brand loyalty behaviours from their parents. Moschis, [13] revealed that parents regulate the amount of exposure of children to several information sources like television, peers and salesperson. Children learn shopping behaviour from their parents and replicate it. Changes in the parental style explains the differences with respect to the way parents try to control children's behaviour with power, sentiments at the time of socializing them [3]

Amongst the family members, mothers have been found as main socializing agents [14], however mothers varying in parental style were seen to vary in communication patterns with children regarding consumption patterns. Socialization of children was also seen to differ with the economic and social

status of mother [15]. It was also seen that children from professionally involved mothers had more exposure to shopping than the children from part time or unemployed mothers. Flouri, [16] studied the impact of maternal communication style on children socialization and revealed that mother's communication style alone was a reliable predictor style of child's level of materialism, though father's role has been found to be very restricted in consumer socialization of children [17,18].

Family influence in consumer socialization of children was studied by Robertson and Rossiter, [19] and found that social status of family also had a role in consumer socialization of children. Children from well-educated families were able to perceive persuasive intent in ads very easily. Moschis & Churchill, [20] found that children from families with higher socio economic set up were found to socialize faster. Female children were perceived to communicate overtly with their parents, while male children had more probability of receiving a negative reinforcement. Mothers were found to be socially oriented towards daughters than sons [21], also intergenerational influence was found to be mainly from mothers to daughters [22]. Studies of Yossi et al. [23] revealed that girls preferred shopping with their parents.

Studies on family as a socializing agent for children in India are limited. According to Hammer & Tunner, [24], American parents follow authoritative parental style and frequently allowed their children in choice making. However authoritative parental style had mixed effect on Indian children [25]. Roopnarine & Hossain, [26] publicized that joint family system have been a major influence on socialization of children in India. Ross, [27]; Kakar, [28] studied that mother in the family is main nurturer and caregiver while as father (grandfather if living) is dominant and children obeyed with respect and fear. Dasgupta, [29] identified that Indian parents place more emphasis on academic achievement and family inter dependence, discourage children autonomy and stresses on importance of extended family with respect and obedience of elders. However the studies of Ronald, [30]; Roopnarine & Hossain, [26] stated that parents in India prepare their children from earlier years for their eventual adult roles , in which males traditionally stay with their parents and look after the entire family, while as females support their spouses and look after household and children in family.

According to a report by McKinsey, (2007), India is expected to be the fifth largest consumer market by 2025. Indian culture has undergone much more social and economic change in last two decades than any country [31]. Also there has been a shift in the society from joint family setup to nuclear family and rise in parental income. All this has contributed a lot in kid's power. Twenty years ago one could safely say that decision making will be dominated by parents, today the role of children cannot be ignored.

IV. PEER GROUP AS A SOCIALIZATION AGENT

Peer group is defined as a group whose values and attitudes are used by a person as a foundation of his or her present behaviour [32, 33] and peer group influence is defined as the amount to which peers exert influence on the assertiveness, feelings and behaviour of a person [34]. Peers offer a distinctive background within which children develops social skills and cognitive talent [35]. Peer influence is more in early adolescence (14 yrs.) but progressively decreases as child approaches late adolescence [36] as cited by Mangleburg, [34]. Moreover Peers play a significant role in imparting the knowledge of style, brand, consumption pattern etc. to the children [20].

Childres & Rao, [12] studied the impact of peer group influence on children for some products and found that peer influence was high for public products than private products. Peers groups also support children in their purchases or consumption decisions and help them to establish a separate identity quite different from their parents [37]. Studies like Brittain, [38] also revealed the same findings that children spend more time with peers for day to day decision and spend time with their parents for value based, long term and ethical decision.

Studies on peer group as a socializing agent for children in India are limited. However certain studies stated that Indian children are generally influenced by peer group and workmates and as the child grows through life, the influence of peer groups raises and reaches its peak during a child's teenage years. Extensive research in this regard showed that children who were more closely associated with their parents and peers performed better than those who received support from only one or neither. Gwen et al. [39] stated that the major success to Pepsi was through peer pressure in selecting their purchase choice.

V. MEDIA AS A SOCIALIZATION AGENT

Media is one of the socializing agents that affect the children throughout the development [20]. Studies on the impact of advertising on children focuses on three types of effects; Cognitive, affective and behavioural [19]. Studies on cognitive effect discussed the children's skills to discriminate between a commercial and a television programme and their ability to comprehend the intent of advertising [40]. Most of these studies have used Piaget's model (1965) of cognitive development. Children at Paget's preoperational stage (2-7 yrs.) respond to commercials in a different way than do children at concrete operational stage (7-12 yrs.). Children in the concrete operational stage are mature enough to distinguish between a television commercial and a normal television programme. Studies on affective effects reveal that children's response to commercials gradually decreases as they proceed to concrete operational stage [2, 40]. Studies on behavioural effects discuss the extent to which children get persuaded by the commercials and are measured by the requests children are making for the purchase of products while shopping with their parents [41].

It is worrying that children are spectators of advertisements primarily because young children are open to thousands of commercials in India [42, 43]. Marketers are using television as a key source for advertisements as it affords access to children at much earlier age than other sources of advertisements can achieve largely because textual learning development does not happen until many years after children get converted to regular television viewers [3]. Although, advertisements have turned to be a main determinant of children's consumer behaviour but other factors have also been found to influence children's purchase requests [40]. Gender has been found to influence the children's purchase requests for advertised products; boys are more persistent than girls in their purchase requests [2, 40]. The other factors that have been found to influence children's consumer behaviour are socioeconomic status of the family,

parent-child interactions and peer group influence. These factors may not only affect children's consumer behaviour but may also enhance or inhibit cognitive, affective and behavioural effects of advertising [44].

It has been seen that children in their earlier stages of television viewing do not differentiate between a commercial and a programme. Most children below the age of 4-5 years are not aware about the concept of commercials and below the age of 7-8 years do not properly understand the persuasive intent of ads and tend to be egocentric [2]. Carroll, [45] in a study on children found that the most common persuasive strategy used in advertising is to associate product with fun and happiness, rather than giving any product rated information. Hence children in the age group of 8-10 years grow a positive attitude towards advertisements. Understanding of tactics and appeals develop only in early adolescence and thereafter [46]. Children even in young adolescence display doubtful predispositions towards advertising and as the children steps in to adolescence, they gain more knowledge about the different tactics used by marketers and hence become sceptical of advertising [46]. Moschis & Churchill, [20] also revealed the same results that in late adolescence children tend to be mature and develop resistance to persuasive intent of advertising.

Chan, [47] found a positive relationship between attentions paid to advertisements and perceived truthfulness and concluded that children who perceived advertisements to be true pay more attention than those who do not. Mizerski, [48] found that children even in young age recognised adult oriented products. Galst & White, [41] studied the effect of commercials on children and found that there is no effect of such exposures but that it is mainly a function of the product category advertised. Study of Mallalieu et al. [49] concluded that children born in 1990 appear to have much developed cognitive skills and differentiated commercials from programs and understood the intent of advertising to a for greater extent that those children reported by earlier studies.

Studies on children's recall of commercials has been examined from various angles and it has been seen that half of the children studied tendered to remember ads for products such as toys , cereals and ice creams [50]. Resnik & Srern, [51]; Gorn & Gibson, [52] exposed that brand preferences can also be manipulated by even a single exposure to a commercial and improved preference for advertised brands over other rival brands are also an outcome of frequent exposure [53].

Studies of Ross et al. [27] showed that certain advertising tactics like inclusion of certain characters and celebrities are essential in shaping children's views for advertised products. Exposure to identical version of ads one with a celebrity endorser and one without a celebrity endorser revealed that children preferred products with celebrity endorser. Study of Atkin, [54] discovered that premium offers are also important in shaping children's consumer behaviour and found in his study that children in a supermarket made more requests for cereals because they were influenced by premium offers. One more study done in this regard indicated that commercials offering premiums remained additionally persuasive than commercials containing a popular programme character [55].

Study of Atkin, [54] also revealed that television watching was a key predictor of children's requests for various products in the supermarkets. Such types of studies in other countries revealed same results. Buijzen & Valkenburg, [56] conducted a research on Dutch children and stated that children purchase requests were directly related to television viewing. Moreover cross cultural studies comparing children from Japan, United States and England revealed a positive relationship between children demands for merchandise advertised on television , though such type of purchase requests were seen more in United [57].

With the advancement in new media, new innovative commercial practices are now being directed to children. Marketers are now using internet as 48% of 8-18 year old are linked to internet access, 40% of 2-7 year used to be on line and 19% of 8-13 years reported visiting a website on the previous day [58]. Thousands of children oriented websites have come in to existence and many are laden with commercial promotions Montgomery, [59] stated that one of the distinctive features of marketing to children on internet is that the boundaries between commercial and non-commercial content are blurred if not absent entirely.

Studies on media as a socializing agent for children in India are limited. Singh, [60]; George, [42] stated that children in India watch television and prefer it to reading. Dhiman, [61] stated that children in India have become more judicious due to repeated exposure to different television commercials. They possess more knowledge about the different products than their parents and play a crucial role in brand identification and brand purchase decisions. Bandyopadhyay, [62] also showed that children are important audience who watch different television commercial and resulted in the demand for advertised products. kapoor & Verma, [63] in a comprehensive study in Delhi investigated the children's understanding of television advertising and stated that children as young as six years could understand the purpose of television ads and can easily distinguish a commercial from a programme. With increase in age of the children, cognitive understanding of the advertisements increased and children have turned to respond to different ads in a mature way [3]. Dudani et al. [64] in a study revealed that 99% of parents perceived that television watching was too high and children carried that influence for a long time with 45% parents agreed that advertising was a major tool which influenced the opinion building process of their children. However both parents and children noted the power of TV ads on children purchase requests and how it shaped children's consumer behaviour.

VI. CONCLUSION

The findings from this study are very interesting and throw light on the importance of family, peer group factor and mass media that build in children the knowledge, skills and attitudes required to function in market place and have an overwhelming impact on their brand choice and consumption behaviour. There is doubt that children are passionate consumers and have become socialized into this role from an early age. Throughout childhood, children develop the knowledge, skills and values they will use in making and influencing purchases now and in the future. Today Children have taken an important place in the society than their parents ever had. They not only are consumers but have a considerable influence may it be direct or indirect influence in the family purchase decisions. The amount of influence exerted by children differs from product group and the

time of decision making process. For some products they are active purchasers while as in others products, they are influencers and they direct the purchase through their parents by "Kidflence". The purchase behaviour is ruled by the way they have been socialized to act as consumers [3].

India is also witnessing a rise in the number of children influencing the family's decision-making about major purchases. Though India has a diverse culture, elder people are given respect in Indian culture and their say is always valued [65], still a shift in Indian culture in terms of rise in nuclear families and dual earning couples, increase in divorce rates, increase in single parent households, delayed parenthood, hyper parenting, rise in children channels etc. have contributed a lot on children's influence in family decision making [66]. Today we see especially in rural areas panchayats (children's committees) are being set up and the fact that kids are often the only literate members of a family in villages adds up to the fact that `pester power' is growing everywhere.

REFERENCES

[1] McNeal, J.U., and Yeh, C, H."Born to shop", American Demographics, vol. 15(6), .2003, pp. 34-39.
[2] Ward, S., and Daniel, Wackman, "Children's Purchase Influence Attempts and Parental Yielding", Journal of Marketing Research, vol. 9 (November), 1972, pp. 316- 319.
[3] Kaur, P., and Singh, R. "Children In Family Purchase Decision Making In India and the West: A Review", Academy of Marketing Science Review, vol. 2006 (8), .2006, pp. 1-30.
[4] Dotson, M., & Hyatt, E. M. "A comparison of parents' and children's knowledge of brands and advertising slogans in the United States: implications for consumer socializatio", Journal of Marketing Communications, vol. 6(4), 2000, pp. 219-230.
[5] Lee, C. K. C., and Beatty, S. E. "Family Structure and Influence in Family Decision Making", Journal of Consumer Marketing, vol. 19, 2002, pp. 24-41.
[6] Darling, N., and L. Steinberg, "Parenting Style as Context: An Integrative Model", Psychological Bulletin, vol. 113 (3), 1993, pp. 487-496.
[7] Becker, W. C. "Consequences of Different Kinds of Parental Discipline", Review of Child Development, vol. 1, 1964, pp. 169-204.
[8] Carlson, L., & Grossbart, S. "Parental style and consumer socialization of children" Journal of Consumer Research, vol. 15, 1988, pp. 77-94.
[9] Baumrind, D. "Current Patterns of Parental Authority", Developmental Psychology Monograph, vol. 4 (1), 1971, pp. 1-103.
[10] Maccoby, E. E., and J.A. Martin, "Socialization in the Context of the Family: Parent-Child Interaction in Socialization, Personality, and Social Development",(4/e), E. Mavis Hetherington (Ed.), New York. John Wiley & Sons, 1983, pp. 1-102.
[11] Grossbart, and K.J. Stuenkel. (1992). The Role of Parental Socialization Types on Differential Family Communication Patterns Regarding Consumption. Journal of Consumer Psychology, Vol. 1, pp. 31-52.
[12] Childers, T.L., and Rao, A.R. "The influence of familial and peer-based reference groups on consumer decisions", Journal of consumer Research, vol.19, 1992, pp. 198-211.
[13] Moschis, G. P. "The Role of Family Communication in Consumer Socialization of Children and Adolescents", Journal of Consumer Research, vol.11, 1985, pp. 898-913.
[14] Neeley, S. M., & Coffey, T. "Understanding the Four-Eyed, Four-Legged Consumer: A Segmentation Analysis of U.S. Moms", .Journal of Marketing Theory & Practice, vol. 15(3), 2007, pp. 251-261.
[15] Roshan, Bob; D, Ahuja., and Kandi, M, Stinson, . "Female headed single parent families. An exploratory study of Children's influence in Family Decision making: Advances in Consumer research, vol. 20, 1993, pp.469-474.
[16] Flouri, Eirini, "An integrated model of consumer materialism: Can economic socialization and maternal values predict materialistic attitudes in adolescents", Journal of Socio-Economics, vol. 28, 1999, pp. 707-724.
[17] Coley, Rebekah, Levine. "Children's socialization experiences and Functioning in Single Mother Households. The importance of Fathers and other Men", Child Development, February, vol. 69(1), 1998, pp. 219-230.
[18] Kim, S. "The effects of parenting style , Cultural conflicts and Peer Relations on Accademic Achievement and Psychological Adjustment among Korean Immigrant Adolescent"s, vol. 57 (2-A),, 2009, pp. 578.
[19] Robertson, T. S., Rossiter, J. R. "Children and commercial persuasion: An attribution theory analysis: J Consumer Res; vol. 1, 1974, pp. 508–12.
[20] Moschis, G. P. & Churchill, G. A. "Consumer socialization: A theoretical and empirical analysis", Journal of Marketing Research, vol. 15, 1978, pp. 599-609.
[21] Carlson, L., Grossbart., and K.J. Stuenkel, "The Role of Parental Socialization Types on Differential Family Communication Patterns Regarding Consumption", Journal of Consumer Psychology, vol.1, 1992, pp.31-52.
[22] Mandrik, Carter A., Fern, Edward F., Yeqing, Bao "Intergenerational Influence: Roles of Conformity to peers and communication effectiveness", Psychology and Marketing, vol. 22(10), 2005, pp. 813-832.
[23] Yossi, Gavish, Aviv, Shoham., and Ayalla, Ruvio, "A Qualitative Study of Mother Adolescent daughter vicarious Role Model Consumption Interactions",Advances in ConsumerResearch, vol 35, 2008, pp. 732-734.
[24] Hammer, T. J., & Turner, P. H. "Parenting in Contemporary Society, Englewood Cliffs, NJ. Prentice Hall. 1990.
[25] Blair, S.L., & Qian, Z. "Family and Asian Students Educational Performance.",Journal of Family Issues, vol. 19, 1998, pp. 255-374.
[26] Roopnarine, J.L., and Hossain, Z. "Parent – Child Interaction in Urban Indian Families in New Delhi:Are they Changing",.Developmental Psychology, vol. 5, 1992, pp. 1-17.
[27] Ross, A.D. "The Hindu Family in the Urban Setting. Toronto", University of Toronto Press, 1976.
[28] Kakar, S. "The inner Worlds: A Psycho-Analytical Study of Childhood and Society in India", New Delhi, Oxford University Press, 1978.
[29] Dasgupta, S. S. "On the Trail of an Uncertain Dream", Indian Immigrant Experience in America, New York: AMS., 1989.
[30] Ronald, A. "In Search of Self in India and Japan", New Jersey: Princeton University. 1998.
[31] Dotson, M., & Hyatt, E. M. "Major influence factors in children's consumer socialization", Journal of Consumer Marketing; vol. 22(1), .2005, pp. 35-42.
[32] Hawkins, DI., Mothersbaugh, DL., Best, RJ . "Group Influences on Consumer Behaviour in Consumer Behaviour, Building Marketing Strategy", Chapter 7, 10th edition, McGraw Hill. Sydney, 2006, pp. 227-259.
[33] Schiffman, L.G, Kanuk, L.L. "Reference Groups and Family Influences in Consumer Behaviour", 10th edition, Prentice Hall. London, 2007, pp.310-352.
[34] Bristol, T., Mangleburg TF. "Not Telling The Whole Story. Teen Deception in Purchasing", J. Acad. Mark. Sci. vol. 33 (1), 2005. pp. 79-95.
[35] McGuire, KD., Weisz, JR. "Social cognition and behavioral correlates of preadolescent chumship", Child Development, vol. 53, 1982, pp. 1478–1484.
[36] Steinberg, L., & Silverberg, S. B. "The vicissitudes of autonomy in early adolescence", Child Development, vol.57, 1986, pp. 841-851.
[37] Moschis, G. P., Moore, R. L., & Smith, R. B. "the impact of family communication on adolescent consumer socialization", Advances in Consumer Research, vol. 11(1), 1984, pp. 314-319.
[38] Brittain, C. V. "Adolescent choices and parent/peer cross-pressures", American Sociological Review, vol. 28, 1963, pp. 385-391.
[39] Gwen, Rae, Bachnann., Deborh, Roedder, John., and Akshay, Rao, Children's Susceptibility to Peer group Purchase Influence, An Exploratory Investigation. Leigh Mc Alister and Michael L. Rothschild, eds. Advances in Consumer Research 20 (Provo, UT: Association for consumer Research), 1993, pp. 463-68.
[40] Valkenburg, P. M. Media and Youth Consumerism. Journal of Adolescent Health, vol. 27, 2000, pp. 52–56.
[41] Galst J., White M. "The unhealthy persuader: The reinforcing value of television and children's purchase-influencing attempts at the supermarket". Child Dev, vol. 47, 1976, pp. 1089 –96.
[42] George,A.."YourT.V.BabyAdMan'sDelight"2003.http://www.hindu.com/thehindu/mp/2003/12/22/stories/2003122201400200.htm,1.Oct.2011.
[43] Kunkel, D., B.L. Wilcox., J, Cantor. E. Palmer., S. Linn., and P. Dowrick, "Psychological Issues in the Increasing Commercialization of Childhood", Report of the APA Task Force on Advertising and Children, 2004.

[44] Gunter, B., & Furnham, A, "Children as consumers", A psychological analysis of the young people's market, London, Routledge, 1998.
[45] Carroll, J. "The role of cognitive development in children's understandings of their own feelings", Child Development, vol. 55, pp. 1984, pp.486-1492.
[46] John, D. R. "Consumer Socialization of Children: A Retrospective Look at Twenty–Five Years of Research", Journal of Consumer Research, vol. 26 (3), 1999, pp. 183-213.
[47] Chan, K. "Children's Perceived Truthfulness of Television Advertising and Parental Influence: A Hong Kong Study", Advances. Consumer Research, vol. 28, 2001, pp. 207-212.
[48] Mizerski, R "The Relationship between Cartoon Trade Character Recognition and Attitude toward Product Category in Young Children", Journal of Marketing, vol. 59 (October), 1995 pp. 58-70.
[49] Mallalieu, Lynnea., Kay, M. Palan., and Russell N. Laczniak, :Examining Children's Cognitive Abilities in an Advertising Context: Differences in Breadth and Depth across Age Groups", Journal of Current Issues and Research in Advertising, vol. 27 (Spring), 2005, pp. 53-64.
[50] Gorn, G. J., & Goldberg, M. E. "The Impact of Television Advertising on Children from Low Income Families", Journal of Consumer Research, vol. 4 (09), 1977, pp. 86-8.
[51] Resnik, A., & Stern, B. "Children's television advertising and brand choice: A laboratory experiment", Journal of Advertising, vol. 6, 1977, pp. 11-17.
[52] Goldberg, M., G. Gorn, and W. Gibson, "TV Messages for Snacks and Breakfast Foods. Do they Iinfluence Children's Preferences", Journal of Consumer Research, vol. 5, 1978, pp. 73-81.
[53] Gorn, G.J., & Goldberg, M. E "Behavioral evidence of the effects of televised food messages on children", Journal of Consumer Research, vol. 9, 1982, pp. 200-205.
[54] Atkin, C. "Observation of Parent–Child Interaction in Supermarket Decision-Makin", Journal of Marketing, vol. 42, 1978, pp. 41- 45.
[55] Miller, J., & Busch, J. "Host selling vs. premium TV commercials: An experimental evaluation P of their influence on children", Journal of Marketing Research, vol. 16, 1979, pp. 323-332.
[56] Buijzen, M. & Valkenburg, P. M. "Parental mediation of undesired advertising effects", Journal of Broadcasting & Electronic Media, vol.49, 2005, pp.153-165.
[57] Robertson, T. S., Ward, S., Gatignon, H., & Klees, D. M. "Advertising and children: A cross-cultural study", Communication Research, vol. 16, 1989, pp. 459-485.
[58] Roberts, D., Foehr, U., Rideout, V., & Brodie, M. "Kids & media @ the new millennium.A comprehensive national analysis of children's media use. Menlo Park", CA: Kaiser Family Foundation, 1999.
[59] Montgomery, "Digital kids. The new online children's consumer culture", D. G. Singer & J. L. Singer (Eds.), The handbook of children and media (2001, pp. 635-650). Thousand Oaks, CA.
[60] Singh, D. "Children as Consumers. Indian Management", September, 1998, pp. 78- 81.
[61] Dhiman, G. "Pester power' is the key,TheTimes of India", Feb 6, 2005, http://articles.timesofindia.indiatimes.com/2005-02-06/india-business/27868106_1_cartoon-network-new-channels-turner-international-in, 02/Sep./11.
[62] Bandyopadhyay, S. "Is Television Advertising Good for Children; Area of Concern and Policy Implication", International Journal of Advertising, vol. 20, No. 1, 2001, pp. 89-116.
[63] Kapoor, N., and D.P.S. Verma, "Children's Understanding of TV Advertisements. Influence of Age, Sex and Parents." Vision, vol. 9 (1), 2005. pp. 21-36.
[64] Dudani, C., Chandak, K. "Roll of Children in Advertising", Working Paper, Indira Institute of Management, 2006.
[65] Jain, P.C., and Bhatt, M. "Consumer behaviour in Indian context, S. Chand, New Delhi, 2004.
[66] Soni, S. "Pester power effect of advertising", International marketing conference on marketing and society IIMK.8-10 April., 2007, pp. 313-324.

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Low Power CMOS Phase Frequency Detector - A Review

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Abstract- This paper describes a performance and comparison of different methodologies for the design of low power CMOS phase frequency detector for high speed applications like PLL. The phase frequency detector (PFD), which helps PLLs achieve simultaneous phase and frequency error detection, is an indispensable functional block and plays an important role in improving the performance of the whole PLL system. This paper also discusses two major problems in PFD, namely, the dead zone problem and the missing edge problem. The proposed design will be the CMOS phase frequency detector for high speed applications with low power dissipation. The PFD will be implemented using 0.18 µm technology. The designed phase frequency detector can be used in PLL with frequency up to 1 GHz.

Index Terms- Phase/Frequency Detectors, PFD, Phase-Locked Loops, PLL, CMOS Integrated Circuits

I. INTRODUCTION

The phase-locked loop (PLL) plays the role of generating a clock signal that is usually a multiple of a reference clock and synchronized with the reference clock in phase. The PLL is widely used in many applications such as frequency synthesis, phase modulation, phase/frequency demodulation, and clock data recovery. In most cases, the charge pump PLL (CP-PLL) is used due to its high frequency range and simple structure. In the PLL, the phase frequency detector (PFD) compares the rising edges of the reference clock and the voltage-controlled oscillator (VCO) clock, and generates a lead signal when the reference phase is leading or a lag signal when the reference phase is lagging. The phase difference detected in the PFD passes through the loop filer to control the VCO. As the phase difference critically affects the overall characteristics of the PLL such as lock-in time and jitter performance, the PFD should be designed to work accurately for any phase difference. However, the PFD suffers from two problems. The first one called the dead-zone problem occurs when the rising edges of the two clocks to be compared are very close. Due to lots of reasons such as circuit mismatch and delay mismatch, the PFD has a difficulty in detecting such a small difference. There have been many PFD structures proposed to cope with this problem. Among them, the three state PFD is widely employed because it is simple, easy to implement, and, more importantly, almost immune to the dead-zone problem. Secondly, some of the rising edges can be missed in the detection when the edges are overlapped with the reset signal internally generated in the PFD, which is called the missing edge problem. Missing edges induce wrong polarity in the PFD output, leading to incorrect behavior and making the PLL spend more time to acquire phase or frequency There have been several research works dealing with the missing edge problem, but most of the previous works require complex circuits or are dedicated to limited cases. As circuit speed increases, the possibility of missing edges increases. Therefore, the missing edge problem becomes a critical factor that determines the acquisition time.

A circuit that detects the phase and frequency differences is required to increase the acquisition range and lock speed of PLL. The output of the circuit consists of two non – complementary signals Qa and Qb. If the frequency at the input A is greater than that of input B the circuit produces output Qa =1 and Qb = 0. Similarly if frequency at the input A is less than that of input B the circuit produces output Qa = 0 and Qb = 1. While if the frequency at both the inputs A and B is equal than the circuit produces the output either at Qa or Qb with the pulse duration equal to phase difference between the two inputs. Thus the average value at the output is the phase differences between the two inputs. The state diagram for the operation of the circuit is shown in figure 1. The output of the circuit mainly depends upon the duty of the input signals; hence the circuit has to be implemented using edge triggered sequential circuits. The operation of the sequential circuit using edge triggered flip flops further depends upon on the rising and falling time of the signals.

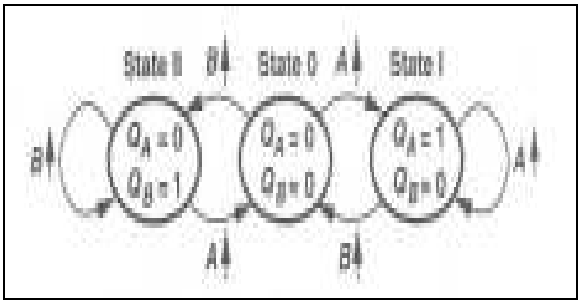

Figure 1: State Diagram

II. CONVENTIONAL PFD

An ideal phase detector produces an output signal whose dc value is linearly proportional to the differences between the phases of two periodic inputs.

$$v_{out} = k_{pd} \Delta \phi \qquad \text{--- 1}$$

Where K_{pd} is the gain of the phase detector and ΔØ is the phase difference between the input signals. PFD generates an output pulse whose width is equal to the time difference between consecutive zero crossings of the input signals.

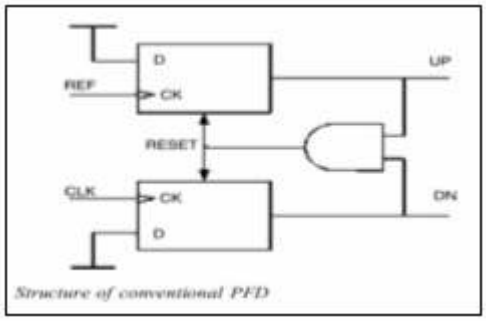

Figure 2: Conventional PFD

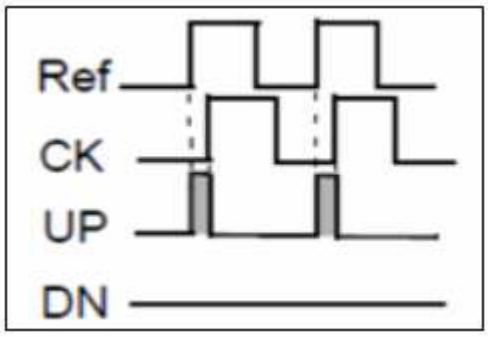

Figure 3: REF leading CK

The circuit consists of two reset table, edge triggered D flip flops with their D inputs tied to logic 1. The Ref and Clk serve as clocks of the flip flops. Suppose the rising edge of REF leads that of CLK, then UP goes to logic high. UP keeps high until the rising edge of CLK makes DN on high level. Because UP and DN, are ANDed, so RESET goes to logic high and resets the PFD into the initial state.

III. CMOS PFD REVIEW

A clock and data recovery circuit with a two exclusive-OR phase frequency detector is presented [1].This PFD generates the control signal for the voltage-controlled oscillator (VCO) in the phase locked loop by comparing different phase clocks and input data. Circuit operates an input at data rate of 800 Mbps to 1.2 Gbps under 2.5V using 0.25 µm CMOS technology.

Fast frequency acquisition phase frequency detector has only 16 transistors [2]. This PFD has linear range when the phase difference is in [0, Π], and saturates when the phase difference is in [Π, 2Π]. It completely eliminates the blind zone, speeds up the acquisition process and improves the maximum operating frequency of the PFD. The circuit topology is very simple. Results show that the circuit can operate up to 800 Meg in 0.5 µm with 5 V supply.

Falling edge phase frequency detector [3] using 12 transistors and consumes 6.6 µW power is presented in this paper. It has no dead zone operates at 2.5 GHz. The circuit can be used in high speed and low power applications. The circuit was implemented in 0.18um technology.

A high-speed CMOS Phase/Frequency Detector (PFD) for faster frequency acquisition is presented [4]. An improved CMOS D-type master-slave flip-flop is described and adopted. Higher speed is attributed to the reduced node capacitances. Charge-sharing phenomena are circumvented. An input delay scheme is employed to achieve faster acquisition.

A new phase frequency detector (PFD) is presented to enable fast frequency acquisition in the phase-locked loop (PLL). To cope with the missing edge problem, the proposed PFD [5] predicts the reset signal and blocks the corresponding input signal during the reset time. The blocked edge is regenerated after the reset signal is deactivated. The PFD works correctly for the entire phase difference and achieves 42.1% speed-up in the acquisition time when it is applied to the conventional charge pump PLL implemented in a 0.18µm CMOS technology.

IV. COMPARATIVE STUDY

Parameters	**[1]**	**[2]**	**[3]**	**[4]**	**[5]**
Technology	0.25 µm	0.5 µm	0.18 um	0.18 µm	0.18 µm
Operating Frequency	800 Mbps to 1.2 Gbps	800 Mbps	2.5 GHz	1.2 to 1.8 GHz	2.3 GHz
Power dissipation	-	300mW	6.6uW	-	1.56 mW
VDD	2.5V	5V	1.8V	-	1.8V

V. PROPOSED METHODOLOGY

The proposed design will be the CMOS phase frequency detector for high speed applications with low power dissipation. The PFD will be implemented using 0.18 µm technology. The designed phase frequency detector can be used in PLL with frequency up to 1 GHz.

REFERENCES

[1] D. H. Kim, et al, "Clock and data recovery circuit with two exclusive OR phase frequency detector", in IEEE Electronics Letters, vol. 36, no. 16, Aug. 2000, pp 1347 – 1349.
[2] W. Hu, et al, "Fast frequency acquisition phase frequency detector with zero blind zone in PLL", in IEEE Electronics Letters, vol. 43, no. 19, Sep. 2007.
[3] N. M. H. Ismail, et al, "CMOS phase frequency detector for high speed application", in 4th International Design and Test Workshop, Nov 2009.
[4] R. Y. Chen, et al, "A high speed fast acquisition CMOS phase frequency detector for MB-OFDM UWB", in IEEE Transaction on Consumer Electronics, vol. 53, no. 1, Feb. 2007, pp 23 - 26.
[5] K. Park, et al, "Fast frequency acquisition phase frequency detector with prediction based edge blocking", in IEEE International Symposium on Circuits and Systems, 2009, pp 1891 - 1894
[6] B. Razavi, "Design of Analog CMOS Integrated Circuits" , Prentice Hall, 1998.

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Understanding the Benefits and Limitations of Six Sigma Methodology

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Abstract- Six Sigma is both a philosophy and a methodology that improves quality by analyzing data with statistics to find the root cause of quality problems and to implement controls. Statistically, Six Sigma refers to a process in which the range between the mean of a process quality measurement and the nearest specification limit is at least six times the standard deviation of the process.

Despite the pervasiveness of Six Sigma program implementations, there is increasing concern about implementation failures. One reason many Six Sigma programs fail is because an implementation model on how to effectively guide the implementation of these programs is lacking. While Six Sigma is increasingly implemented in industry, little academic research has been done on Six Sigma and its influence on quality management theory and application. There is a criticism that Six Sigma simply puts traditional quality management practices in a new package. To investigate this issue and the role of Six Sigma in quality management, this study reviewed both the traditional quality management and Six Sigma literatures. Quality professionals are aware that the six-sigma methodology employs existing, well-known tools developed in quality sciences and are based on the works of Deming, Juran, Ishikawa, Taguchi, and others. Nevertheless six sigma, a Motorola innovation, has been a positive force. A good presentation – black belts and green belts honoring six-sigma experts – can make statistical process improvement, and the systematic six-sigma methodology taste good, and do good work.

Index Terms- lean manufacturing, six sigma, DMAIC, SCM

I. Introduction

Six Sigma is both a philosophy and a methodology that improves quality by analyzing data with statistics to find the root cause of quality problems and to implement controls. Statistically, Six Sigma refers to a process in which the range between the mean of a process quality measurement and the nearest specification limit is at least six times the standard deviation of the process. The statistical objectives of Six Sigma are to centre the process on the target and reduce process variation. A Six Sigma process will approach 'zero defects' with only 3.4 defects per million opportunities (DPMO) for a defect to occur. In comparison, the goal of many quality initiatives throughout the 1980s and early 90s was to obtain a process capability index (Cpk) of at least 1.0, which roughly translates to 3 Sigma. However, this level of quality still produces a defect rate of 66,810 DPMO. Six Sigma differs from other quality programmes in its 'top-down' drive and its rigorous methodology that demands detailed analysis, fact-based decisions, and a control plan to ensure ongoing quality control of a process.

However, despite the immense popularity and the wide-spread adoption of Six Sigma, there is an increasing concern across industries regarding the failure of Six Sigma programs. One reason many Six Sigma programs fail is because an implementation model detailing the sequence of Six Sigma elements/activities is not available. The existing literature identifies many elements of Six Sigma which does enhance our understanding of Six Sigma programs. However, the success of Six Sigma programs hinges on the sequence of many Six Sigma elements/activities or a model for implementation. Many characterize Six Sigma programs as the latest management fad of improvement tools and techniques (Watson, 2006). It is well known that Six Sigma programs involve a host of critical decisions and many researchers have contributed to the existing literature. For example, Schroeder et al. (2008) have identified many critical decisions or elements of Six Sigma programs such as management involvement, improvement specialists, performance metrics, a systematic procedure, and project selection and prioritization. Six Sigma programs improve operational performance in order to enhance customer satisfaction with a company's products and services (Rajagopalan et al., 2004). Over the years, many companies, such as General Electric, Allied Signal, Raytheon, and Delphi Automotive have implemented Six Sigma programs (Treichler et al., 2002), and claimed that these programs have transformed their organizations. Six Sigma programs are heavily promoted in practitioners' books on Six Sigma (e.g., Harry and Schroeder, 2000) A survey of aerospace companies concluded that less that 50% of the respondents were satisfied with their Six Sigma programs (Zimmerman and Weiss, 2005). Another survey of healthcare companies revealed that 54% do not intend to embrace Six Sigma programs (Feng and Manuel, 2007). Companies such as 3M and Home Depot were not satisfied with their implementation of Six Sigma programs (Hindo, 2007). The real question is not whether Six Sigma programs have value, but why do so many Six Sigma programs fail? One reason for Six Sigma program failure is because we lack a model on how to effectively guide the implementation of the perfect efficient Six Sigma program (Wurtzel, 2008).

This paper is part of a wider and critical research project work aimed at exploring and analyzing strategies and supporting concepts used to improve the level of stability within a supply chain , probably combining various tools and techniques used in TQM and supply chain. First part of the paper focuses mainly on the literature review comprising of six sigma and other QM techniques. Next part of the paper systematically focuses on six sigma methodology i.e. how six sigma works, the positives of implementing six sigma , the negatives of six sigma and last part of the paper throws some light on what future work is required to

be done by quality professionals in order to achieve the goals set by Japan's Quality gurus.

II. LITERATURE OVERVIEW

A. Six Sigma: A Thorough Understanding

"Six Sigma is a long-term commitment. It won't work well without full commitment from upper management. Six Sigma changes the way a company thinks by teaching fact-based decision making to all levels. The programme changes the 'DNA' of a company by changing the way the leaders think and by improving the management pipeline by developing management and communication skills in people."

Over the years, many researchers have studied Six Sigma programs and identified many critical decisions of these programs. For example, previous research of Antony and Banuelas (2002), Coronado and Antony (2002), Lakhavani (2003), Lynch et al. (2003), Mcadam and Evans (2004), Gijo and Rao (2005), Szeto and Tsang (2005), Ladani et al. (2006), Savolainen and Haikonen (2007), Davison and Al-Shaghana (2007), recently being Zu et al. (2008) studied the evolving theory of quality management and the role of Six Sigma. While defining Six Sigma programs and uncovering the underlying theory, Schroeder et al. (2008) identified five elements of these programs. One of them is management's involvement in performing many Six Sigma functions, such as selecting improvement specialists, identifying project selection, and facilitating Six Sigma implementation (Gitlow and Levine, 2005; Snee and Hoerl, 2003). Antony et al. (2007) emphasized as Firstly, management's involvement in on-going projects for sustainability of Six Sigma programs need to be defined . Improvement specialists are trained or hired at different Six Sigma competency levels (e.g., Black Belt or Green Belt). Their primary responsibility was to provide technical expertise and leadership in facilitating a specific Six Sigma implementation (Pyzdek, 2003). Third, as Keller (2005) pointed out, Six Sigma programs have performance metrics facilitating Six Sigma implementation (Gitlow and Levine, 2005; Snee and Hoerl, 2003). Fourth, Six Sigma implementation uses a systematic procedure; a five-step DMAIC (Define, Measure, Analyze, Improve, and Control) methodology. A detailed description of DMAIC methodology can be referenced from many papers. Pyzdek (2003) or Keller (2005) focused mainly on DMAIC. Fifth, project selection and prioritization is an important element of Six Sigma programs. The prioritization of projects is determined by many criteria, such as a cost benefit analysis or the Pareto Analysis (Banuelas et al., 2006). While Considering effective implementation of Six Sigma and the cost associated with this, many authors question the return on investment of Six Sigma programs (e.g., Gupta, 2008). The real question is not whether Six Sigma programs have value, but why do so many Six Sigma programs fail? One reason could be because we lack a model on how to effectively guide the implementation of Six Sigma programs (Wurtzel, 2008). Secondly, we lack an understanding of the sequence of these elements/activities, or a model for effectively guiding the implementation of these programs. Because there is no implementation model, practitioners have encountered tremendous difficulty in implementing these programs, and there are reports of wide-spread Six Sigma failures. Zimmerman and Weiss (2005) specifically focused on the failure of Six Sigma Program for aerospace industry and found that less than 50% of the survey respondents from aerospace companies expressed satisfaction with their Six Sigma programs. Mullavey (2005) described the top 10 reasons why Six Sigma implementations fail. Berg (20 06) reported that their Six Sigma program was expensive and did not yield expected results. Sutton (2006) described nine ways to get the best out of Six Sigma programs. A national survey of Six Sigma programs in healthcare companies revealed that 54% do not intend to embrace Six Sigma programs (Feng and Manuel, 2007). At 3M, a Six Sigma program that was not structurally implemented almost satisfied creativity and innovation of workforce (Hindo, 2007). Home Depot's Six Sigma program negatively affected employee performance, and yielded Home Depot's worst Consumer Satisfaction Index ranking (Hindo and Grow, 2007). Angel and Pritchard (2008, p. 41) reported that ''nearly 60% of all corporate Six Sigma initiatives fail to yield desired results''. According to Gupta (2008, p. 22), at times, Six Sigma ''improvement programs cost more than the improvement they drive because of incorrect application''. While reporting cash flow problems of Six Sigma programs in small companies, Foster (2007, p. 19) claims that if these programs are not ''skillfully implemented; the benefits of Six Sigma may be marginal''. According to Chandra (2008), one reason Six Sigma programs fail is because these programs are not correctly implemented. The existing literature research related to Six Sigma and other improvement initiatives e.g. Lean or Theory of Constraints are utilized to isolate steps of implementation. Although suggested in different studies, these steps can connect with each other to hypothesize an implementation model. In describing a successful lean (e.g., manufacturing cells) implementation, Chakravorty and Hales (2004) found that the first step in implementing an improvement plan was to perform a customer and market driven strategic analysis. The purpose of this analysis was to direct the operational improvement effort to gain a competitive position in the market. According to Keller (2005), Six Sigma programs have many tools for improvement including Histograms, Pareto Charts, Statistical Process Control (SPC), and Analysis of Variance (ANOVA). Foster (2007) claimed that a common process for implementing improvement tools in Six Sigma is nothing but structured DMAIC methodology, which is similar to Edward Deming's ''Plan-Do-Check-Act'' problem solving approach. Lee-Mortimer (2006) considered the DMAIC methodology to be essential to Six Sigma programs and appropriate for delivering business improvements. According to Chakravorty and Franza (2009), a form of DMAIC methodology, Define-Measure-Analyze-Design-Verify (DMADV), was central to a new product development experience. Mast and Bisgaard (2007) considered DMAIC methodology as the scientific method in Six Sigma programs. Keller (2005) points out that the objective of Six Sigma programs is to create a higher perceived value of the company's products and services in the eyes of the customer. Antony et al.(2005) indicated that linking Six Sigma to business strategy and customer needs is critical for successful implementation. Pande et al. (2000)point out that a cross-functional team is necessary to implement Six Sigma programs and the purpose of the team is to provide an on-going involvement of management in the

implementation process. According to Harry and Linsenmann (2007), the CEO of DuPont committed complete management support for implementing Six Sigma programs, and ensured that management learned Six Sigma methodology by requiring that managers themselves become Green Belt certified. At DuPont the Six Sigma program was not merely a methodology to get results, but was a management culture created to ensure long-term transformation of the business units. Study revealed that one reason Six Sigma implementation failed in many companies was due to the lack of commitment from management (Gopal, 2008). Management simply pushed Six Sigma programs out to employees, and did not become personally involved in the implementation process. As Mullavey (2005) points out, in order to successfully implement Six Sigma programs, management must understand Six Sigma methodology, must provide leadership, and must guide the implementation process. Mast and Bisgaard (2007) considered DMAIC methodology as the scientific method in Six Sigma programs. Keller (2005) pointed out the objective of Six Sigma programs as *to create a higher perceived value of the company's products and services in the eyes of the customer*. On the other hand, Antony et al. (2005) indicated that linking Six Sigma to business strategy and customer needs was critical for successful implementation of Six Sigma.

Jack Welch in GE's 1997 AGM provided a detailed description of each step of DMAIC methodology, and of various levels of training (e.g., Black Belt or Green Belt). Six Sigma implementation begins not inside the business, but outside it, focusing on answering the questions, 'How can we make the customer more competitive? What is critical to the customer's success?' Learning the answer to the question and then learning how to provide the solution is the only focus we need(Harry and Schroeder (2000, p. 39).

In order to implement Deming's style of quality management, Hales and Chakravorty (2006) also found that after identifying the tools for improvement to be used, the next step was to understand the overall operations, and to set priorities for the project. One way to understand overall operations is by developing a process map. There are several important points worth discussing about the implementation model. The first step of the model is to perform Strategic Analysis, which needs to be market/customer driven. Various implementation experience shows that the reason for Six Sigma implementation was to improve customer expectations through operational excellence. Many Six Sigma programs are implemented to gain operational efficiency. Unfortunately, many of these operational gains do not directly provide enhanced customer satisfaction or value. Bendell (2006) claims that Six Sigma is a strategic approach and improvement projects should be selected based on improving customer satisfaction and operational efficiency. In reality, a majority of the improvement projects are selected based on cost perspective and, therefore, the approach becomes suboptimal, diverting from basic purpose of improving quality of the goods and services to Cost effectiveness. According to Andel (2007, p. 1) the cost minimization approach usually translates into a cutting headcount exercise. It is important to learn more about how to identify projects and how to prioritize them. This could be scope for future work.

One reason many Six Sigma improvement programs fail is because improvement projects are not correctly identified and prioritized (Zimmerman and Weiss, 2005). Over the years, many researchers have worked on prioritizing improvement projects by mixing tools such as Six Sigma, Quality, Lean, or Theory of Constraints tools. For example, Chakravorty and Atwater (1998) showed how to prioritize quality improvement projects using Theory of Constraints. Chakravorty and Sessum (1995) showed how to prioritize Lean improvement projects using Theory of Constraints. Chakravorty (1996) mixed Lean and Theory of Constraints concepts to improve the performance of manufacturing operations. Recent empirical research (e.g., Banuelas et al., 2006) found that companies prioritize improvement initiatives by mixing these tools. *More research is necessary on how to mix these tools to correctly identify and prioritize improvement projects.* Lean thinking is part of the culture right across operational domains, coupled with Six Sigma approaches in quality (e.g., Banuelas et al., 2006,Nave, 2002).

There is growing concern that Six Sigma or other process improvement programs fail because they do not consider the human side of implementation. For example, Six Sigma implementation negatively affected employee morale at Home Depot and studied creativity and innovation at3M (Hindo, 2007; Hindo and Grow, 2007). According Angel and Pritchard (2008, p. 41) examples like Home Depot and 3 M show that companies cannot focus on implementing Six Sigma in isolation. Clearly Six Sigma is not a set of process tools that should be part of a more holistic process improvement strategy. For any of these TQM tools viz. Six Sigma to be used effectively, employee behavior change must be an integral part of the programs. A behavior-focused approach makes change sustainably. Further, it keeps us ever aware that a technically sound change designed by Six Sigma, lean or similar applications could be at risk of failing unless supported by the appropriate behavior change.

TABLE 1.1 Sigma Table

Sigma	Defects Per Million	Yield
6	3.4	100.00%
5	233	99.977
4	6,210.00	99.379
3	66,807.00	93.32
2.5	158,655.00	84.1
2	308,538.00	69.1
1.5	500,000.00	50
1.4	539,828.00	46
1.3	579,260.00	42.1
1.2	617,911.00	38.2
1.1	655,422.00	34.5
1	691,462.00	30.9
0.5	841,345.00	15.9
0	933,193.00	6.7

Initially Six Sigma practice was developed considering in view the yield as shown in table 1.1. Note that above yield can only be

achieved if processes monitored and improved on continual basis. Six Sigma deployment need to be monitored strictly.

Zimmerman and Weiss (2005) point out companies need to pay attention to the human side of Six Sigma implementation. The human side of Six Sigma implementation is an important area for future research. This research will be greatly helpful for practicing managers wanting to effectively implement Six Sigma programs to achieve sustained results in their business environment.

Due to an increasing pace and complexity of business environments, organizations no longer compete on processes but the ability to continually improve processes (Teece, 2007). At the same time numerous organizations that have deployed continuous improvement initiatives have not been successful in getting what they set out to achieve.

Results of a 2007 survey of US manufacturers showed that while 70% of plants had deployed lean manufacturing techniques, 74% of these were disappointed with the progress they were making with lean (Pay, 2008). *An earlier study found that only 11% of companies considered their continuous improvement initiatives to be successful*. Although operations management executives realize the importance of continually improving processes, they have found that managing continuous improvement is a challenging task (Kiernan, 1996; Pullin, 2005). The challenge lies in creating an infrastructure to coordinate continuous improvement projects (Choo et al., 2004; Wruck and Jensen, 1998). Dynamic capability is defined as ‘‘a learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness.’’ (Zollo and Winter, 2002, p. 340). The implementation of dynamic capabilities involves repeated cycles of organizational learning (Cyert and March, 1963; Mahoney, 1995; Scho¨ n, 1975). Similarly, process improvement involves organizational learning to make changes in operating routines. Continuous improvement (CI) is an ongoing activity aimed at raising the level of organization-wide performance through focused incremental changes in processes (Bessant and Caffyn, 1997; Wu and Chen, 2006). A CI initiative provides a planned and organized system for the continual discovery and implementation of such process changes. CI initiatives consist of two broad areas of action required for sustained improvements, namely the execution and the coordination of process improvement projects. Continuous improvement thus fits into Helfat et al.’s (2007, p. 5) notion of dynamic capability as patterned activity, in contrast to ‘‘a one-time idiosyncratic change to the resource base of an organization.’’ When appropriately implemented, continuous improvement initiatives help to integrate operations processes and enhance the organization’s ability to make cohesive and quick process changes to improve performance. For continuous improvement to create and support dynamically changing operational capabilities it is critical that it include a coherent infrastructure (Eisenhardt and Martin, 2000; Garvin, 1993b). However, existing studies tell us little about the constituent elements of such an infrastructure. In seeking these elements for CI infrastructure we rely on the theoretical relationship between organizational learning and dynamic capability (Zollo and Winter, 2002). CI infrastructure can add a dynamic dimension to CI initiatives by institutionalizing organizational learning, manifested in the form of process improvements (Linder-manetal., 2004; Molinaetal., 2007). It can serve as the right context for dynamic capability by facilitating the involvement of middle and lower levels of management in strategy deployment and creating a culture for organizational learning (Neilson et al., 2008).

Even though the fruitful results of Six Sigma appeared quickly ,The 1990s decade was one of economic decline and malaise for Japan (Stieglitz, 2003). When an economy turns sour, manufacturing’s helpful reaction would be to pull in and reach out: work force lay-offs, plant closures, production and inventory reductions, and aggressive use of global best practices. In Japan industry did not help. Specially, Japan was

1. late to restructure,
2. late to outsource off-shore,
3. late to learn and implement design for manufacture and assembly,
4. late to employ modular deliveries from suppliers, and
5. Japan had been bulking up on inventories, its lean/JIT heritage seemingly losing ground.

This suggests that six sigma, even though most popular, could not help the country like Japan to recover fast and smooth from economic slowdown, which opened the fresh doors for other QM techniques either individually or collectively (Stieglitz, 2003).

Finally, late in the decade, Japanese companies reacted. In 1999 Sony announced that it would slash 17,000 jobs; Mitsubishi Electric would trim 10% of its 146,000 global employees; Nissan would close three assembly plants and two engine facilities, and reduce employment by 21,000. These three companies ‘‘barely represent the tip of the iceberg of major Japanese companies that have announced restructuring plans’’ (Ostram, 2000). So much for the lifetime-employment aspect of Japanese management. Resistance to mergers, acquisitions, and other alliances with foreign companies also was melting. Ford took a major stake in Mazda, Daimler-Chrysler the same in Mitsubishi automotive, and Renault in Nissan . With Renault’s help, a lot of it in the DFMA (Bremner et al., 2004) arena, Nissan emerged in 2004 as the world’s highest operating-margin automaker—after losing money nearly every year of the 1990s (Bremner et al., 2004). As the New York Times puts it (Belson, 2004), ‘‘The qualms are gone. Now even Japan’s pride and joy, its top-end electronics manufacturers are coming to China.’’ More accurately, Japan, like other industrialized countries, is selectively moving production to developing countries – especially of products involving a lot of touch labor – and successfully exporting to the developing countries its higher-end products, such as machine tools (Economist, 2004).

B. Implementing Six Sigma

Implementing a typical Six Sigma programme begins at top management level with training in fact-based decision making and evaluation of a company's strategic goals. The objective behind training is to define what process variables are critical to product quality and to define the gaps between goals and current performance that will become Six Sigma projects. Black Belts and Master Black Belts are chosen to become Six Sigma experts and be dedicated full-time to run Six Sigma projects. Green Belts, who keep their regular jobs while they work part-time on Six Sigma projects, are also chosen. Six Sigma uses a group of

improvement specialists, typically referred to as champions, master black belts, black belts, and green belts (Henderson and Evans, 2000; Linderman et al., 2003). Those specialists receive intensive differentiated training that is tailored for their ranks and is designed to improve their knowledge and skills in statistical methods, project management, process design, problem-solving techniques, leadership skill, and other managerial skills (Barney, 2002a; Gowen and Tallon, 2005; Linderman et al., 2003; Snee and Hoerl, 2003). Same has been tried to summarize the six sigma deployment in fig.1.1 as shown below. With assigning the improvement specialists to take different levels of roles and responsibilities in leading the continuous improvement efforts, the organization builds a Six Sigma role structure for quality improvement. In the Six Sigma role structure, there is a hierarchical coordination mechanism of work for quality improvement across multiple organizational levels (Sinha and Van de Ven, 2005). For example, the senior executives serve as champions for making the organization's strategic improvement plans and black belts under them lead Six Sigma projects and mentor green belts in problem solving (Barney, 2002a,b; Sinha and Van de Ven, 2005). This mechanism helps to coordinate and control work across organizational levels to ensure that the tactical tasks match with the overall business strategy (Sinha and Van de Ven, 2005).

Six Sigma structured improvement procedure is as explained below.

Six Sigma applies a structured approach to managing improvement activities, which is represented by Define–Measure–Analyze–Improve–Control (DMAIC) used in process improvement or Define–Measure–Analyze–Design–Verify (DMADV) used in product/service design improvement (Linderman et al., 2003). Both of these procedures are grounded in the classic Plan–Do–Check–Act (PDCA) cycle, but Six Sigma specifies the QM tools and techniques to use within each step, which is unique to Six Sigma (Linderman et al., 2003). The Six Sigma structured improvement procedures provide teams a methodological framework to guide them in the conduct of improvement projects

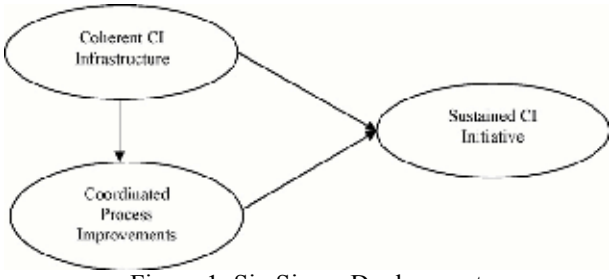

Figure 1: Six Sigma Deployment

The Six Sigma structured improvement procedure is expected to support product/service design and process management. Both product/service design and process management practices involve using different managerial and technical tools and their effectiveness is dependent on how well teams actually use these tools (Ahire and Dreyfus, 2000). The DMAIC/DMADV procedures offer a standardized approach for the teams to follow, and prescribe appropriate tools to use at each step, as well as systematic project management tools, which enhances their problem-solving ability (Antony and Banuelas, 2002; Choo et al., 2004; Kwak and Anbari, 2004). In addition, these structured procedures guide the teams search for solutions to complicated problems by breaking complex tasks into elementary components to reduce task complexity so that the teams can be focused, which will increase their productivity (Linderman et al., 2003, 2006). Likewise, the use of Six Sigma metrics is more effective and efficient when teams follow the structured procedures in conducting Six Sigma projects. These procedures not only entail a 'measure' step to identify measurable customer requirements and to develop baseline defect measures, but also request using metrics throughout the project, e.g., from determining project goals in the 'define' step to establishing on-going process measures to continuously control the key processes in the 'control' step (Pande et al., 2002). Linderman et al. (2006) found that when teams strictly follow the DMAIC steps and faithfully complete each step, they are more likely to meet the project goals, especially those challenging goals, and to achieve improved project performance.

C. Involving Lean Manufacturing

Many companies are now combining implementation of Six Sigma and Lean Manufacturing programmes. Lean Manufacturing is a method for reducing lead-time across the value chain, which improves cash flow, eliminates waste, reduces inventory and increases on-time delivery. In process industries, such as the chemical and plastics industries, key Lean Manufacturing tools are reduction in setup time and Total Productive Maintenance (TPM), comments Bonnie Smith, managing director at the Time Based Management Consulting Group (TBM). Reducing set-up time allows a company to run smaller batches cost-effectively or make more frequent transitions, which is necessary for reducing inventory. TPM focuses on improving machine maintenance to decrease downtime. "While Six Sigma alone improves firsttime yield and eliminates some waste in a manufacturing process, Lean significant, breakthrough waste elimination,". Applying both Lean Manufacturing and Six Sigma tool sets results in far better improvements than can be obtained with either method alone.

III. BENEFITS OF IMPLEMENTING SIX SIGMA

Quality management (QM) has developed into a mature field with sound definitional and conceptual foundations (Sousa and Voss, 2002), but new QM methods continue to grow. For example, Six Sigma, which is ''an organized and systematic method for strategic process improvement and new product and service development that relies on statistical methods and the scientific method to make dramatic reductions in customer defined defect rates'' (Linderman et al., 2003, p. 194), generates intense interest in industry. Since its initiation at Motorola in the 1980s, many companies including GE, Honeywell, Sony, rpillar, and Johnson Controls have adopted Six Sigma and obtained substantial benefits (Pande et al., 2000; Snee and Hoerl, 2003). Six Sigma emphasizes using a variety of quantitative metrics in continuous improvement, such as process Sigma measurements, critical-to-quality metrics, defect measures, and traditional quality measures like process capability (Breyfogle et al., 2001; Dasgupta, 2003; Linderman et al., 2003; Pyzdek, 2003). Six Sigma metrics are used to set improvement goals (Linderman et

al., 2003; Pande et al., 2002). Objective data helps in reducing corporate use of political agendas to drive solutions (Brewer, 2004). As suggested by Linderman et al. (2003), using explicit, challenging goals in Six Sigma projects can increase the magnitude of improvements, reduce performance variability of the projects, and increase employees' improvement efforts and commitment to quality. Moreover, Six Sigma integrates business-level performance, process measures, and project metrics into a systematic review process so that managers can manage the organization quantitatively and translate the business strategy into tactical tasks (Barney, 2002a).

When the buying firm involves its suppliers in the product/service design process, the suppliers can provide inputs about product or component simplification and standardization and the capabilities of prospective materials and parts (Flynn et al., 1995; Forza and Flippini, 1998; Kaynak, 2003). Also, an improved supplier relationship enhances process management through timely delivery of high quality materials and parts (Kaynak, 2003). By selecting suppliers based on quality encourage the suppliers to continuously improve their quality and thus provide high quality parts, which helps to reduce process variability due to purchased materials and parts (Flynn et al., 1995).

Garvin's (1984) quality performance model suggests that quality performance affects business performance through two routes—the manufacturing route and the marketing route (Sousa and Voss, 2002). In the manufacturing route , improved quality performance results in fewer defects, lower scrap and rework rates, less waste, and more dependable processes, which lead to lower manufacturing costs, lower warranty and liability costs, higher efficiency and productivity, and increased return on assets and profitability (Handfield et al., 1998; Kaynak, 2003; Reed et al., 1996). In the marketing route, improved quality increases customer satisfaction that leads to increased sales and larger market share (Ahire and Dreyfus, 2000; Choi and Eboch, 1998; Handfield et al., 1998). By providing high quality products and services, the firm has less elastic demand and can charge higher prices, which brings about more profits (Kaynak, 2003; Sousa and Voss, 2002).

The QM literature has unanimously emphasized the importance of top management support for QM (Beer, 2003). This study once again confirms that top management support is critical for traditional QM and it is also important for Six Sigma. Top management support directly supports the Six Sigma role structure in an organization. The success of executing substantial changes required for Six Sigma deployment relies on whether top management understands and accepts Six Sigma principles and whether they are willing to support and enable the restructuring of the organization's policies (Antony and Banuelas, 2002; Lee and Choi, 2006).

IV. LIMITATIONS OF IMPLEMENTING SIX SIGMA

The main hurdles in successful implementation of Six Sigma , in the views of researchers are , One organization's own management and employees , two active supplier participation and three active customers participation. The same are explained in detail in continued discussion.

Neither quality information nor the Six Sigma structured improvement procedure has a direct effect on product/service design or process management, but those two practices are found to have a significant effect on the Six Sigma focus on metric which in turn directly affects product/service design and process management (Linderman et al.2003, 2006). Six Sigma is criticized as offering nothing new and simply repackaging traditional QM practices (Clifford, 2001; Stamatis, 2000). It is argued that the large returns from Six Sigma at some companies were due to the initial quality level of these companies being so low that anything would have drastically improved their quality (Stamatis, 2000). Although there have been numerous case studies, comprehensive discussions, books and websites addressing Six Sigma, very little scholarly research has been done on Six Sigma and quality management theory and application (Goffnett, 2004; Schroeder et al., 2005).

Top management support is crucial in Six Sigma implementation, as demonstrated by chief executives such as Jack Welch of GE, Bob Galvin of Motorola, and Lawrence Bossidy of AlliedSignal, who each led Six Sigma implementation in their firm (Henderson and Evans, 2000; Slater, 2000). Top management makes the strategic decisions required for Six Sigma adoption (Lee and Choi, 2006). Six Sigma role structure can only be established if top management uses its authority and power to integrate the Six Sigma black and green belt system into the organization's human infrastructure, to adjust the performance appraisal and compensation policy to incorporate Six Sigma performance, and to provide resources for Six Sigma training (Antony and Banuelas, 2002; Bhote, 2003; Breyfogle et al., 2001; Hendricks and Kelbaugh, 1998).

Execution of the Six Sigma focus on metrics also requires support from top management. Top management sets its organization's strategic visions and objectives. This puts restriction on implementation and achieving six sigma goals. It has been observed that the ultimate aim of top management is always to earn healty profits even in falling market scenario. Six sigma aims at achieving highest quality standards. (Ahire and O'Shaughnessy, 1998). The creation of a partnership with key suppliers is one major intervention that companies should make to realize continuous improvement (Hackman and Wageman, 1995).

Six Sigma connects employees' promotion and rewards with the level of their Six Sigma certifications and their involvement and achievement in Six Sigma projects (Henderson and Evans, 2000; Lee and Choi, 2006), which ignites the employees' interest in quality improvement and increases their commitment to the organization's goal of high quality (Linderman et al., 2003). But at the same time the negative effect of employees misunderstanding about this comes into picture i.e. if he or she fails to deliver expected quality product their promotion and reward will be low.

The Six Sigma structured improvement procedure is expected to support product/service design and process management. Both product/service design and process management practices involve using different managerial and technical tools and their effectiveness is dependent on how well teams actually use these tools (Ahire and Dreyfus, 2000). Also from the entire study , we can easily conclude that

1. Quality information is positively related to supplier relationship.

2. Quality information is positively related to product/service design.
3. Quality information is positively related to process management.(Ahire and Dreyfus,2000; Flynn et al., 1995; Forza and Flippini, 1998; Kaynak, 2003; Gowen and Tallon, 2005; Kwak and Anbari, 2004; Lee and Choi, 2006 ;X. Zu et al.,2008).

Six Sigma is simply a repackaging of traditional QM methods or provides a new approach to improving quality and organizational excellence. This question has created some confusion about Six Sigma (Goffnett, 2004), and also put managers in a dilemma: on one hand, if they do not adopt Six Sigma because it is considered to be the same as traditional QM methods, their company may lose the opportunity to gain substantial benefits as GE and other companies practicing Six Sigma have achieved from their Six Sigma efforts; on the other hand, if Six Sigma is different, there lacks solid answer to what are the new practices that the company needs to implement to improve the current QM system (Schroeder et al., 2008).

V. CONCLUSION AND SCOPE

Academics need to better understand Six Sigma so that they do not overhype it or too quickly dismiss it as nothing new. By better defining and adequately understanding Six Sigma, scholars can develop a deeper and richer knowledge of this phenomenon. The implementation of QM in an organization requires two types of decisions: what to do and how to do it (Sousa and Voss, 2002). The findings of this study suggest that Six Sigma implementation requires three key practices to work with other QM practices in order to enhance the organization's ability of improving quality. Further research exploring how these Six Sigma practices are adopted in different organizational contexts is needed, since different organizations have different maturity levels of QM implementation and the strengths and weakness of their existing QM systems vary. It is desirable to explore the critical contextual factors influencing the integration of Six Sigma practices into an organization's existing QM system.

Six Sigma is an effective approach to a broad-based quality control program. It is far more than the traditional approach, in which internal teams are created to reduce production defects, solve problems within one department, and address problems in isolation. Six Sigma is more than a quality control program with another name; it is a quality-based system for reorganizing the entire approach to work in every aspect: productivity, communication, involvement at every level, and external service.

Despite the limitations discussed above, this study contributes to the scholarly research beginning to examine Six Sigma. Schroeder et al. (2008) started with a definition of Six Sigma and its underlying theory to argue that although the Six Sigma tools and techniques appear similar to prior QM approaches, Six Sigma provides an organizational structure not previously seen.

Still further study is deeply required to find solutions to the following questions

- How does internal and external system variation and uncertainty impact supply chain?
- How and why does the trade-off concept support the strategy development process?
- How and why do different strategies limit such variation and uncertainty?
- How can a company use investments in inventory and capacity to provide greater stability in the internal and external phases of a delivery system?

Another area suggested for further study and research is the investigation on how Six Sigma works with other improvement methods such as lean manufacturing. There are common characteristics between lean manufacturing and Six Sigma in reducing waste and improving process (Breyfogle et al., 2001). As mentioned earlier, many plants sampled in this study have implemented lean manufacturing in addition to TQM or Six Sigma. Lean Six Sigma is becoming a new continuous improvement approach in industry (Devane, 2004; George, 2003). Based on the results of this study, researchers may explore how the QM/Six Sigma practices interact with lean manufacturing practices in creating a unique approach to organizational excellence. (X. Zu et al.,2008)

Finally, Six Sigma be viewed as an organization change process. This might provide improved ways for implementation of the Six Sigma process and a more enlightened analysis of what needs to be changed. It might also improve management of the change management process itself. There is certainly ample literature about organizational change that could be used as a starting point (Van de Ven and Poole, 1995).

REFERENCES

[1] Ahire, S.L., Dreyfus, P., 2000. The impact of design management and process management on quality: an empirical examination. Journal of Operations Management 18, 549–575.
[2] Ahire, S.L., O'Shaughnessy, K.C., 1998. The role of top management commitment in quality management: an empirical analysis of the auto parts industry. International Journal of Quality Science 31, 5–37.
[3] Andel, T.,2007.Lean & Six Sigma Traps to Avoid. Material Handling Management, March /http://www.mhmonline.com/viewStory.asp?nID=5423S.
[4] Angel, D.C.,Pritchard,C.,2008.BehaviortestsSixSigma.Industrial Engineer (August),41.
[5] Antony,J.,Banuelas,R.,2002. Key in gredients for the effective implementation of Six Sigma program. Measuring Business Excellence 6(4), 20–27.
[6] Banuelas, R., Tennant, C.,Tuersley, I.,Tang, S., 2006. Selection of Six Sigma projects in the UK. The TQM Magazine 18(5), 514–527.
[7] Barney, M., 2002a. Macro: Six Sigma. The Industrial Organizational Psychologist 39 (4), 104–107.
[8] Barney, M., 2002b. Motorola's second generation. Six Sigma Forum Magazine 1 (3), 13–16.
[9] Beer, M., 2003. Why total quality management programs do not persist: the role of management quality and implications for leading a TQM transformation. Decision Sciences 34, 623–642.
[10] Belson, K., 2004. Japanese capital and jobs flowing to China. New York Times, February 17, C, p. 1.
[11] Bendell, T.,2006.Are view and comparison of Six Sigma and the lean organizations. The TQM Magazine18(3), 255–262.
[12] Berg, M., 2006. Six Sigma shortcomings. Industrial Engineer(October), 45.
[13] Bessant, J., Caffyn, S., 1997. High-involvement innovation through continuous improvement. International Journal of Technology Management 14 (1), 7–28.
[14] Bhote, K.R., 2003. The Power of Ultimate Six Sigma: Keki Bhote's Proven System for Moving Beyond Quality Excellence to Total Business Excellence. AMACOM American Management Association, New York, NY.

[15] Bremner, B., Edmondson, G., Dawson, C., Welch, D., Kerwin, K., 2004. Nissan's boss: Carlos Ghosn saved Japan's no. 2 carmaker. Now he's taking on the world. Business Week, October 4, 50–58.
[16] Brewer, P.C., 2004. Six Sigma helps a company create a culture of accountability. Journal of Organizational Excellence 23 (3), 45–59.
[17] Breyfogle,F.,Cipello,J.,Meadows,B.,2001.ManagingSixSigma.Wiley Inter Science, New York, NY.
[18] Chakravorty,S.S.,Atwater,J.B.,1998.Implementingqualityimprovement programs using the focusing steps of the array of constraints. International Journal of Technology Management 16 (4/5/6/), 544–555.
[19] Chakravorty,S.S., Atwater, J.B., 2006. Bottleneck management : theory and practice. Production & Planning Control17 (5), 441–447.
[20] Chakravorty, S.S., Sessum,J.L., 1995. Developing effective strategies to prioritize setup reduction in multi machine production system.
[21] Cheng, J.L., 2006. DMAIC integration necessary for success. ASQSIX Sigma Forum Magazine5(4),22–28.
[22] Choi, T.Y., Eboch, K., 1998. The TQM paradox: relations among TQM practices, plant performance, and customer satisfaction. Journal of Operations Management 17, 59–75.
[23] Choo, A.S., Linderman, K.W., Schroeder, R.G., 2004. Method and context perspectives on learning and knowledge creation in quality management. Journal of Operations Management 25 (4), 918–931.
[24] Clifford, L., 2001. Why you can safely ignore Six Sigma. Fortune January, 140.
[25] Coronado, R.B.,Antony,J., 2002. Critical success factors for the successful
[26] implementation of Six Sigma projects in organisations. The TQM Magazine 14(2),92–99.
[27] Cyert, R.M., March, J.G., 1963. A Behavioral Theory of the Firm. Prentice-Hall, Englewood Cliffs, NJ.
[28] Dasgupta, T., 2003. Using the six-sigma metric to measure and improve the performance of a supply chain. Total Quality Management & Business Excellence 14 (3), 355–367.
[29] Davison,L.,Al-shaghana,K.,2007. The link between Six Sigma and quality culture — an empirical study. Total Quality Management 18(3), 249–265.
[30] Economist, 2004. (Still) made in Japan, April 7.
[31] Eisenhardt, K.M., Martin, J.A., 2000. Dynamic capabilities: what are they? Strategic Management Journal 21 (October–November Special Issue), 1105–1121.
[32] Feng, Q.,Manuel,C.M.,2007.Under the knife: an ational survey of Six Sigma programs in US health care organizations. International Journal of Health Care Quality Assurance 21(6),535–547.
[33] Flynn, B.B., Sakakibara, S., 1995. Relationship between JIT and TQM: practices and performance. Academy of Management Journal 38 (5), 1325–1360.
[34] Forza, C., Flippini, R., 1998.TQMimpact on quality conformance and customer satisfaction: a causal model. International Journal of Production Economics 55, 1–20.
[35] Foster,S.T.,2007.Does Six Sigma improve performance? The Quality Management Journal14(4),7–20.
[36] Garvin, D., 1988. Managing Quality: The Strategic and Competitive Edge. Free Press, New York, NY, p. 22.
[37] Garvin, D.A., 1993b. Manufacturing strategic planning . California Management Review 35 (4), 85–106.
[38] Gijo,E.V.,Rao,T.L.,2005. Six Sigma implementation— hurdles and more hurdles. Total Quality Management 16(6),721–725.
[39] Goffnett, S.P., 2004. Understanding Six Sigma: implications for industry and education. Journal of Industrial Technology 20 (4), 1–10.
[40] Gopal, R.,2008. 10 ways to failure for a new Six Sigma program. /http://www.isixsigma.com/library/content/c071203a.aspS.
[41] Gowen III, C.R., Tallon, W.J., 2005. Effect of technological intensity on the relationships among Six Sigma design, electronic-business, and competitive advantage: a dynamic capabilities model study. Journal of High Technology Management Research 16 (1), 59–87.
[42] Gupta, P.,2008. Reducing the cost of failures. Quality Digest 47 (1), 22.
[43] Hackman, J., Wageman, R., 1995. Total quality management: empirical, conceptual, and practical issues. Administrative Science Quarterly 40 (2), 309–343.
[44] Hales, D.N., Chakravorty,S.S., 2006.Implementation of Deming's style of Quality management : an action research study. International Journal of Production Economics 103,31–148.
[45] Handfield, R ., Ghosh, S., Fawcett, S., 1998. Quality driven change and its effects on financial performance. Quality Management Journal 5 (3), 13–30.
[46] Harry,M.J., Linsenmann, D.R.,2007. The Six Sigma Field book : How Du Pont Successfully Implemented the Six Sigma Breakthrough Strategy. Double day Business of Random House, Inc.,NewYork, NY.
[47] Helfat, C.E., Finkelstein, S., Mitchell, W., Peteraf, M.A., Singh, H., Teece, D.J., Winter, S.G., 2007. Dynamic Capabilities: Understanding Strategic Change in Organizations. Blackwell Publishing, Malden, MA.
[48] Henderson, K.M., Evans, J.R., 2000. Successful implementation of Six Sigma: benchmarking general electric company. Benchmarking: An International Journal 7 (4), 260–281.
[49] Hendricks, C.A., Kelbaugh, R., 1998. Implementing Six Sigma at GE. The Journal of Quality and Participation 21 (4), 48–53.
[50] Hindo, B.,2007.At3M, a struggle between efficiency and creativity. Business Week,June11.
[51] Hindo, B.,Grow,B.,2007. Six Sigma: so yesterday. BusinessWeek, June 11.
[52] Kaynak, H., 2003. The relationship between total quality management practices and their effects on firm performance. Journal of Operations Management 21 (4), 405–435.
[53] Keller,P.,2005. Six Sigma: Demystified. McGraw-Hill, NewYork, NY.
[54] Kiernan, M.J., 1996. Get innovative or get dead. Business Quarterly 61 (1), 51–58.
[55] Kwak, Y.H., Anbari, F.T., 2004. Benefits, obstacles, and future of Six Sigma approach. Technovation 26 (5/6), 708–715.
[56] Ladani, L.J.,Das,D., Cartwright,J.L., Yenker,R., Razmi,J., 2006.Implementation of Six Sigma system in celestica with practical examples. International Journal of Six Sigma and Competitive Advantage 2(1), 69–88.
[57] Lakhavani,S.T.,2003. Six Sigma implementations: trials, tribulations, and lessons learned. ASQ's Annual Quality Congress Proceedings 57, 643–647.
[58] Lee , Choi ,2006. Six Sigma: a vital improvement approach when applied to the right problems, in the right environment. Assembly Automation26(1), 10–18.
[59] Lee-Mortimer, A., 2006. Six Sigma: a vital improvement approach when applied to the right problems, in the right environment. Assembly Automation26(1),10–18.
[60] Linderman, K., Schroeder, R.G., Choo, A.S., 2006. Six Sigma: the role of goals in improvement teams. Journal of Operations Management 24 (6), 779–790.
[61] Linderman, K., Schroeder, R.G., Zaheer, S., Choo, A.S., 2003. Six Sigma: a goal-theoretic perspective. Journal of Operations Management 21 (2), 193–204.
[62] Linderman, K., Schroeder, R.G., Zaheer, S., Liedtke, C., Choo, A.S., 2004. Integrating quality management practices with knowledge creation processes. Journal of Operations Management 22 (6), 589–607.
[63] Lynch,D.P., Bertolino,S., Cloutier,E., 2003. How to scope DMAIC projects. Quality Progress36(1),37–41.
[64] Mahoney, J.T., 1995. The management of resources and the resource of management. Journal of Business Research 33 (2), 91–101.
[65] Mast, J.D., Bisgaard,S., 2007. The science in Six Sigma. Quality Progress 40 (1),25–29.
[66] Mcadam, R., Evans, A., 2004. Challenge to Six Sigma in a high technology mass-manufacturing environments. Total Quality Management 15 (5/6), 699–706.
[67] Mullavey,F., 2005. Shack led by bad Six Sigma. Quality Digest, September /http://www.qualitydigest.com/sept05/articles/03_article.shtmlS.
[68] Neilson, G.L., Martin, K.L., Powers, E., 2008. The secrets to successful strategy execution. Harvard Business Review 86 (6), 60–70.
[69] Ostram, D., 2000. Corporate Japan's restructuring efforts: a progress report. Japan Economic Institute Report, 20, May 19.
[70] Pande, P. S., Robert, P. N., & Roland, R. C. (2002). The Six Sigma way team field book. New York: McGraw-Hill.
[71] Pande, P.S., Neuman,R.P., Cavanagh,R., 2000. The Six Sigma Way: How GE, Motorola, and Other Top Companies are Honing their Performance. McGraw-Hill, NewYork, NY.
[72] Pullin, J., 2005. Room for improvement. Professional Engineering 18 (15), 38–138.
[73] Pyzdek, T.,2003. The Six Sigma Handbook: A Complete Guide for Green Belts, Black Belts, and Managers at All Levels. McGraw-Hill, New York, NY.
[74] Rajagopalan,R.,Francis,M.,Suarez,W.,2004.Developing novel catalysts with Six Sigma. Research Technology Management 47,13–16.
[75] Reed, R., Lemak, D.J., Montgomery, J.C., 1996. Beyond process: TQM content and firm performance. Academy of Management Review 21, 173–202.

[76] Savolainen,T., Haikonen,A., 2007. Dynamics of organizational learning and continuous improvement in Six Sigma implementation. The TQM Magazine 19(1), 6–17.
[77] Scho¨ n, D.A., 1975. Deutero-learning in organizations: learning for increased effectiveness. Organizational Dynamics 4 (1), 2–16.
[78] Schonberger, R.J., 2008. Best Practices in Lean and Six Sigma Process Improvement. John Wiley & Sons, Hobokon, NJ.
[79] Schroeder,R.G., Linderman, K., Liedtke, C., Choo, A.S., 2008. Six Sigma: definition and underlying theory. Journal of Operations Management 26 (4),536–554.
[80] Sinha, K.K., Van de Ven, A.H., 2005. Designing work within and between organizations. Organization Science 16 (4), 389–408.
[81] Slater, R., 2000. The GE Way Fieldbook: Jack Welch's Battle for Corporate Revolution. McGraw-Hill, New York, NY.
[82] Snee, R.D.,Hoerl,R.W.,2003.Leading Six Sigma. Wiley, Hoboken, NJ.
[83] Sousa, R., Voss, C.A., 2002. Quality management re-visited: a reflective review and agenda for future research. Journal of Operations Management 20, 91–109.
[84] Stamatis, D.H., 2000. Who needs Six Sigma, anyway? Quality Digest May. Available at http://www.qualitydigest.com/may00/html/sixsigmacon.html.
[85] Sutton, C., 2006. Getting the most out of Six Sigma. Quality Management (March), 46–48.
[86] Szeto, A.Y. T., Tsang, A.H.C., 2005.Antecedent to successful implementation of Six Sigma. International Journal of Six Sigma and Competitive Advantage1(3),307–322.
[87] Teece, D.J., 2007. Explicating dynamic capabilities: the nature and micro foundations of (sustainable) enterprise performance. Strategic Management Journal 28 (11), 1319–1350.
[88] Treichler,D., Carmichael,R., Kusmanoff,A., Lewis,J., Berthiez,G., 2002. Design for Six Sigma: 15 lessons learned. Quality Progress 35, 33–42.
[89] Watson,G.,2006. Building on Six Sigma effectiveness. AS Q Six Sigma Forum Magazine 5(4), 14–15.
[90] Wruck, K.H., Jensen, M.C., 1998. The two key principles behind effective TQM program. European Financial Management 4 (3), 401–423.
[91] Wu, C.W., Chen, C.L., 2006. An integrated structural model toward successful continuous improvement activity. Technovation 26 (5/6), 697–707.
[92] Wurtzel,M., 2008. Reasons for Six Sigma deployment failures. BPM Institute. June /http://www.bpminstitute.org/articles/article/article/reasons-for-six-sigma-deployment-failures.htmlS.
[93] Zimmerman, J.P., Weiss,J., 2005. Six Sigma's seven deadly sins. Quality 44,62–66.
[94] Zollo, M., Winter, S.G., 2002. Deliberate learning and the evolution of dynamic capabilities. Organization Science 13 (3), 339–351.
[95] Zu, X., Fredendall, L.D.,Douglas,T.J., 2008. The evolving theory of quality management: the role of Six Sigma. Journal of Operations Management 26,630–650.

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Multi-Dimensional Modeling of Direct Injection Diesel Engine and Effects of Split Injection

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Abstract- Computations have shown that with high pressure multiple injections two or more injection pulses per power cycle, the Soot - NO_X trade off curves of a diesel engine can be shifted closer to origin than those with the conventional single pulse injections, reducing both the particulate matter and NO_X emissions significantly. In order to understand the mechanism of emissions reduction, multidimensional computations were carried out using CFD for a SCOTE Single cylinder diesel engine with multiple injections. Computations were carried at 9° and 10° with included angle 140° without significant wall impingement using double injections, and the predicted cylinder pressure, heat release rate, particle fate theory, soot and emissions were compared with the measured data. Excellent agreements between predictions and measurements were achieved after improvements in the models were made. The improvements include using a RNG $K-\varepsilon$ turbulence model adopting a new wall heat transfer model and introducing the nozzle discharge coefficient to account for the contraction of fuel jet at the nozzle exit .The present computations confirm that split injection allows significant soot reduction without a NO_X penalty. Based on the computations it is found that multiple injections have retarded injection timings. Regarding soot reduction , it is shown that reduced soot formation is due to the fact that the soot production rich regions at the spray tip are not replenished when the injection is terminated and then restarted .With split injection the subsequently injection fuel burns rapidly and does not contribute significantly to soot production . The present work also demonstrates the usefulness of multidimensional modeling of diesel engine combustion to reveal combustion mechanisms and to provide design insights for low emission engines. The peak pressure obtained for single injection experimental and predicted are 95and 87 bars where start of injection is at 6° btdc, and duration of injection was taken as 20°, NO_X were predicted as 450ppm and that of measured was 529ppm.Predicted PM value is 160ppm where as the measured value is 182.4ppm.In case of double injection the predicted and measured pressures are 93.5 and 88 bars respectively, predicted and measured NO_X were177ppm and 246ppm.As Particulate is concerned the predicted and measured values were 36.2ppm and 42.6ppm respectively.

Index Terms- CFD, Pilot injection, main injection, split injection, start of injection, and duration of injection

I. INTRODUCTION

This Diesel engine is widely used in heavy duty transport applications. Diesel engine is more fuel efficient than spark ignition engine on the other side they have relatively higher emissions and noise levels. Diesel engine manufacturers have to address these problems to meet current and future government regulations which limit particulate and NO_X emissions, while maintaining a quite efficient engine to satisfy the consumers. Particulate matter and NO_X production along with engine noise highly depend on the combustion process Therefore precise control over the fuel injection and spray formation is essential in making improvements to the combustion process .The optimum pressure and optimum nozzle diameter increases the performance and consequently reduces the particulate matter with the better atomization and fuel- air mixing. This in turn unfortunately increases NO_X because of high temperature. To improve the performance and to reduce the NO_X –particulate formation without scarifying the fuel consumption, it is important to understand the relationships between various injection parameters and how they affect the combustion process. Along with the injection pressure and nozzle diameter other injection parameters like such as nozzle hole L/D ratio, rate of injection profile , effect of fuel spray , spray characteristics , that may affect the droplet size, spray penetration exit velocity and spray cone angle. Use of multiple injections can reduce particulate emissions by as much as a factor of three without increasing NO_X emissions. This will be done by better mixing later in the cycle. Optimizing the injection pressure, injection angle and optimizing the nozzle diameter has proven to be an effective way to reduce particulate emissions and consequently improves the engine performance. Multiple injection strategies have been reported for simultaneous reduction of NO_X and PM in a large bore direct injection diesel engine [1, 2, 3].Small bore diesel engines results shown by Nehmer and Reitz [2] that pulsated injection might provide a method to reduce PM and allow for reduction of NO_X from controlled pressure rise. The effectiveness of double, triple and rate shaped injection strategies to simultaneously reduce NO_X and PM was also evaluated. Numerical simulations were carried out to explore the mechanism of soot and NO_X reduction for multiple injections [4]. Multiple injection strategies have a similar effect to the restarted single injection on NO_X reduction. Reduced emissions are due to the fact that the soot producing rich region is **not replenished** when the injection pressure is terminated and restarted. Zang investigated the effect of [5] pilot injection on NO_X, Soot emissions and combustion noise in a small diesel engine, soot emission was seen relevant to the pilot flame and reducing the pilot flame at the main injection starting time can reduce soot emissions. By optimizing pilot injection timings and quantity maintaining and dwell between main and pilot injections simultaneous reduction of NO_X and PM was obtained in a HSDI diesel engine [6].It was also shown that simultaneous reduction of combustion noise and emission is possible by the influence of the pilot burned gas through minimizing the fuel quantity by advancing the pilot injection

timing [7].Combustion concepts like homogeneous charge compression ignition combustion have been shown to be effective for NO_X and PM reduction. The concept of HCCI was applied initially to spark ignition engines because of its volatility property for better homogeneous mixture, where as in diesel engines this concept has been delayed as diesel has low volatility. With the concept of multi pulse injection the problem of homogeneous mixture in diesel engines could be solved and the same has been applied for high speed direct injection diesel engines effectively. Hashizume [8] proposed a low soot solution called multiple stage diesel combustion for higher load operating conditions. Although, soothing luminous flame was observed, this luminous flame disappeared quickly and most of the soot was oxidized rapidly smoke and NO_X were reduced. Su W ,Lin T, Pei Y.A have done work[9]on multi pulse HCCI diesel engine ,they used multiple short injection pulses for early injection and followed by main injection near top dead center and they found that for very early injection a great increase in Hydrocarbon emission was seen. Hasegawa and Yanagihara employed two injections called uniform bulky combustion system .The first injection was used to form a pre- mixture. The second injection was used as an ignition trigger. The ignition of premixed gas could be controlled by the second injection when the early injection maintained a low temperature reaction.

II. METHODOLOGY AND MODEL FORMUALTION

The computer code used in this study was **FLUENT**. The code can solve unsteady, compressible turbulent flows with combustion and fuel spray, and have been used for the computations of various internal combustion engines The code uses a finite volume methodology to solve discredited Nervier-strokes equations. RNGK-ε was used in this study. It could predict more realistic large scale flame structures compared with the K-ε model. The RNG K-ε model is formulated as

$$\frac{\partial \rho k}{\partial t}+\nabla.\left(\rho u k\right)=-\frac{2}{3}\rho k\nabla.u+\tau.\nabla u+\nabla.\left(\alpha_k \mu k\right)-\rho\varepsilon+W^s \quad [1]$$

$$\frac{\partial \rho \varepsilon}{\partial t}+\nabla.\left(\rho u \varepsilon\right)=-\left[\frac{2}{3}C_1-C_3+\frac{2}{3}C_\mu C_\eta \frac{k}{\varepsilon}\nabla.u\right]\rho\varepsilon\nabla.u+\nabla.\left(\alpha_\varepsilon \mu\nabla\varepsilon\right)+\frac{\varepsilon}{k}\left[\left(C_1-C_\eta\right)\tau:\nabla u-C_2\rho\varepsilon+C_s W^s\right] \quad [2]$$

$$C_3=\frac{-1+2C_1-3m\left(n-1\right)+\left(-1\right)^\delta\sqrt{6}C_\mu C_\eta\eta}{3} \quad [3]$$

$\delta=1$ if $\nabla.u<0$

$\delta=0$ if $\nabla.u>0$

And

$$C_\eta=\frac{\eta\left(1-\frac{\eta}{\eta_o}\right)}{1+\beta\eta^3} \qquad \eta=S\frac{k}{\varepsilon}$$

$$S=\left(2S_{ij}S_{ij}\right)^{1/2}$$

$$S_{ij}=\frac{1}{2}\left(\frac{\partial u_i}{\partial x_i}+\frac{\partial u_j}{\partial x_i}\right)$$

In equation (1)-(3) k and ε are turbulent kinetic energy and its dissipation rate .ρ,u,τ and μ are density, velocity, stress tensor and effective viscosity respectively.η is the ratio of the turbulent –to mean –strain time scale . S is the magnitude of the mean strain. m =0.5, and n =1.4.The C3 term accounts for the non-zero velocity dilatation which is closed.

III. GOVERNING EQUATIONS

The governing equations of gas flow consist of mass, momentum and energy conservation equations turbulence equations, gas state relation equations. To take care of physical modeling k-ε turbulence model is employed. The various equations, which are solved**:**

Continuity $$\frac{\partial p}{\partial t}+\nabla(\partial u)=0 \quad [4]$$

Momentum

$$\frac{\partial \rho u}{\partial t}+\nabla(\rho u)=-\nabla p-\nabla\left[\frac{2}{3}\rho k\right]+\nabla\sigma+\rho g \quad [5]$$

Turbulence Model

K-εquation

$$\frac{\partial(\rho k)}{\partial t}+\nabla(\rho u k)=-\frac{2}{3}\rho k\nabla u+\sigma\nabla u+\nabla.[(\frac{\mu}{pr_k})\nabla k]-\rho\varepsilon \quad [6]$$

ε-Equation

$$\frac{\partial(\partial\varepsilon)}{\partial t}+\nabla.(\rho u\varepsilon)=-(2c_{\varepsilon 1}/3-c_{\varepsilon 3})\rho\varepsilon\nabla.u+\nabla.\left[(\frac{\mu}{pr_\varepsilon})\nabla\varepsilon\right]+\frac{\varepsilon}{k}\left[c\varepsilon_1\sigma:\nabla u-c\varepsilon_2\rho\varepsilon\right] \quad [7]$$

The quantities $c\varepsilon_{1,}c\varepsilon_{2,}c\varepsilon_{3,}pr_{\varepsilon,}pr_k$ are constants whose values are determined from experiments and some theoretical considerations, a feature that establishes certain universality. Standard values of these constants are often used in engine calculations as given below.

$c\varepsilon_1=1.44 c\varepsilon_2=1.92 c\varepsilon_3=-1, pr_k=1.0,$

$pr_\varepsilon=1.3$

IV. MATHEMATICAL MODELS

A Spray model

Spray models used in this study is WAVE break up model suggested by Reitz and could be summarized as follows. [10] Liquid break up is modeled by postulating the new drops are

formed (with drop radius r) from a parent drop or blob (with radius a) with stripping. $r_{new} = B_0 \cdot \Lambda$ (4)Where B_0 =0.61 is a constant, the value of which is fixed. The rate of change of drop radius in apparent parcel due to drop breakup is described by using the rate expression; $\frac{dr}{dt} = \frac{r - r_{new}}{\tau_{bu}}, \tau_{bu} = 3.788 \frac{r}{\Lambda \Omega}$ (5)

The spray –wall interaction model used in the simulations is based on the spray –wall impingement model descried in [8].The model assumes that a droplet, which hits the wall is affected by rebound or reflection based on the Weber number. The Dukowicz model was applied for treating he heat –up and evaporation of the droplet which is described in [11].This model assumes a uniform droplet temperature .I n addition the rate of droplet temperature change is determined by the heat balance which states that that heat convection from the gas to the droplet ether heat up the droplet or supplies heat for vaporization. With higher droplet densities and relative velocities droplet collisions occur. High droplet densities are restricted to the spray kernel. High relative velocities can especially be seen at the tip of the spray, where preceding droplets are decelerated by the gas. Depending on the droplet collision conditions various effects like elastic droplet bouncing, droplet coalescence and droplet atomization are observed.

B. Ignition and Combustion Models

The shell auto ignition model was used for modeling of the auto ignition [10].In this mechanism 6 species for hydrogen fuel, oxidizer, total radical pool, branching agent, intermediate species and products were involved. In addition the important stages of auto ignition such as initiation propagation, branching and termination were presented by generalized reactions described in [10]. The combustion model used in this study is of the turbulent mixing controlled verity as described by Magnusson and Heritage[11] .This model assumes that in premixed turbulent flames, the reactions (fuel ,oxygen) are contained in the same eddies and are separated from eddies containing hot combustion products . The chemical reactions usually have time scales that are very short compares to the characteristics of the turbulent transport processes .Thus it can be assumed that the rate of combustion is determined by the rate of intermixing on a molecular scale of the eddies containing reactants and those containing hot products in other words by the rate of dissipation of these eddies.

C. NOX and soot Formation Models

The reaction mechanism of NO_X formation is expressed in terms of the extended a Zeldovich mechanism.

$N2+O \leftrightarrow NO+N$ [8]

$N+O2 \leftrightarrow NO+O$ [9]

$N+OH \leftrightarrow NO+H$ [10]

From the fact that in most stoichiometric and fuel –lean flames , the occurring OH concentration very small , the third reaction of the Zeldovich mechanism can be neglected .F or the formation of thermal NO_X , the partial equilibrium approach can be used and the equilibrium of the first two reactions result in one global reaction as follows;

$N2+O2 \leftrightarrow 2N$ [11]

The chemical species appearing in this global reaction are used in the giver single –step fuel conversion equation via:

$\frac{d[NO]}{dt} = 2k_f[N_2IO_2]$ =2kf[N2/O2] [12]

Where only the forward reaction is considered and the reaction rate kf is given as

$Kf = \frac{A}{\sqrt{T}} \exp\left(\frac{-E_a}{RT}\right)$ [13]

The soot formation model currently implemented in fluent is based upon a combination of suitably extended and adapted joint chemical /physical rate expressions for the representation of the processes of particle nucleation, surface growth and oxidation. $\frac{dm_{soot}}{dt} = \frac{dm_{form}}{dt} - \frac{dm_{oxid}}{dt}$ [14]

$\frac{dm_{form}}{dt} = A_f m_{fv} p^{0.5} \exp\left(\frac{-E_a}{RT}\right)$ [15]

$\frac{dm_{soot}}{dt} = \frac{6M_c}{\rho_s d_s} m_s R_{tot}$ [16]

D. Numerical model

The numerical method used in this study is a segregated solution algorithm with a finite volume –based technique. The segregated solution is chosen is due to the advantage over the alternative method of strong coupling between the velocities and pressure. This can help to avoid convergence problems and oscillations in pressure and velocity fields. This technique consists of an integration of the governing equations of mass, momentum species, energy and turbulence on the individual cells within the computational domain to construct algebraic equations for each unknown dependent variable. The pressure and velocity are coupled using the **SIMPLE** algorithm which causes a guess and correct procedure for the calculation of pressure on the staggered grid arrangement .It is more economical and stable compared to the other algorithms. The **upwind** scheme is always bounded and provides stability for the pressure correction equation. The CFD simulation convergence is judged upon the residuals of all governing equations. This scaled residual is defined as:

$$R^{\phi} = \frac{\sum_{cells} P \left| \sum_{nb} a_{nb} \phi_{nb} + b - a_p \phi_p \right|}{\sum_{cells} P \left| a_p \phi_p \right|}$$

Where Φp is a general variable at a cell p, a_p is the center coefficient, a_{nb} are the influence coefficients for the neighboring cells and b is the contribution of the constant part of the source term. The results reported in this paper are achieved when the residuals are smaller than 1.0×10 -4.

V. TURBULENT DISPERSION OF PARTICLES

Dispersion of particles due to turbulent fluctuations in the flow can be modeled using either **Stochastic tracking** (discrete random walk**)** Particle cloud model Turbulent dispersion is

important because it is more realistic, enhances stability by smoothing source terms and eliminating local spikes in coupling to the gas phase.

Table 1: Engine Specifications

Engine	Caterpillar
Bore* stroke	137.19*165.1
Compression ratio	15.1:1
Displacement	2.44 liters
Con rod length	261.62mm
Engine speed	1600 rpm
Nozzle holes	6
Spray angle	140°

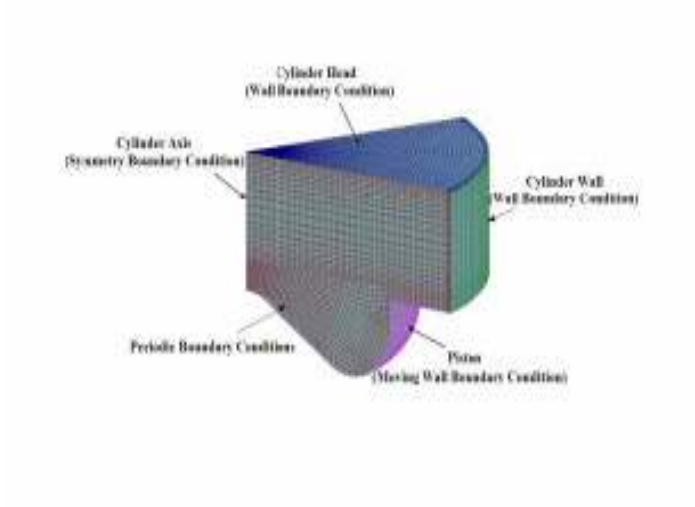

Figure 1: Computational Mesh

VI. RESULTS

Pressure histories for single injection

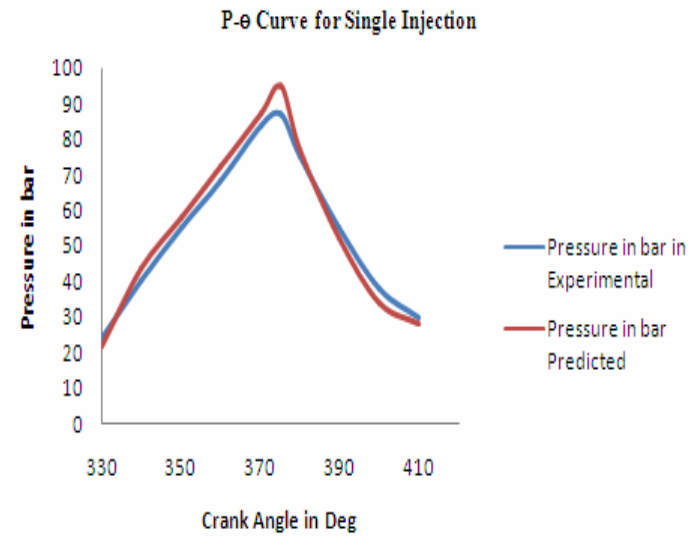

Figure 2

Figure 2 shows the variations of pressure (experimental and predicted) with variation in crank angle for single injection. It is clear from the fig that the predicted results are closely following the experimental results. The major deviation of the predicted pressure from the experimental value is noticed near TDC. From the deviations two important aspects can be observed.

- The predicted peak pressure is higher the experimentally obtained pressure. The peak pressure with RNGK-ε model of diesel computational values and experimental for single injection 95 bar and 87 bar respectively.
- One reason for lower experimental pressure may be due to the greater ignition delay during combustion. The increase in ignition delay causes the combustion to continue even after the piston crosses TDC towards expansion, stroke resulting in lower peak pressure.
- The other reasons for the difference in peak pressure may be due to the residual gases in the clearance volume during exhaust stroke. The higher temperature residual gases are reduces to the fresh charge entry during suction, as it destroys some vacuum by expanding. Blow by and crevice flows also effect the in cylinder pressures. Both these features are not incorporated in this model.
- The occurrence of predicted peak pressure even before TDC indicates that majority of the fuel is consumed in combustion before the piston reaches TDC.This supports the argument that the ignition delay is more in experimental case. Another important observation that can be made is that the RNGK-ε predicts the pressure variations closer to the experimental results.

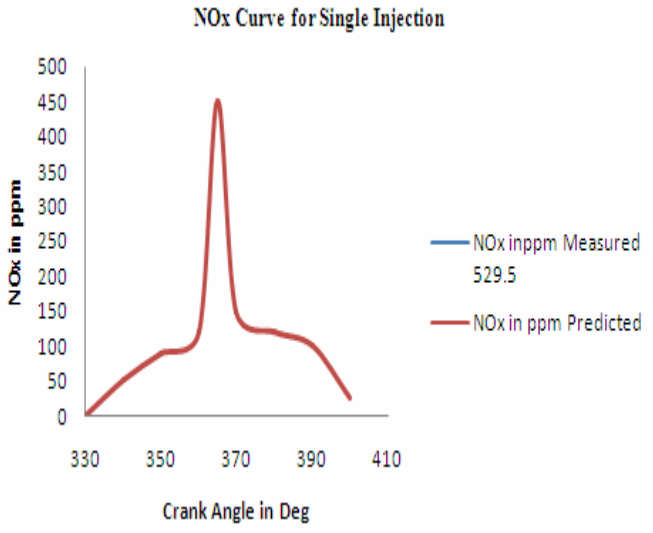

Figure 3

Figure 3 shows the mass fraction of NO variations with crank angle. The fig reveals that the NO formation takes place between 5° bTDC and 25° aTDC. It is a fact that the combustion

generated temperatures during this period will be high. High NO concentration is found in regions with close to stoichiometric mixture fraction and region where the temperature is high. It is understood from the fig the RNG K-ε model prediction agrees well with the measured data.

Figure 4 shows the soot variations with respect to the crank angle. The soot emission predicted with experimental value is 160ppm and 182.7ppm with RNG K-ε model. It is very interesting to note that soot oxidation predominantly takes place in the high temperature regions in which NO_X production is high. The fact that local conditions that favor soot oxidation also favor NO formation is probably major reason for the well known Soot -NO_X trade off typically encountered when optimizing diesel engine. Soot production is given by particle inception rate as a spatial distribution with strong correlation to the mixture fraction field.

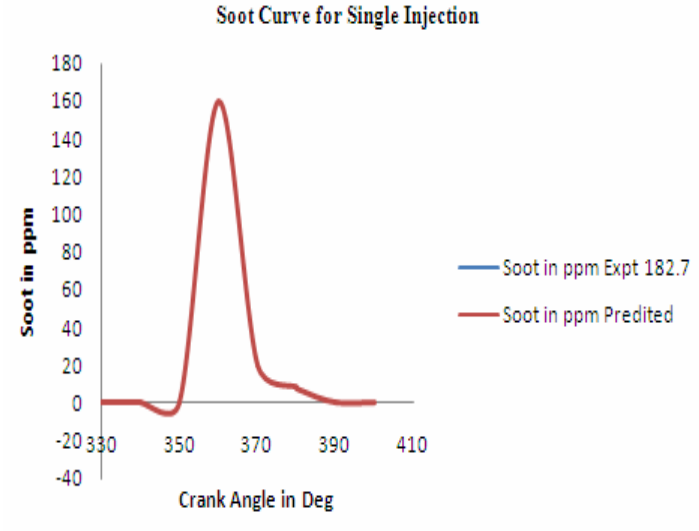

Figure 4

Figure 5 shows the predicted and experimental heat release rate were 550j / ° and that of measured 460j/°. .

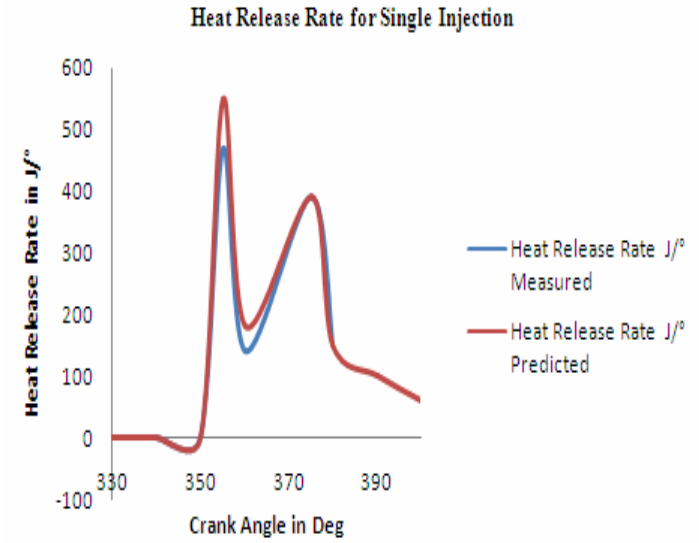

Figure 5

Double Injection

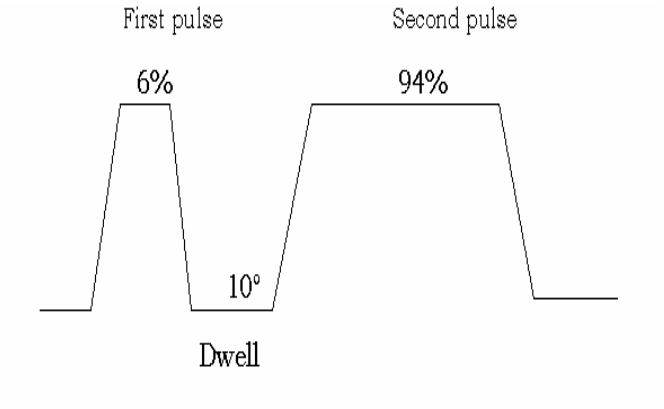

Figure 6: Pressure Histories for Double Injection

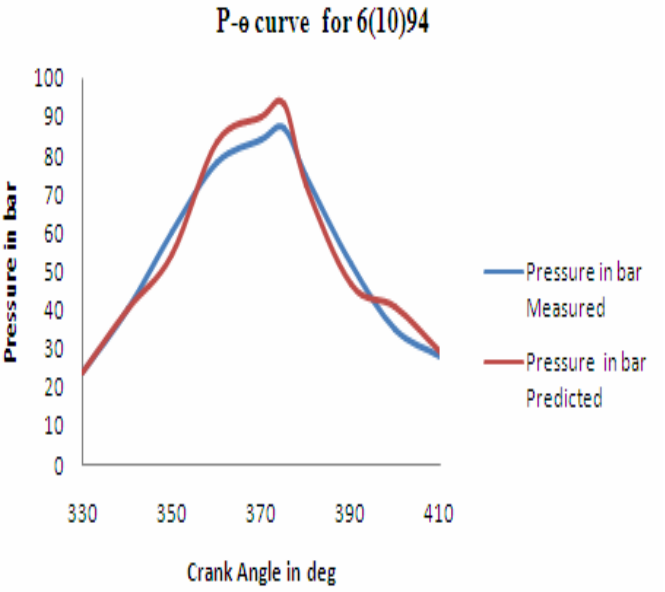

Figure 7

Figure 6 shows the amount of fuel injected in the first pulse as pilot injection and also second pulse as main injection.

Figure 7shows the variations of pressure (experimental and predicted) with variation in crank angle for double injection. It is clear from the fig7.7that the predicted results are closely following the experimental results. The major deviation of the predicted pressure from the experimental value is noticed near TDC. From the deviations two important aspects can be observed.

- The predicted peak pressure is higher the experimentally obtained pressure. The peak pressure with RNGK-ε model of diesel computational values and experimental for double injection 98 bar and 90bar respectively.

- The other reasons for the difference in peak pressure may be due to the residual gases in the clearance volume during exhaust stroke. The higher temperature residual gases are reduces to the fresh charge entry during suction, as it destroys some vacuum by expanding. Blow by and crevice flows also effect the in

cylinder pressures. Both these features are not incorporated in this model.

- The occurrence of predicted peak pressure even before TDC indicates that majority of the fuel is consumed in combustion before the piston reaches TDC. This supports the argument that the ignition delay is more in experimental case. Another important observation that can be made is that the RNGK-ε predicts the pressure variations closer to the experimental results.

- A small injection before the main injection with 0% EGR is not effective in reducing particulate. Thus pilot injection would not be effective in enhancing mixing after the main injection.

- The pilot injection was effective at the 0% EGR condition is that pilot injections are known to reduce the premix burn fraction of burning resulting in lower NO_X production [929461].

Comparison between available experimental and predicted NO_X for double injection

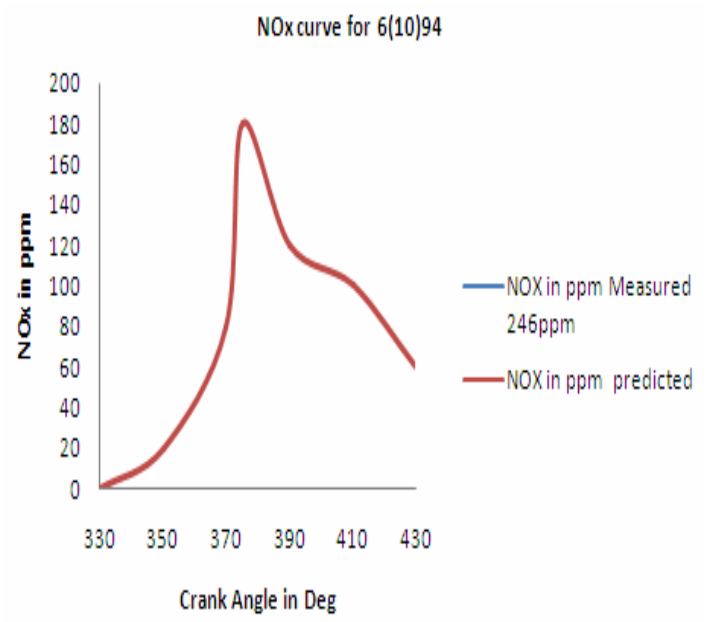

Figure 8

The Nitric oxide (NO) and (NO_2) are usually grouped together as NO_X. How ever NO is the predominant Oxide of Nitrogen produced inside the engine cylinder. The principal source NO is the oxidation of atmospheric Nitrogen. The oxidation of Nitrogen present in the fuel is an additional source of NO. The atmosphere contains both Nitrogen and Oxygen in abundant quantities. But the oxidation of Nitrogen will not take place in atmosphere. It requires high temperatures during to carry out the oxidation reaction. 'Zeldovich Mechanism', which is used in the model, clearly explains the formation of NO.

- Figure 8 shows the mass fraction of NO variations with crank angle. The fig reveals that the maximum NO formation takes place between 5° bTDC and 25° aTDC. It is a fact that the combustion generated temperatures during this period will be high. High NO concentration is found in regions with close to stoichiometric mixture fraction and region where the temperature is high. It is understood from the fig the RNG K-ε model prediction agrees well with the measured data. As pilot injection was initiated ignition delay has been reduced hence the reduction in NO_X and Soot as temperature levels got reduced.
- The measured value from the experiment was 246ppm and where as the computed value from RNG K-ε model is approximately 177.8ppm.

Comparison between Available Experimental and Predicted Soot for Double Injection

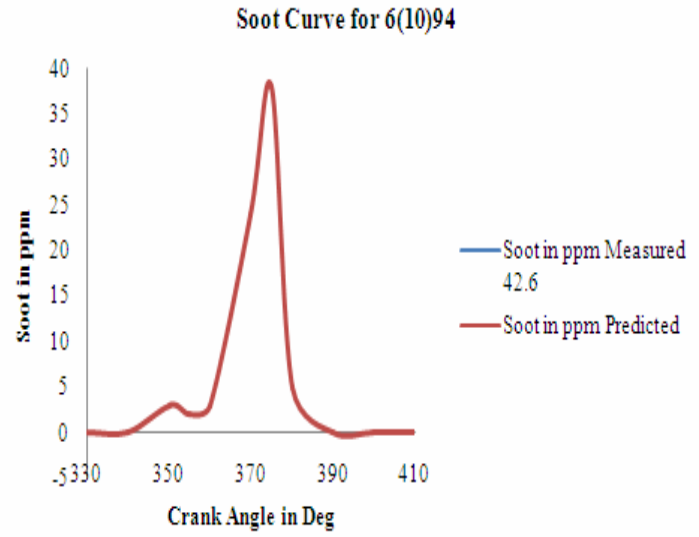

Figure 9

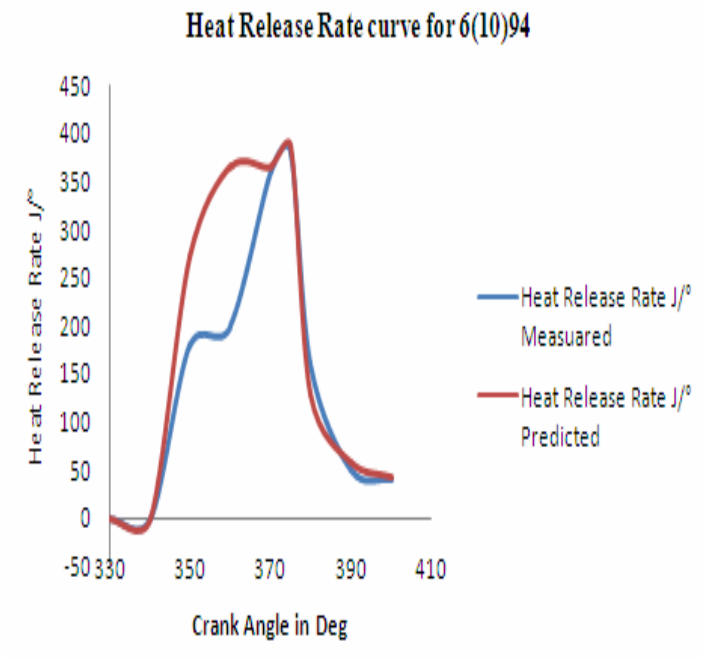

Figure 10

Figure 9 shows the soot variations with respect to the crank angle. The soot emission predicted with experimental value is 36.2ppm and 42.6ppm with RNG K-ε model. It is very interesting to note that soot oxidation predominantly takes place in the high temperature regions in which NO_X production is high. The fact that local conditions that favor soot oxidation also favor NO formation is probably major reason for the well known Soot -NO_X trade off typically encountered when optimizing diesel engine. Soot production is given by particle inception rate as a spatial distribution with strong correlation to the mixture fraction field.

Figure 10 shows the heat release rate in double injection, the measured and predicted values are approximately 400j/° and 490j/° respectively.

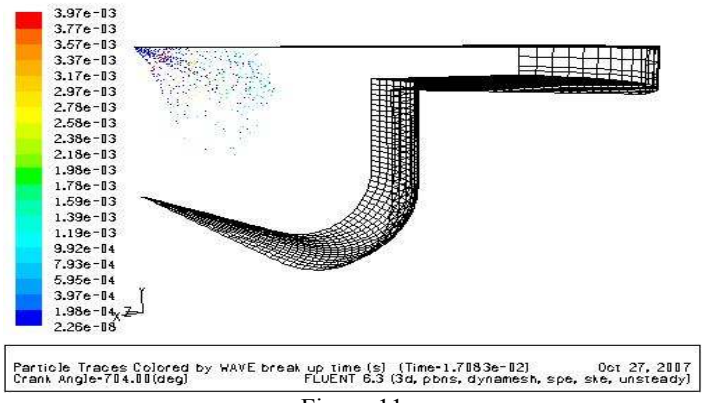

Figure 11

Figure 11 explains particle traces and particle fate theory. This theory enables during simulations how the particles are participated in combustion, how many particles are escaped, how many are trapped, how many are evaporated and how many are aborted. During simulation nearly approximately 1660 to 1734paricles were participated in combustion for every 2000 particles injection. The number of particles participated in combustion could be seen while simulation is under progress. .

VII. Conclusions

A. Single Injection

Based on the above observations the following conclusions are drawn with single injection with start of injections 6° bTDC and duration of injection as 20°.

- It is found that the predicted peak pressure is higher as compared to the available experimental value and are found to be 95bar 87 bar respectively.
- The peak energy (Heat release) predicted during the operating cycle is 537j/° from the fig 6.4,and where as the experimental value is 460j/° .
- It was found that NO emissions obtained from available experimental values are very slightly higher than the predicted value. The NO emission obtained from the available experimental value is 529.5ppm where as the predicted value by RNG K-ε model is approximately 450ppm.
- It was found that the soot emissions are slightly lower for the predicted value by RNG K-ε model when compared to the available experimental value. Soot emission by RNG K-ε is 160ppm approximately and the measured value is 182.7ppm.

B. Double Injection with 10° dwell 6(10)94

Based on the above observations the following conclusions are drawn with double injection with start of injections 6°bTDC and duration of injection as 22° with dwell period of 10°.

- It is found that the predicted peak pressure is higher as compared to the available experimental value and are found to be 93.5bar 88 bar respectively.
- The peak energy (Heat release) predicted during the operating cycle is 489j/° from the fig 6.4, and where as the experimental value is 400j/°.
- It was found that NO emissions obtained from available experimental values are very slightly higher than the predicted value. The NO emission obtained from the available experimental value is 246.05ppm where as the predicted value by RNG K-ε model is approximately 177.8ppm.
- It was found that the soot emissions are slightly lower for the predicted value by RNG K-ε model when compared to the available experimental value. Soot

emission by RNG K-ε is 36.2ppm approximately and the measured value is 42.6ppm.

APPENDIX

bTDC	before top dead center
aTDC	After top dead enter
CA	Crank angle
SOI	Start of injection
DOI	Duration of injection

REFERENCES

[1] Tie gang Fang, Robert. E.Coverdill, Chia-fon F.Lee,RobertA White Effects of injection angles on combustion process using multiple injection strategies in an HSDI diesel engine Fuel 87(2008)3232-3239
[2] Nehmer DA, Reitz RD. Measurement of effect of injection rate and split injections on diesel Engine, soot and NOX emissions.SAE Paper 940668
[3] T.C .Tow, D.A. Pier Pont, and R.D. Reitz Reducing particulate and NOX Emissions by using multiple injections in a Heavy duty D.I. Diesel Engine S.A.E Paper940897 ”
[4] Zhiyu Han, A.N.Uludogan, Gregory J. Hampson, and Rolf D. Reitz Mechanism of soot and NOX Emission Reduction Using Multiple-injection in a Diesel Engine SAE Paper 960633
[5] Zang. L.A Study of pilot injection in a diesel engine.SAE Paper 1999-01-3493
[6] Chen.S.K.Simultaneous reduction of NOX and particulate emissions by using multiple injections in a small diesel engine.SAE 2000-01-3084.
[7] Tanaka T Ando A. Ishizaka K .Study on pilot injection of DI diesel engine using common rail injection system. JSAE 2002:23:297-302
[8] Combustion and Emission Characteristics of Multiple stage Diesel Combustion. SAE 980505
[9] Hasegawa R Y Anagihara H. HCCI Combustion in DI diesel engine.SAE2003-01-0745.
[10] Liu, A.B.and Reitz R.D.”Modeling the Effects of Drop Drag and Break-up SAE 930072.
[11] Dukowicz, J.K .Quasi steady droplet change in the presence of Informal report Los Alamos Scientific Laboratory” LA 7997-MS.
[12] D.A. Pierpont, D.T. Montgomery, and R.D.Reitz Reducing NOX using multiple Injections and EGR in a D.I.Diesel engine SAE950217
[13] Internal combustion fundamentals by J.B.Heywood. .
[14] Taewon Lee and Rolf D. Reitz “the Effects of Split Injection and Swirl on a HSDI Engine E quipped With a Common Rail Injection System” SAE Paper 2003-01-0349
[15] K.V.Tanin, D.D Wick man, D.T. Montgomery, S.Das, and R.D.Reitz The influence of boost pressure on emission and fuel consumption of a heavy duty single cylinder diesel Engine SAE paper 1999-01-0840
[16] Chongjin bai and A.D. Gosman Development of methodology for spray impingement simulation .SAE paper 950283
[17] Liu, A.B.and Reitz R.D.”Modeling the Effects of Drop Drag and Break-up SAE 930072
[18] www.FLUENT.com
[19] www.cfd-online.com
[20] www.cornel.com
[21] P.R.O‘Rourke and A.AAmsdon, The TAB Method for Numerical Calculation of Spray Droplet Break –Up, SAE Technical Paper 872089, 1987.

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BCD-Clustering algorithm for Breast Cancer Diagnosis

Dr Sulochana Wadhwani, Dr A.K. Wadhwani, Tripty Singh, Dr. Sarita Singh Bhadauoria

Abstract- Cluster analysis or clustering is the task of assigning a set of objects into groups (called clusters) so that the objects in the same cluster are more similar (in some sense or another) to each other than to those in other clusters. Cluster analysis can be used to differentiate between different types of calcification clusters in a mammogram image. In this application, actual position does not matter, but the cluster size shape and intensity is considered as a time based feature, for each image that was taken over time. This technique allows, for example, accurate measurement of the rate a radioactive tracer is delivered to the area of interest, without a separate sampling of clusters, an intrusive technique that is most common today. Choosing cluster centers is crucial to the clustering. In this paper we compared two fuzzy algorithms
: Fuzzy c-means algorithm and the new fuzzy clustering and fuzzy merging algorithm. Fuzzy c-means algorithm uses the reciprocal of distances to decide the cluster centers. The representation reflects the distance of a feature vector from the cluster center but does not differentiate the distribution of the clusters. The Breast Cancer Diagnosis-Clustering algorithm uses Gaussian weights and the generated cluster centers are more representative. When a feature vector is of equal distance from two cluster centers, it weighs more on the widely distributed cluster than on the centrally located cluster. We implemented both algorithms MATLAB.

Index Terms- BCD-Clustering algorithm, empty clusters, hard clusters, soft clusters, and mammogram

I. INTRODUCTION

The notion of a cluster varies between algorithms and is one of the many decisions to take when choosing the appropriate algorithm for a particular problem. At first the terminology of a cluster seems obvious: a group of data objects. However, the clusters found by different algorithms vary significantly in their properties, and understanding these cluster models is the key to understanding the differences between the various algorithms.

Typical cluster models include:

1. Connectivity models: for example hierarchical clustering builds models based on distance connectivity.
2. Centroid models: for example the k-means algorithm represents each cluster by a single mean vector.
3. Distribution models: clusters are modeled using statistic distributions, such as multivariate normal distributions used by the Expectation-maximization algorithm.
4. Density models: for example DBSCAN and OPTICS defines clusters as connected dense regions in the data space.
5. Subspace models: in Biclustering (also known as Co-clustering or two-mode-clustering), clusters are modeled with both cluster members and relevant attributes.
Group models: Some algorithms (unfortunately) do not provide a refined model for their results and just provide the grouping information.

A clustering is essentially a set of such clusters, usually containing all objects in the data set. Additionally, it may specify the relationship of the clusters to each other, for example a hierarchy of clusters embedded in each other. Clustering can be roughly distinguished in:

1. Hard Clustering: Each object belongs to a cluster or not
2. Soft Clustering (also: fuzzy clustering): Each object belongs to each cluster to a certain degree (e.g. a likelihood of belonging to the cluster)

There are also finer distinctions possible, for example:

- Strict partitioning clustering: here each object belongs to exactly one cluster
- Strict partitioning clustering with outliers: object can also belong to no cluster, and are considered outliers.
- Overlapping clustering (also: alternative clustering, multi-view clustering): while usually a hard clustering, objects may belong to more than one cluster.
- Hierarchical clustering: objects that belong to a child cluster also belong to the parent cluster
- Subspace clustering: while an overlapping clustering, within a uniquely defined subspace, clusters are not expected to overlap.

Clustering is the process of grouping feature vectors into classes in the self-organizing mode. Let $\{x^{(q)}: q = 1,\ldots,Q\}$ be a set of Q feature vectors. Each feature vector $x^{(q)} = (x_1^{(q)}, \ldots, x_N^{(q)})$ has N components. The process of clustering is to assign the Q feature vectors into K clusters $\{c^{(k)}: k = 1, \ldots, K\}$ usually by the minimum distance assignment principle. Choosing the representation of cluster centers (or prototypes) is crucial to the clustering. Feature vectors that are farther away from the cluster center should not have as much weight as those that are close. These more distant feature vectors are outliers usually caused by errors in one or more measurements or a deviation in the processes that formed the object [2].

The simplest weighting method is arithmetic averaging. It adds all feature vectors in a cluster and takes the average as prototype. Because of its simplicity, it is still widely used in the clustering initialization.

The arithmetic averaging gives the central located feature vectors the same weights as outliers. To lower the influence of

the outliers, median vectors are used in some proposed algorithms.

To be more immune to outliers and more representative, the fuzzy weighted average is introduced to represent prototypes:

$Z_n^{(k)} = \Sigma_{\{q:\, q\in k\}} w_{qk} x^{(q)}_n$; (1)

Rather than a Boolean value 1 (true, which means it belongs to the cluster) or 0 (false, does not belong), the weight w_{qk} in equation (1) represent partial membership to a cluster. It is called a *fuzzy weight*. There are different means to generate fuzzy weightsOne way of generating fuzzy weights is the reciprocal of distance

$w_{qk} = 1/ D_{qk}$, ($w_{qk}= 1$ if $D_{qk} = 0$) (2)

It was used in earlier fuzzy clustering algorithms [2]. When the distance between the feature vector and the prototype is large, the weight is small. On the other hand, it is large when the distance is small. Using Gaussian functions to generate fuzzy weights is the most natural way for clustering. It is not only immune to outliers but also provides appropriate weighting for more centrally and densely located vectors. It is used in the *fuzzy clustering and fuzzy merging* (FCFM)

We implemented the *fuzzy c-means* (FCM) algorithm and the fuzzy clustering and merging algorithm in Java, applied the algorithms to several data sets and compared the weights of the two algorithms.

II. Clustering Algorithms

The clustering groups a sample set of feature vectors into K clusters via an appropriate similarity (or dissimilarity) criterion (such as distance from the center of the cluster).

The k-means Algorithm

The k-means algorithm assigns feature vectors to clusters by the minimum distance assignment principle [5], which assigns a new feature vector $x^{(q)}$ to the cluster $c^{(k)}$ such that the distance from $x^{(q)}$ to the center of $c^{(k)}$ is the minimum over all K clusters. The basic k-means algorithm is as follows:

- Put the first K feature vectors as initial centers
- Assign each sample vector to the cluster with minimum distance assignment principle.
- Compute new average as new center for each cluster
- If any center has changed, then go to step 2, else terminate.

The advantages of the method are its simplicity, efficiency, and self-organization. It is used as initial process in many other algorithms. The disadvantages are: 1) K must be provided; 2) it is a linearly separating algorithm.

III. BCD-Clustering algorithm for Breast Cancer Diagnosis

1. K Is Initial Number Of Clusters, Imax Is The Iteration Of Fuzzy
2. C-Means, P Is For The Weight
3. Input Initial Number Of Clusters K, Imax, P
4. Initialize Weights Of Prototype
5. Standardize The Initial Weight Over K
6. Starting Fuzzy C-Means Loop
7. Standardize Cluster Weights Over Q
8. Compute New Prototype Center
9. Compute New Weight
10. End Of Fuzzy C-Means Loop
11. Assign Feature Vector According The Max Weight
12. Remove Clusters With No Feature Vectors Eliminate(0),
13. Compute Arithmetic Center Of Clusters.
14. Calculate Sigma And Xie_Beni Value.
15. Calculate Fuzzy Weight
16. Get Variance (Mean-Square Error) Of Each Cluster
17. Compute Modified XB

Standardize the Weights over Q. During the FCM iteration, the computed cluster centers get closer and closer. To avoid the rapid convergence and always grouping into one cluster, we use

$w[q,k] = (w[q,k] - w_{min})/(w_{max} - w_{min})$ (5)

before standardizing the weights over Q. Where w_{max}, w_{min} are maximum or minimum weights over the weights of all feature vectors for the particular class prototype.

Removing Empty Clusters- After the fuzzy clustering loop we add a step (Step 8) to eliminate the empty clusters. This step is put outside the fuzzy clustering loop and before calculation of modified XB validity [2]. Without the elimination, the minimum distance of prototype pair used in Equation (8) may be the distance of empty cluster pair. We call the method of eliminating small clusters by passing 0 to the process so it will only eliminate the empty clusters.

For modified XB. After the fuzzy c-means iteration, for the purpose of comparison and to pick the optimal result, we add Step 9 to calculate the cluster centers and the modified Xie-Beni clustering validity κ [7]:[2]

The XB validity is a product of compactness and separation measures [10]. The compactness-to-separation ratio ν is defined by Equation (6). [2]

$\nu = \{(1/K)\sum_{(k=1,K)} \sigma_k^2\}/D_{min}^2$ (6)

$\sigma_k^2 = \sum_{(q=1,Q)} w_{qk} \| x^{(q)} - c^{(k)} \|^2$ (7)

D_{min} is the minimum distance between the cluster centers.

The Modified Xie-Beni validity κ is defined as

$\kappa = D_{min}^2 / \{\sum_{(k=1,K)} \sigma_k^2 \}$ (8)

The variance of each cluster is calculated by summing over only the members of each cluster rather than over all Q for each

cluster, which contrasts with the original Xie-Beni validity measure.

$$\sigma_k^2 = \sum_{\{q:\ q \text{ is in cluster } k\}} w_{qk} \| x^{(q)} - c^{(k)} \|^2 \qquad (9)$$

IV. Data Set

We used the Wisconsin breast cancer data set (WCBD data sets to run both algorithms: The Wisconsin breast cancer data set (WCBD) [7] consists of 200 randomly selected from more than 500 breast cancer vectors of the University of Wisconsin Medical School. Each feature vector has 30 features in [0, 1]. The vectors are labeled for two classes. One label is attached to 121 vectors while the other is attached to 79 vectors.

The geological data set [7] is labeled for K = 2 classes. Each of the Q = 70 feature vectors has N = 4 features. The data labels are estimates by humans that give 35 to each class. These were assigned by humans providing their best guesses.

V. Results

The BCD-Clustering algorithm uses reciprocal distance to compute the fuzzy weights. When a feature vector is of equal distance from two cluster centers, it weights the same on the two clusters no matter what is the distribution of the clusters. It cannot differentiate the two clusters with different distributions of feature vectors. Therefore, the BCD-Clustering algorithm is more suited to data that is more or less evenly distributed around the cluster centers. The BCD-Clustering algorithm lumps the two clusters with natural shapes but close boundaries into a large cluster. For some difficult data such as WBCD data, it is hard to for the BCD-Clustering algorithm to cluster the very closed classes together without the help of other mechanisms such as elimination of small clusters. Results are cited at the end of this paper. Results are shown in Table 1and 2

VI. Conclusion and Future Work

The BCD-Clustering algorithm uses Gaussian weights, which are most representative and immune to outliers. Gaussian weights reflect the distribution of the feature vectors in the clusters. For a feature vector with equal distance from two prototypes, it weighs more on the widely distributed cluster than on the narrowly distributed cluster. The BCD-Clustering algorithm outperforms the BCD-Clustering algorithm on all the test data we used in this paper.

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P=0	P=1	P=2	P=3	P=4	P=5	P=6
-1	0.5	2	0.5	0.707107	0.793701	0.840896
-0.9	0.552486	1.81	0.552486	0.743294	0.820554	0.862145
-0.8	0.609756	1.64	0.609756	0.780869	0.84798	0.883668
-0.7	0.671141	1.49	0.671141	0.819232	0.87553	0.905114
-0.6	0.735294	1.36	0.735294	0.857493	0.902583	0.926009
-0.5	0.8	1.25	0.8	0.894427	0.928318	0.945742
-0.4	0.862069	1.16	0.862069	0.928477	0.951731	0.963575
-0.3	0.917431	1.09	0.917431	0.957826	0.971683	0.978686
-0.2	0.961538	1.04	0.961538	0.980581	0.987012	0.990243
-0.1	0.990099	1.01	0.990099	0.995037	0.996689	0.997516
0	1	1	1	1	1	1
0.1	0.990099	1.01	0.990099	0.995037	0.996689	0.997516
0.2	0.961538	1.04	0.961538	0.980581	0.987012	0.990243
0.3	0.917431	1.09	0.917431	0.957826	0.971683	0.978686
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0.9	0.552486	1.81	0.552486	0.743294	0.820554	0.862145
1	0.5	2	0.5	0.707107	0.793701	0.840896

Sigma=0.1	Sigma=0.2	Sigma=0.3	Sigma=0.4	Sigma=0.5	Sigma=0.6	Sigma=0.7
-1	1	50	1.92875E-22	3.72665E-06	0.003866	0.043937
-0.9	0.81	40.5	2.57676E-18	4.00653E-05	0.011109	0.07956
-0.8	0.64	32	1.26642E-14	0.000335463	0.028566	0.135335
-0.7	0.49	24.5	2.28973E-11	0.002187491	0.065729	0.216265
-0.6	0.36	18	1.523E-08	0.011108997	0.135335	0.324652
-0.5	0.25	12.5	3.72665E-06	0.043936934	0.249352	0.457833
-0.4	0.16	8	0.000335463	0.135335283	0.411112	0.606531
-0.3	0.09	4.5	0.011108997	0.324652467	0.606531	0.75484
-0.2	0.04	2	0.135335283	0.60653066	0.800737	0.882497
-0.1	0.01	0.5	0.60653066	0.882496903	0.945959	0.969233
0	0	0	1	1	1	1
0.1	0.01	0.5	0.60653066	0.882496903	0.945959	0.969233
0.2	0.04	2	0.135335283	0.60653066	0.800737	0.882497
0.3	0.09	4.5	0.011108997	0.324652467	0.606531	0.75484
0.4	0.16	8	0.000335463	0.135335283	0.411112	0.606531
0.5	0.25	12.5	3.72665E-06	0.043936934	0.249352	0.457833
0.6	0.36	18	1.523E-08	0.011108997	0.135335	0.324652
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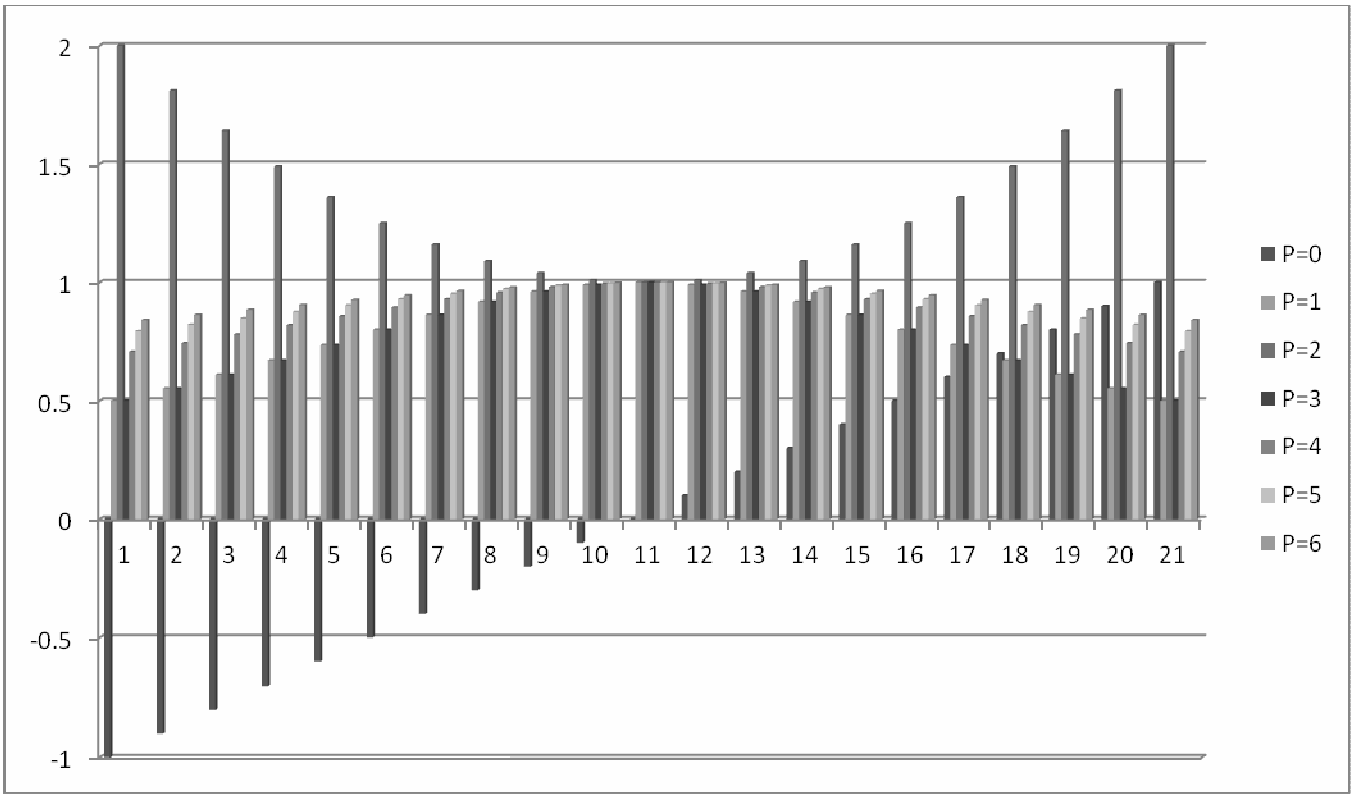
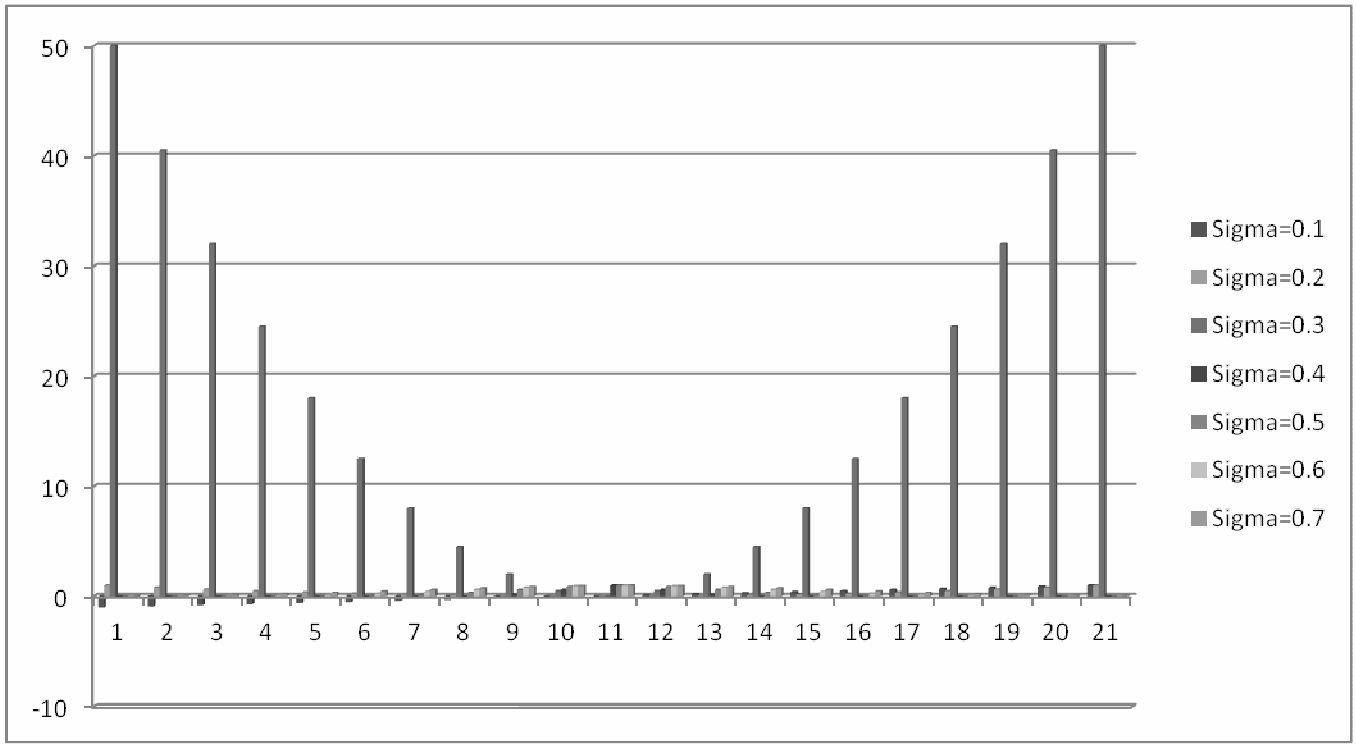
0.8	0.64	32	1.26642E-14	0.000335463	0.028566	0.135335
0.9	0.81	40.5	2.57676E-18	4.00653E-05	0.011109	0.07956
1	1	50	1.92875E-22	3.72665E-06	0.003866	0.043937



Graph 1



Graph 2

REFERENCES

[1] E. Anderson, "The iris of the Gaspe peninsula" Bulletin American Iris Society, Vol. 59, 2-5, 1935.
[2] Liyan Zhang "Comparison of Fuzzy c-means Algorithm and New Fuzzy Clustering and Fuzzy Merging Algorithm" , www.cse.unr.edu/~lzhang/fuzzyCluster
[3] J. C. Bezdek, etc. Convergence Theory for Fuzzy c-Means: Counterexamples and Repairs, IEEE Trans. Syst., September/October 1987.
[4] Maria Colmenares & Olaf WolkenHauer, "An Introduction into Fuzzy Clustering", http://www.csc.umist.ac.uk/computing/clustering.htm, July 1998, last update 03 July,2000
[5] Marti Hearst, K-Means Clustering, UCB SIMS, Fall 1998, http://www.sims.berkeley.edu/courses/is296a-3/f98/lectures/ui-bakground/sld025.htm.
[6] Uri Kroszynski and Jianjun Zhou, Fuzzy Clustering Principles, Methods and Examples, IKS, December 1998
[7] Carl G. Looney A Fuzzy Clustering and Fuzzy Merging Algorithm, CS791q Class Notes, http://www.cs.unr.edu/~looney/.
[8] Carl G. Looney Pattern Recognition Using Neural Networks, Oxford University Press, N.Y., 1997.
[9] Carl G. Looney "Chapter 5. Fuzzy Clustering and Merging", CS791q Class Notes, http://www.cs.unr.edu/~looney/.
[10] Ramze Rezaee M, Lelieveldt B P F and Reiber J H C, A New Cluster Validity Index for the Fuzzy c-mean, Pattern Recognition Letters, (Netherlands) Mar 1998.
[11] M.J.Sabin, Convergence and Consistency of Fuzzy c-means /ISODATA Algorithms, IEEE Trans. Pattern Anal. Machine Intell., September 1987.

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Mathematical Analysis of Section Properties of a Platform Integrated with Vehicle Chassis

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Abstract- The present work depicts mathematical behavior of a vehicle mounted platform/frame integrated with chassis structure in terms of plane stresses and plane strains for non-uniform loads. The load type considered in present work is concentrated load for which the mathematical model is formulated. A different type of combination of longitudinal and cross members in platform/frame design is formulated. The dimensions of platform members are determined using IS standards. After analysis of all possible combinations of longitudinal and cross members present design is anticipated. Section properties of longitudinal and cross members of the platform are determined & deduction of bending stress and shear force based on the load pattern are the fundamental steps in design and analysis of platform structure. The peculiarity of this analysis is the calculation of combined section modulus of three members. These are evaluated by excel programs developed indigenously.

Index Terms- concentrated load, section properties, shear forces, plane stresses and strains, platform.

I. INTRODUCTION

Transportation system is a prominent factor which has great impact on country's economic augmentation. Transportation of sophisticated equipment/cargo needs extreme concern for long transportation distance and type of road also has an impact on proper transportation of the cargo. To deal with the above and many other related factors a significant research is carried on vehicle chassis. Platforms are required to provide a leveled base for accurate leveling vehicle mounted devices. The platforms are generally of welded structure type, designed to accommodate one, two or more ISO type shelters according to the application. The design of the platform mainly depends upon load, its type and pattern; these parameters are determined by the shelter length, distance between the ISO corner blocks, the weight of shelter and the load distribution inside the shelter. Selection of type of cross members, determination of their dimensions and locations with respect to expected load patterns are important steps in the process of platform design.[1-5] Factors such as self-weight of platform, mounting of platform on vehicle chassis, axle load distribution, departure angle and ramp angle of the vehicle bear a significant effect on the platform design. Various types of chassis frames are into use viz. conventional, integral, semi-integral frames, of which conventional being extensively used. The platform members are made of three types of sections viz. channel, tabular & box sections. Each section has its own characteristic for the type of load it is subjected to. The loads acting on the platforms are categorized as short duration load, momentary load, impact, inertia, static and overloads. Elementary analysis of platform comprises static and dynamic loads. The structural configuration of a chassis is often very complex due to normative and functional constraints. A vehicle chassis is characterized by a high level of static indetermination because of the complex interconnection of beams (longitudinal elements, cross elements and pillars) and panels. Therefore it is relatively difficult to perform an analytical calculation of stresses and strains unless dire approximations are introduced. The structural analysis is normally performed numerically using the finite element method. However, in order to provide some design criteria, it is necessary to understand the structural functionality of the principal chassis components. For this reason it is convenient to consider some basic layouts: Though these layouts cannot provide precise quantitative information, they can prove useful to explain the structural function of the chassis components.[6-9] The conception of the parameters which influence chassis behavior is useful both in the outlining process, when the main configuration is selected and during results analysis when the final design is refined. For precise mathematical analysis boundary conditions needs to needs to be thoroughly understood. A *monocoque* structure is one whose thickness is small if compared to the section dimensions, e.g. a folded metal sheet so that it forms a cylinder welded on a generatrix. This structure is unable to support concentrated loads causing local collapse of monocoque. To withstand concentrated loads the structure is stiffened with longitudinal stiffeners and ribs, such structures are termed as semi-monocoques.e.g. Aeronautical structures as wings. The connections for the application of concentrated loads are grasped by addition of thicker sheet metal elements.

II. THEORY

The longitudinal members are presumed as long cylindrical or prismatical bodies. These members are subjected to concentrated loads/forces that are perpendicular to longitudinal elements and invariable along the length. Dimension along z-direction is extremely dominant as compared with the dimensions in x & y directions. Microanalysis of forces acting on the body shows that surface and body forces are into existence. Fundamental assumption of the body being rigid reflects the fact that relative distance between any two points on it is always constant. The components of small displacements parallel to x, y & z axis are u, v & w respectively. Then the components of normal and shearing strain along x, y & z axes are given as

$e_x = du/dx$; $e_y = dv/dy$ and $e_z = dw/dz$ (1)

$\gamma_{xy} = (du/dy) + (dv/dx)$; $\gamma_{xz} = (du/dz) + (dw/dx)$;

$\gamma_{yz} = (dv/dz) + (dw/dy)$ (2)

The aim of considering complete differentials rather that partial ones is that it gives complete strain in the presumed plane, as

already known that length is the dominant dimension in present analysis.[11-12].

Applying the above equations to the longitudinal member of the platform we get components u and v of the displacement functions are x and y & being independent of the z co-ordinate. Hence the longitudinal displacement of the outer member is zero. We get the following equations as

$\gamma_{xy} = \gamma_{xz} = e_z = 0$ (3)

Using Hooke's law the normal stress can be determined.

III. COMPUTION OF SECTION PROPERTIES

Section properties of individual members of the platform are of paramount importance in design and formulation of the structure of the platform. Longitudinal and cross member of dimensions are selected by taking into account the concentrated loading to which the platform will be subjected.

A. Section properties of main longitudinal member of the platform.

The main longitudinal member of the platform is intended to support the cross-members at the central location and is mounted on chassis. The main longitudinal member is welded to cross members and is integrated with vehicle chassis. The dimensions as per IS808 1967 are chosen, neglecting the fillet radii are 125x75x5 in mm, shown in figure 1 below.

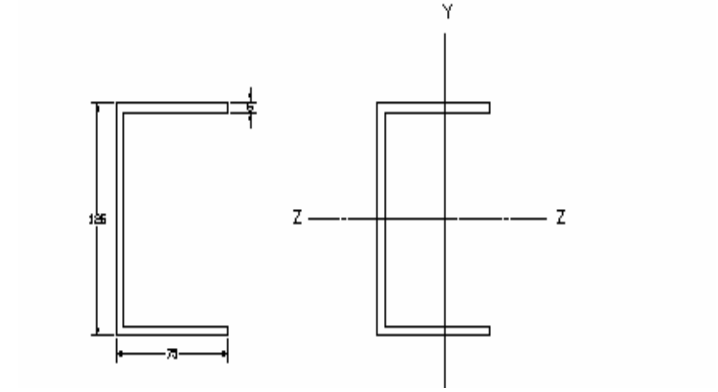

Table1. Location of centroid for main longitudinal member

Shape	Area (mm^2)	yi (from bottom) mm	xi (from left) mm
01	375	122.5	37.5
02	575	62.5	2.5
03	375	2.5	37.5
Total	1325		

Table1. Continued

xiAi (mm^3)	yiAi (mm^3)	Centroid X_{left} mm	Centroid Y_{bottom} mm
14062.5	45937.5	22.3113	62.5
1437.5	35937.5		
14062.5	937.5		
29562.5	82812.5		

Knowing the exact centroid location (Refer Table 1), further assists in determining the orientation of main longitudinal member along axis of loading.

B. Calculation of Moment of Inertia for main longitudinal member about X & Y axes

Table 2 Moment of Inertia X axis Calculations

Shape	IC	d = xi - x(left)	d^2A	IC + d^2A mm^4
1	781.25	60	1350000	1350781
2	633698	0	0	633698
3	781.25	-60	1350000	1350781
	Moment of Inertia about X axis =			3335260

Table 3 Moment of Inertia Y axis Calculations

Shape	IC	d = xi - x(left)	d^2A	IC + d^2A mm^4
1	175781.25	15.188	86510.9914	262292
2	1197.9167	-19.811	22568 0.8473	226879
3	175781.25	15.188	86510.9916	262292
	Moment of Inertia about Y axis =			751463

The numeric values of moment of inertia determined above gives moment of inertia (Refer Tables 2 &3) of shape also referred as second moment of area. These values directly predict area of material in the cross section and displacement of that area from the centroid. The efficiency/strength of the cross section to resist bending due to concentrated loading is envisaged with the aid of second moment of inertia. The numeric values of other properties of main longitudinal member along x and y axes are enlisted directly below. To avoid complexities in calculations as well as in manufacturing the section selected is symmetric about both the axes. Table 4 below reflects various section properties of main longitudinal member about X axis.

Table4. Section Properties of Main Longitudinal Member about X axis

Parameter	Symbol	Numeric Value	Unit
Section Modulus	Sx	53364.16667	mm^3
Section Modulus (bottom)	S (bot)	53364.16667	mm^3
Section Modulus (top)	S (top)	53364.16667	mm^3
Radius of Gyration	rx	50.17148267	mm
Plastic Modulus	Zx	61531.25	mm^3

Shape Factor		1.153044334	

Table5. Section Properties of Main Longitudinal Member about Y axis

Parameter	Symbol	Numeric Value	Unit
Section Modulus	Sy	14262.32841	mm^3
Section Modulus (left)	S (left)	33680.80514	mm^3
Section Modulus (right)	S (right)	14262.32841	mm^3
Radius of Gyration	ry	23.81474487	mm
Plastic Modulus	Zy	25921.875	mm^3
Shape Factor		1.817506529	

Determination of section/elastic modulus is vital step in design of main longitudinal member as it is undeviating measure of strength. There is direct proportion between the load carrying capacity and value of section modulus. Section modulus comprises the fact that extreme fibres are subjected to load/stress during bending; hence its values from both ends .i.e. top & bottom are established. Value of radius of gyration determined helps in envisaging the distribution of mass about central axis. The plastic section modulus is used for materials where plastic behavior is dominant. The value predicted for this section is for reference as component is designed by taking into account only the elastic modulus. (Refer Tables 4 &5) Ratio of plastic to elastic moment in a component subjected to bending is devised by shape factor. This is of paramount importance to predict the material behavior in under loading in elastic and plastic regions. From the above analysis we get all the physical and geometrical properties of main longitudinal member. These properties assist in freezing the platform configurations. Similar analysis of other members as outer longitudinal member (125x75x6), longitudinal walkway support (50x30x5), and chassis of the vehicle (250x100x6) leads us to all the individual properties of the platform members. Now the calculation of combined section modulus of chassis, main longitudinal member and cross member is attempted. This combined section modulus as shown in figure 2 below is further used in evaluation of stress of the platform for various types of load cases on the platform as load in stationary condition, load during braking, load during vehicle travel on a gradient etc. hence calculation of combined section modulus is important at this design stage before further processing for other higher analysis. This calculation is depicted in Table 6 below.

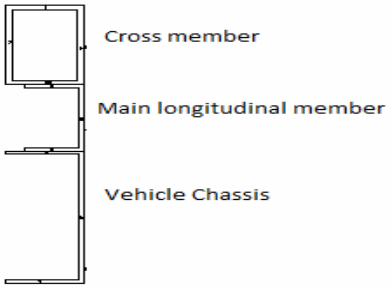

Figure2. Sections combined for section modulus calculation

Sr. No.	Area (a) mm^2	Cent. Dist. from bottom edge mm (Y_i)	ay_i (mm^3)	Position of centroid from bottom edge
01	800	521	416.8×10^3	315.04mm
02	575	312.5	179.687×10^3	
03	1428	125	178.5×10^3	
04	1072	450	482.4×10^3	
05	375	372.5	139.687×10^3	
06	600	247	148.2×10^3	
07	1072	450	482.4×10^3	
08	375	252.5	94.6875×10^3	
09	600	3	1800	
10	800	379	303.2×10^3	
Total	7967		$2.42736 \times 10^6 mm^3$	

Knowing the centroid location for the combined section, further the analysis is extended to calculate the moment of inertia of the combined sections. This is shown in Table 7 below

I_c M.I. axis (mm^4)	Yi-$\bar{y}$=d (mm)	d^2A (mm^4)	$I_c + d^2A$ (mm^4)	$I_z = \Sigma(I_c + d^2A)$ (mm^4)
4266.66	205.6	33.8170×10^6	33.82135×10^6	202.3147152 x 10^6
633.69×10^6	-2.9	4835.75	638.5336×10^3	
6.740×10^6	-190.4	51.7680×10^6	58.5087×10^6	
1.60406933×10^6	134.6	19.4215×10^6	21.0256×10^6	
781.25	57.1	1.2226×10^6	1.2234×10^6	
1800	-68.4	2.8071×10^6	2.8089×10^6	
1.60406933×10^6	134.6	19.4215×10^6	21.0256×10^6	
781.25	-62.9	1.4836×10^6	1.484×10^6	
1800	-312.4	58.5562×10^6	58.5586×10^6	
4266.666	-63.4	3.2156 x	3.2199146	

7		10^6	67 x 10^6	

Section modulus values are $\mathbf{S_{bottom}}$ = 641.4543918 x 10^3 mm^3 & $\mathbf{S_{top}}$ = 965.2419618 x 10^3 mm^3. This combined section modulus value determined gives us the combined strength of the vehicle chassis, main longitudinal member and cross member combination.

IV. CONCLUSION

For the design of platform component, the elementary concepts of design as moment of inertia, location of centroid, computation of section modulus through numeric technique is accomplished. Plane stress and plane strain concepts are utilized to have thorough insight of the stress and strains along the dominant parameter i.e. length of the main longitudinal member. Applying the identical modus operandi for working out of the combined section modulus of vehicle chassis, main longitudinal member and cross member as employed for estimating the section modulus and other properties of main longitudinal member provides us the novel way of determining the section modulus and hence the strength/efficiency of combined sections. Thus a numerical technique to calculate the section properties of combined sections is formulated. This technique of calculating section properties can be applied earlier than using advanced design techniques as computer aided design and analysis. The advanced concepts of plane strain and plane stress are employed further in the analysis of normal components of stress and strain. Calculation of stress at various locations and for different load cases using this technique will be attempted in future.

REFERENCES

[1] J. Wang, "Fundamentals of erbium-doped fiber amplifiers arrays (Periodical style—Submitted for publication)," *IEEE J. Quantum Electron.*, submitted for publication.

[2] Wakeham.K.J. "Introduction to chassis design revision 1.0" Undergraduate diss., Memorial University of Newfoundland and Labrador. 2009

[3] Beleandez, T. Neipp, C. And Belea, N.A, "Numerical and experimental analysis of a cantilever beam: A laboratory project to introduce geometric Nonlinearity in mechanics of materials". International journal of engng. Ed. vol.19 No 6 pp 885-892. 2003

[4] Karaoglu, C. and Kuralay, N.S., "Stress analysis of truck chassis with riveted joints", Elsevier science Publishers B.V Amsterdam, the Netherlands Vol.38 pp 1115-1130. 2000

[5] Ye.N and Moan T 2007, "Static and Fatigue analysis of three types of Aluminum Box-Stiffener/web Frame connections, International Journal of Fatigue 29 pp1426- 1433

[6] Crouse W.H and Anglin D.L, Automotive Mechanics, Tata McGraw Hill Education Pvt.Ltd. pp. 658-711 2007

[7] National Code of Practice, Heavy Vehicle Modifications Section H Chassis Frame.

[8] National Code of Practice, Heavy Vehicle Modifications Section J Body Mounting.

[9] Meiyalagan, M Anbarasu, M and Dr.Sukumar.S, "Investigation on cold formed C Section Long Column with Intermediate Stiffener and corner lips under axial compression" International Journal of applied engineering research, Dindigul, Vol.No.1 pp 28-41. 2010

[10] Young B, "Tests and design of fixed ended cold formed steel plain angle columns, Journal of structural engineering © ASCE / 19311940, 2004

[11] Martin H.Sadd (2004), "Elasticity Theory, Applications and Numerics" Elsevier, a division of Reed Elsevier India Private Limited.

[12] Timoshenko S and Goodier J.N, "Theory of Elasticity" Mc-Graw Hill Book Company, Inc.

[13] Reimpell J., Stoll H., Betzler J.W., "The Automotive chassis: Engineering Principles" Second Edition. Butterworth Heinemann, A division of Reed Educational and Professional Publishing Ltd.

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Business Ethics

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Abstract- Business ethics being part of the larger social ethics, always been affected by the ethics of the era. At dissimilar times of the world, people, particularly leaders of the world, were blind to ethics and morality which were clearly unethical to the succeeding period.

History of business is tainted by and throughout the history of Slavery history of colonialism and later by the history of cold war. The current discussion of business ethics is the ethical discussion of the post-colonialism and post-world wars. The need for business ethics in the current era had begun gaining notice since 1970s. In the past, firms started highlighting their ethical stature since the late 1980s and early 1990s, as the world witness grave economic and natural disasters because of unethical business practices.

Index Terms- business ethics, ethical problems, and international business ethics

I. INTRODUCTION

Importance of ethics in the business world is superlative and global. New trends and Issues arise on a daily basis which may create an important burden to organizations and end consumers. Nowadays, the need for proper ethical behaviour within organizations has become Crucial to avoid possible lawsuits. The public scandals of corporate malfeasance and misleading practices, have affected the public perception of many organizations (e. g., Enron, Arthur Andersen, WorldCom etc.). It is widely known that advertising does not promote the advancement of human moral sensibility. Lasch's contention (1978: 1) that modern advertising "Seeks to create needs, not to fulfil them: to generate new anxieties instead of allaying old ones. The recent expansion of global business and fall of trade barriers worldwide have further Underlined the interest in the topics of ethical behaviour and social responsibility (See among Others, Jones, 1991: 366-395). In addition, as many scholars believe, human rights and environmental conservation are gaining increasing more recognition in both academic and commercial settings.

As multinational companies expand globally and enter foreign markets, ethical conduct of the officers and employees assume added importance since the very cultural diversity associated with such expansion may undermine the much shared cultural and ethical values observable in the more homogeneous organizations (Mahdavi, 2001). Although understanding of other cultures and recognition of differences among them will enhance the cross-cultural communication, it may not be sufficient to provide viable guidelines of proper ethical behaviour in organizations. Thus, concerns about unethical behaviour of corporations in other countries, are manifested in legislations such as The Foreign Corrupt Practices Act of 1977, and the Sarbane-Oxley Act of 2002. In the academic arena, on the other hand, the culture-based consequentiality model is developed to explain, among other things, how cultural differences alter the ethical perception and actions of individuals engaged in making decisions with ethical overtones (Robertson and Fadil, 1999: 385-392).

Training sessions, codes of Journal of Academic and Business Ethics International Business Ethics, Page 3 ethics, reward systems, and coaching are a few methods that organizations employ in this regard (Delaney and Sockell, 1992:719-727; Laczniak and Indemeden, 1987: 297-307; Jansen and Von Glinow, 1985: 814-822).

Therefore, the problems that organizations face today are: How ethical values are communicated most effectively to employees? Which communication channel works best? American business in spite of all of its faults and weaknesses, still form a key model for much of the world. An important force in disseminating the American style of management is the role of the U.S. as the world's largest manufacturer of contemporary culture. Moreover, many researchers have pointed to the significant role that the American business schools play in propagating the U.S. style of management throughout the world. (See Mahdavi, 2001; and Nimgade, 1989:104, among others) Morf (1999: 265) believes: "Ethics is the moral principle that individuals inject into their decision making process and that helps temper the last outcome to conform to the norms of their society". Moreover, ethical principles have the very profound function of making behaviour predictable (Mahdavi, 2003). The truly global companies must come to grips with the legal and moral atmosphere in which they operate. But above all, they need to establish an environment that fosters ethical behaviour, because in the final analysis to do otherwise cuts into their profitability.

In contrast to this view a group of scholars put forth the theory of Virtuous Ethics, which is defined as a theory that focuses mainly on an individual's moral character. According to these scholars, marketing researchers have paid little attention to virtuous ethics. Furthermore, they propose that without taking virtuous ethics into account, a comprehensive analysis of the ethical character of marketing decision makers and their strategies cannot be attained.

Research suggests that ethical or unethical behaviour in business organizations is a function of both individual characteristics and contextual factors, and among these factors, organizational culture is one of the key influences (Meyers, 2004; Frederick, 1995; Trevino & Nelson, 2004). Research by Trevino et al. (1999) showed that in the United States (US) ethical business organizations have, as a rule, clearly

communicated ethics guidelines or codes of ethics. They have incentive systems that are clearly tied to ethical behaviour, and promote the achievement of both economic outcomes and non-economic goals (Trevino & Weaver, 2001). According to Gabler (2006), employees of an ethical business have "a sense of responsibility and accountability for their actions and for the actions of others … and freely raise issues and concerns without fear of retaliation" (p. 339). In such businesses "Managers model the behaviours they demand of others; and …communicate the importance of integrity when making difficult decisions" (Gabler, 2006, p. 339).

But are the practices, perceived as contributing to the creation of ethical business cultures, the same around the world? Numerous international studies of business ethics were conducted in the last two decades (e.g., Helin & Sandstorm, 2008; Robertson, Gilley, & Street, 2003; Robertson, Olson, Gilley, & Bao, 2008).

Some of these studies focused on the impact of cultural values on business ethics in companies from various countries of Asia, North America, and Europe (e.g., Cheung & Chan, 2005; Husted & Allen, 2008; 2003; Jackson, 2001; Jeffrey, Dilla, & Weatherholt, 2004; Pucetaite & Lamsa, 2008; Rees & Miazhevich, 2008). However, most of the extant studies focused on a limited number of practices and behaviours (e.g., ethical decision making or ethical leadership), and were conducted, as a rule, in a small number of countries. To our knowledge, none of the studies attempted to compare ethical business practices in a large group of companies from a culturally and economically diverse sample of countries of the world. In this paper we explore whether business practices, related to ethical behaviour, are similar or different in business organizations from thirteen *Centre for Ethical Business Cultures*® Dimensions of Ethical Business Cultures. The countries in our study represent a diverse sample of cultures, levels of economic development, and socio-political systems. In this exploratory study, we were not formulating and testing specific hypotheses. Rather, we were interested in finding the evidence of either convergence or divergence of ethical business practices, and identifying specific practices which contribute the most to country (regional) differences and/or similarities.

There has been a growing research interest in the area of business and marketing ethics. Ethics has been studied in almost all business issues except branding. Not a single academic study has been found on branding ethics after an extensive literature search covering the following sources: three online database (ABI Inform Global, Ebsco and Infotrac), three journals (*Journal of Business Ethics*, *Journal of Brand Management* and *Journal of Product and Brand Management*), dozens of books and websites.

Brands may have been in existence for well over a thousand years. But never has any society before seen the power of branding as is witnessed today: Brands are prevalent in every aspect of human life: production and consumption, food and clothing, personality and lifestyle; and from pop culture to politics. Branding is no longer just about adding value to a product; branding represents and promotes lifestyles and brands themselves become a kind of culture. In the words of Hazel Kahan (quoted in Hall, 1999), brands are now gunning for a share of consumers' inner lives, their values, their beliefs, their politics; yes, their souls. The impact of brands and branding is far beyond the field of marketing and advertising. Branding is a social construct as well as an economic construct. As an economic construct, brands have been studied from both marketing and financial perspectives. As a social construct, brands have not yet been fully understood owing to the dearth of academic research in this area. Advertising is probably the most visible element of marketing but branding is at the centre of any marketing communications. Most problems with advertising have their roots in branding strategy.

A statement that we are living in "one world" misses the significant point that there May be many substantial local as well as regional factors that make a variation in attitudes and behaviour. In addition it is important to note that what may happen at a distance be able to have a great effect on local activity. Business persons, diplomats, media representatives and those from many other groups must recognize, as some have, which the welfare and even continued existence of their enterprises requires a good knowledge of what they may face in foreign climes not to speak of variations even in their native country. "Go global or perish" (Kehoe, 1998) is a fundamental battle cry. Even those who are not active in Operations far from home cannot ignore the impact of the possible indirect influences on Economic or political performance at home. Moreover, attempts to translate local Experience and knowledge to activity elsewhere in the world can lead to less than wished Results. "Business in the global arena may be characterized as a brilliantly structured Mosaic of complexity and diversity, composed of various and different places, peoples, Cultures, customs, laws, mores, processes, and ethical systems, a mosaic that challenges, Excites and, at times, frustrates a global manager" (Ibid.). Lest it be believed that these Factors relate only to business activity one may note that recent and past decisions on a Geopolitical basis often have been made without recognition of the underlying factors faced in those actions. Even on an individual level the challenges can play a role apart From what a manager in charge may be faced with. What may be encountered in tourism?

In a foreign setting, for instance, can often make a great difference in the emotional Experience not to speak of possible difficulties or even dangers for those unable to Recognize their bases.

II. WHY BUSINESS ETHICS?

Discussion on ethics in business is necessary because, business can go unethical, and there are plenty of evidences as in today on unethical corporate practices. Even Adam Smith, in whose name neo-liberal laissez-faire is advocated opined that 'People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices' Business does not operate in vacuum. Firms and corporations operate in the social and natural environment. By virtue of existing in the social and natural environment, business is duty bound to be accountable to the natural and social environment in which it survives. Irrespective of the demands and pressures upon it, business, by virtue of its existence is bound to be ethical, for at least two reasons: one, because whatever the business does affects its stakeholders and two, because every juncture of action has trajectories of ethical as well as unethical paths wherein the

existence of the business is justified by ethical alternatives it responsibly chooses One of the Business ethics - Wikipedia, the free encyclopaedia . Conditions that brought business ethics to the forefront is the demise of small scale, high trust and face-to-face enterprises and emergence of huge multinational corporate structures capable of drastically affecting everyday lives of the masses.

III. WHAT IS BUSINESS ETHICS?

Ethics, the search for 'a good way of being' for a wise course of action, as it could be practiced by business firms is called **business ethics.** Ethics in business deals with the ethical path business firms ought to adopt. Afflicting the least suffering to humans and the nature in its entirety, achieving the greatest net benefit to the society and economy enriching the capability of the system in which it is functioning, being fair in all its dealings with its proximate and remote stakeholders, being prepared to correct its mal-habits and nurturing an enduring virtuous corporate character in totality, can be called **business ethics**. It is often suggested from extended utilitarian/ consequentiality position that businesses can often attain short-lived gains by acting in an unethical fashion; however, such behaviours tend to undermine the economy over time. For those who uphold the principles of virtue ethics, all that matters is corporations maintaining character of honesty, fairness and humaneness than being ethical for the sake of better consequences. On the other hand experts of deontological ethics and virtue ethics postulate that what matters is the motive to be ethical than the consequential fallout Jacques Cory, a noted business ethicist observes, "companies should behave ethically and be profitable in parallel, and even if ethics diminishes the profitability of the company, they should still behave ethically". Seen from the Kantian Ethical perspective Business has to consider its remote and proximate stakeholders as ends in themselves and not merely as means toward some other end. A business becomes ethical by assuming the responsibility of '''translating''' the abstract ethical injunctions into series of obligations. However, while translating, we do not just abide by the '''a priori''' ethical injunctions or codes rather Business ethics - Wikipedia, the free encyclopaedia. Respond to the situation in its contextual singularity pragmatically choosing the best alternative course of response from the multiple possibilities. In other words, ethics is a matter of 'responsibility in the experience of absolute decisions made outside of knowledge or given norms'.

IV. INTERNATION BUSINESS ETHICS AND ETHICS OF ECONOMIC SYSTEMS

The issues here are grouped together because they involve a much wider, global view on business ethical matters.

A. International Business Ethics

While business ethics emerged as a field in the 1970s, international business ethics did not emerge until the late 1990s, looking back on the international developments of that decade. Many new practical issues arose out of the international context of business. Theoretical issues such as cultural relativity of ethical values receive more emphasis in this field. Other, older issues can be grouped here as well. Issues and subfields include: Ethical issues arising out of international business transactions; bio. E.g. prospecting and bio piracy in the pharmaceutical industry; the fair trade movement; transfer pricing. Issues such as globalization and cultural imperialism. Varying global standards - e.g. the use of child labour.

The way in which multinationals take advantage of international differences, such as outsourcing production (e.g. clothes) and services (e.g. call centres) to low-wage countries. Foreign countries often use dumping as a competitive threat, selling products at prices lower than their normal value. This can lead to problems in domestic markets. It becomes difficult for these markets to Business ethics - Wikipedia, the free encyclopaedia compete with the pricing set by foreign markets. In 2009, the International Trade Commission has been researching anti-dumping laws. Dumping is often seen as an ethical issue, as larger companies are taking advantage of other less economically advanced companies.

B. Ethical Problems in International Business

Getz (1990: 567-577) analyzed international codes of conduct in four entities: (1) the Organization for Economic Cooperation and Development (OECD), which is the primary policymaker for industrialized nations, (2) the International Chamber of Commerce (ICC), which is concerned with fair treatment among multinational corporations, (3) the International Labour Organization (ILO), which is concerned with direct investment in developing countries, and (4) the Center for Transnational Corporations (CTC), whose objective is to maximize the contributions of transnational corporations to economic development and growth and to minimize the negative effects of the activities of these corporations.

These various codes were developed in order to establish order among multinational corporations; although, some organizations refuse to abide by these codes, mainly because national governments have not sanctioned them completely. Without uniform and full enforcement, multinational organizations could have rampant choice in international ethical issues. Underlying this lack of consensus is the issue of national as well as corporate culture (See Hofstede, 1980: 46-47). Every nation is different and every multinational organization is in one way or another distinct in the way they do business, especially in other countries.

In addition to these codes, the moral corporation should address human rights and whistle blowing and the international ethics code under which it operates. These issues are not very new.

In a survey of 300 multinational corporations, 80 percent agreed with seven items being ethical issues for business: (1) employee conflict of interest, (2) inappropriate gifts to corporate personnel, (3) sexual harassment, (4) unauthorized payments, (5) affirmative action (6) employee privacy; and (7) environmental issues (Brooks, 1989; Berenheim, 1987, 1989: 117-129).Journal of Academic and Business Ethics International Business Ethics.

V. ETHICAL CLIMATE AND ETHICAL PROBLEMS

Strategies, such as these codes of ethics, are only one means of achieving the ultimate goal of having ethical international responsibility in the engagement of business worldwide. As stated above, there are many ethical responsibilities faced by multinational organizations.

Theorists generally agree that situational variables such as organizational climate can affect ethical behaviour of individuals

(Kelly et al., 1989: 327-340). However, there have been no attempts to study the relationship of ethical climate of an organization and ethical behaviour of its members.

Ethical climate, it must be emphasized, is not the same as culture is commonly perceived, but rather a broader concept of culture (Schein, 1990, pp. 109-119). Culture is believed to be more associated with deeper beliefs, values and assumptions (Denison, 1996, pp. 619-654).

Therefore, just as one can value an individual's culture by his or her actions and personal activities, ethical climate can be observed on a larger scale; in this case, the organization. Ethical climate is, in essence, the employee's perception of the norms of an organization (Bartels et al. 1998: 799-804).

VI. BUSINESS ETHICS CHALLENGES IN A GLOBAL ECONOMY

Be many substantial local as well as regional factors that make a variation in attitudes and behaviour. In addition it is important to note that what may happen at a distance be able to have a great effect on local activity. Business persons, diplomats, media representatives and those from many other groups must recognize, as some have, which the welfare and even continued existence of their enterprises requires a good knowledge of what they may face in foreign climes not to speak of variations even in their native country. "Go global or perish" (Kehoe, 1998) is a fundamental battle cry. Even those who are not active in operations far from home cannot ignore the impact of the possible indirect influences on economic or political performance at home. Moreover, attempts to translate local experience and knowledge to activity elsewhere in the world can lead to less than wished results. "Business in the global arena may be characterized as a brilliantly structured mosaic of complexity and diversity, composed of various and different places, peoples, cultures, customs, laws, mores, processes, and ethical systems, a mosaic that challenges,exites and, at times, frustrates a global manager" (Ibid.). Lest it be believed that these factors relate only to business activity one may note that recent and past decisions on a geopolitical basis often have been made without recognition of the underlying factors faced in those actions. Even on an individual level the challenges can play a role apart from what a manager in charge may be faced with. What may be encountered in tourism in a foreign setting, for instance, can often make a great difference in the emotional experience not to speak of possible difficulties or even dangers for those unable to recognize their bases.

VII. THE PLACE OF ETHICS IN BUSINESS FUNCTIONING

All of the elements of the challenges to be faced in a changing environment the field of ethics in recent years have become a major point of consideration in all circles of society, on a domestic level as well as globally. It has become increasingly clear that policies that do not take into account individual and social differences will not stand the test of time. Knowledge of the basics of a discipline alone will not keep the decision maker in any field of professional activity on an adequate level of performance. In business those who are knowledgeable in accounting, finance, or other disciplines but who do not recognize the broader social implications of their decisions are not likely to be effective. In politics a grasp of the elements of local and international law without recognition of the underlying forces does not make for effective action. The recognition of the breadth of awareness of the many factors involved in even primary situations has led to a somewhat variation of structuring of the concepts of the field. Perhaps to emphasize the broader aspects of the functioning of ethical and closely related factors the somewhat newer approach is to identify such action under the rubric *Corporate Social Responsibility*.

The activity under this concept is not to be considered as limited to business corporations as it also can apply to other corporate bodies as worker's unions, on-profit organizations as well as to public entities though they may not be generally recognized as belonging to the same family. A further variation in the description of this area has come with development of the concept of *Sustainable Development (SD)*. Many business executives "demonstrate their commitment to acting in a socially responsible manner. For a growing number of companies the chosen vehicle to make their case is the corporate sustainability report, a document that outlines corporate initiatives in such areas as the environment and resource management, as well as philanthropy, workplace conditions, and concern for the communities in which the companies do business" (Osborne, 2002). As a result of that approach the reporting is often described as identifying the "*triple bottom line"* which covers action in environmental, economic, and social responsibility areas. The term *business ethics*, however, remains a common designation of the area as one subset of the general area of ethics.

Down through the years the concern with ethical behaviour often was not a topic of major interest, particularly in a business setting. At the national or local level governments are (or may not be) active in attempting to insure their constituents a stable and ethical society. One move has been to add legislation regarding those aspects of social behaviour which formerly may have been governed and accepted by society or its elements but without the rule of law. While the legal provisions established may have been accepted to one extent or another by ethical sentiment of all or parts of the community there has been some latitude in the past that called for legislation.

VIII. ETHICS IN ACTION

Ethical behaviour is determined by the values of the society and legal principles act to support activity along these lines. At the governmental level the major role of the executive, legislative and judicial entities is to insure the health and safety of its people and provide that all will be protected from the deleterious effects of bad or dangerous practices by any elements of the community. Legal enactments are often supplemented by codes of conduct. These are most often met in quasi-public institutions or groups, such as lawyers, accountants, doctors, pharmacists and other professional organizations, such as the chambers of commerce. Educational institutions generally also have codes of conduct for all members of that community and action in schools of business in particular has shown a great deal of activity along those lines. Courses covering the problems of ethical performance in public and private organizations have shown an increase in number and stature where a decade ago these studies were more limited.

IX. ETHICS SUPPORT IN EDUCATION

What is the role of educational and professional organizations in the development and maintenance of ethical practice? A response to this comes from the field as "Can business schools teach students to be virtuous? In the wake of all the corporate scandals they have no choice" (Alsop, 2003). The answer to this comes from particularly notable attempts to delineate standards of performance. The Association for the Advancement of Collegiate Schools of Business International (AACSB) has developed extensive Standards that call for proper implementation of the educational process. While these are established as requirements for accreditation they serve as guidelines for quality education in the field. Standard 15 states "Normally, the curriculum management process will result in undergraduate and master's level general management degree programs that will include learning experiences in such management specific knowledge and skills areas as: Ethical and legal responsibilities in organizations and society" (AACSB International, 2003). Noteworthy is the fact that this area is listed as the first of eight categories of business disciplines. In other professional areas the codes of conduct promulgated by many groups are reinforced by the requirements for continuing education that includes a strong exposure to ethical problems faced in practice. Educational programs in other areas such as tourism should also include attention to ethics and legal aspects in travel abroad.

X. ETHICAL BRANDING AND CORPORATE REPUTATION

Corporate reputation can be defined in terms of a number of attributes that form a buyer's perception as to whether a company is well known, good or bad, reliable, trustworthy, reputable and believable (Levitt, 1965). Corporate reputation is concerned with how people feel about a company based on whatever information (or misinformation) they have on, company activities, workplace, past performance and future prospects (Fombrun,2000). According to Keller (1998), a socially responsible corporate image association involves the creation of consumer perceptions of a company as contributing to community programs, supporting artistic and social activities and generally attempting to improve the welfare of society as a whole.

XI. CONCLUSION

Business is a human activity and, like most human activities, it has been and is likely to continue to be evaluated from a moral point of view (Robin and Reidenbach, 1987). Branding, as part of business, is no exception. Business ethics in organizations requires values-based leadership from top management, purposeful actions that include planning and implementation of standards of appropriate conduct, as well as openness and continuous effort to improve the organization's ethical performance.

Although personal values are important in ethical decision making, they are just one of the components that guide the decisions, actions, and policies of organizations. Examination of the recent development in the international trade and the far-reaching expansion of global entities lead the authors of this paper to the inevitable conclusion that ethical issues and concerns facing business entities are no longer related to the limited frameworks of Journal of Academic and Business Ethics International Business Ethics, national or even regional arenas. These issues have assumed global dimensions and as such require global solutions.

Business activity and that of other organizations requires an awareness of the challenges faced on a global scale. In this connection ethics plays a significant role. However labelled, corporate social responsibility or sustainable development, the term business ethics remains the key designation for this area. While the study of ethics has a long history the main challenge under which ethics plays a role today is a need for awareness of the fundamental force of the culture in which the activity takes place. Not only is the action of organizations critical in facing the many of the problems, but individuals also playing a significant role. Government and educational institutions, too, have their place in leading the way for members of organizations active in a local and global environment.

The use of critical thinking is an important part of ethical decision making especially in ambiguous areas. While the development of personal character is important, it must be linked to competence in understanding risks and approaches to managing ethics and compliance in a complex organizational context.

REFERENCES

[1] Journal of Academic and Business Ethics, International Business Ethics, International business ethics: strategies and responsibilities, iraj Mahdavi, National University.
[2] An Adversarial Ethic for Business or When Sun-Tzu met the Stakeholder Joseph Heath, Department of Philosophy, and University of Toronto.
[3] Journal of Religion and Business Ethics, Culture as the Basis of the Good Entrepreneur Michael Naughton, Jeffrey R. Cornwally_University.
[4] Dimensions of Ethical Business Cultures: Comparing Data from 13 countries of Europe, Asia, and the Americas Alexandre Ardichvili, PhD, Associate Professor at the Minnesota University Douglas Jondle, Ph.D., Center for Ethical Business Cultures at the Opus College of Business, University of St. Thomas, Minneapolis, Minnesota Brenda Kowske, PhD, Kenexa Research Institute.
[5] ETHICAL BRANDING AND CORPORATE REPUTATION, Corporate Communications: An International Journal, Volume 10, 2005, Ying Fan, Department of Marketing, and University of Lincoln Brayford Pool.
[6] Governance and ethics .rusnah, muhamad.university of Malaya.
[7] Business Ethics Challenges in a Global Economy,Dr. Blair J. Kolasa Vice Rector, Wyższa Szkoła Biznesu,National Louis University.
[8] Sigmund Wagner-Tsukamoto, Senior Lecturer, School of Management, University of Leicester, and UK.E-mail: saw14@le.ac.uk,Paper for Annual Review of Social Ethics (Institute of Social Ethics, Nanzan University, Nagoya / Japan).
[9] The Failure of Regulation in Banking: Ethical Reflections, David Knights Centre for Leadership and Organizational Ethics, Bristol Business School, UWE, Bristol, BS16 1QY. Guest Professor Gothenburg, School of Business, Law and Economics, Gothenburg University.
[10] Managing the Risks of Business Ethics and Compliance O.C. Ferrell, Ph.D.University of New Mexico, Anderson Schools of Management, 1924 Las Lomas Blvd. Albuquerque, NM 87131, and Linda Ferrell, Ph.D.
[11] The impact of corporate social responsibility programs on corporate strategic planning, Alessandro Biscaccianti.

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Performance Analysis of Gradient Adaptive LMS Algorithm

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Abstract- Tracking speed and stability of adaptive gradient filtering algorithms represented by least mean square (LMS) are restricted for non-stationary environment. The noise cancellation simulation results testified that the algorithm could get stabilized only after 20 iterative operations and provide stronger ability to boost SNR of weak signal compared with LMS/NLMS/Variable size/sign LMS filter. All the performances indicates that tracking ability and convergence stability are superior to other algorithm in the same environment.

Index Terms- adaptive filter, least mean-square (LMS) algorithm, noise cancellation system

I. INTRODUCTION

Filtering is the technique or practice leading to accepting selected signal from the band of spectrum of the incoming wavelengths to the system. In the process of digital signal processing, often to deal with some unforeseen signal **,** noise or time varying signals, if only by a two FIR and IIR filter of fixed coefficient cannot achieve optimal filtering. Under such circumstances, we must design adaptive filters, to track the changes of signal and noise. Adaptive filter is that it uses the filter parameters of the moment ago to automatically adjust the filter parameters of the present moment to adapt to the statistical properties that signal and noise unknown or random change, in order to achieve optimal filter. based on in depth study of adaptive filter, based on LMS algorithm and RLS algorithm are applied to adaptive filter technology to the noise and through the simulation results prove that its performance is usually much better than using conventional methods designed to filter fixed

II. ADAPTIVE FILTER

The principle of an adaptive filter is its time-varying, self-adjusting characteristics. An adaptive filter usually takes on the form of an FIR filter structure, with an adaptive algorithm that continually updates the filter coefficients, such that an error signal is minimized according to some criterion. The error signal is derived in some way from the signal flow diagram of the application, so that it is a measure of how close the filter is to the optimum. Most adaptive algorithms can be regarded as approximations to the Wiener filter, which is therefore central to the understanding of adaptive filters.

$$y[n] = \sum_{k=0}^{N-1} c_k^*[n]x[n-k]$$

Here, the $c_k[n]$ are time dependent filter coefficients (we use the complex conjugated coefficients ck[n] so that the derivation of the adoption algorithm is valid for complex signals, too).

Adaptive filters are designed as compare to FIR and IIR filter because in this filter coefficients are to be varied. According to taps adapt the filter by doing iterations. In this filter using a weight control mechanism or transversal filter in which weights are to be updated.

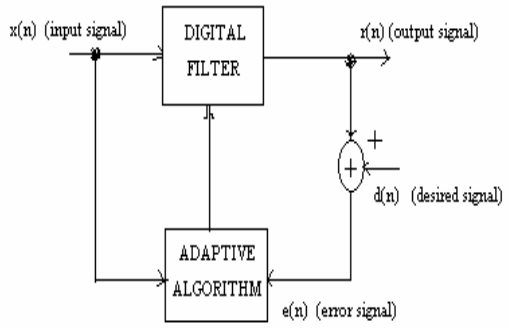

Figure 1: Block diagram of adaptive filter

III. ALGORITHM OF ADAPTIVE FILTER

Adaptive filters are designed to remove the problem of wiener filter. In wiener filters the processed data will be matched with the prior information for designing. Adaptive filter is totally based on stochastic approach. This approach is totally based on Steepest Descent Algorithm which is to be solved the Weiner-Hopf equation. In this method the weights are adjusted iteratively in the direction of the gradient. The error performance surface used by the SD method is not always known a priori. We can use the estimated values. Thus LMS algorithm belongs to the family of stochastic gradient algorithm. Then define NLMS, Variable Step LMS, and Sign LMS.

A. Wiener Filter Theory

The starting point for deriving the equations for the adaptive filter is to define very clearly what we mean by an optimum filter. The Wiener filter is probably the most common definition in use,

$$e_k = y_k - \hat{n}_{=} \quad y_k - \sum_{i=0}^{N-1} w(i).x_{k-i}$$

it requires the prior information about the data to be processed and filter is optimum where $w(i)$ is the ith coefficient of the Wiener filter. Since we are dealing with discrete values, the input signal and Wiener filter coefficients can be represented in matrix notation.

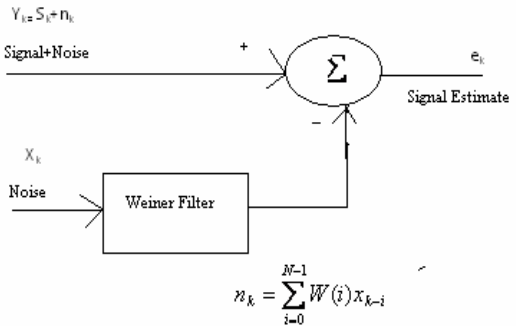

Figure2: Weiner filter

B. Least Mean Square Algorithm (LMS)

The error performance surface used by the SD method is not always known a priori. We can use estimated values. The estimates are RVs and thus this leads to a stochastic approach. We will use the following instantaneous estimates.

$$W(n+1) = W(n) + \frac{1}{2}\mu[-\nabla(j(n))]$$

$$W(n+1) = W(n) + \mu X(n)e^*(n)$$

Thus LMS algorithm belongs to the family of stochastic gradient algorithms. The update is extremely simple while the instantaneous estimates may have large variance; the LMS algorithm is recursive and effectively averages these estimates. The simplicity and good performance of the LMS algorithm make it the benchmark against which other optimization algorithms are judged.

C. Normalized LMS Algorithm

In the standard LMS algorithm the correction is proportional to m $\mathbf{x}(n)e^*(n)$. If $\mathbf{x}(n)$ is large, the update suffers from gradient noise amplification.

The normalized LMS algorithm seeks to avoid gradient noise amplification. The step size is made time varying, m(n), and optimized to minimize error.

$$W(n) + \mu(n)[p - RW(n)]$$

D. LMS Algorithm with Sign Algorithms

In high speed communication the time is critical, thus faster adaptation processes is needed

$$\text{sgn}(a) = \begin{cases} 1 & a > 0 \\ 0 & a = o \\ -1 & a < 0 \end{cases}$$

The Sign algorithm (other names :pilot LMS, or sign Error)

$$w(n+1) = w(n) + \mu u(n)\,\text{sgn}(e(n))$$

IV. IMPLEMENTATION OF ALGORITHM

A. Adaptive Noise Canceling Applied to a sinusoidal interference

The traditional method of suppressing a sinusoidal interference corrupting an information bearing signal is to use a fixed notch filter tuned to the frequency of the interference. To design the filter, we naturally need to know the precise frequency of the interference. But if the notch is required to be very sharp and the sinusoidal signal is known to drift slowly, clearly, then we have a problem which calls for adaptive solution. One such solution is provided by the use of adaptive noise canceling, an application that is different. Figure shows the block diagram of a dual port input adaptive noise canceller. The primary input supplies an information bearing signal and a sinusoidal interference that are uncorrelated to each other. The reference input supplies a correlated version of the sinusoidal interference. For the adaptive filter, we may use a transversal filter whose tap weights are adapted by means of the LMNS algorithm. The filter uses the reference input to provide (at its output) an estimate of the sinusoidal interfering signal contained in the primary input. Thus, by subtracting the adaptive filter output from the primary input, the effect of the sinusoidal interference is diminished. In particular, an adaptive noise canceller using the LMS algorithm has two important characteristics

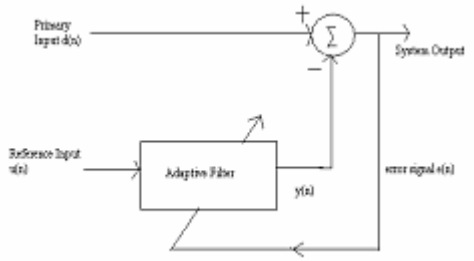

Figure3: Adaptive Noise Canceling Applied to a sinusoidal interference

1. The canceller behaves as an adaptive notch filters whose null point id determined by the angular frequency w_0 of the sinusoidal interference. Hence, the canceller is tunable, and the tuning frequency moves with w_0
2. The notch in the frequency response of the canceller can be made very sharp at precisely the frequency of the sinusoidal interference by choosing a small enough value for the step size parameterμ.

V. OBSERVATION AND ANALYSIS

The simulation results show that LMS and RLS algorithm in the area to cancel the noise has very good results, LMS filtering gives good results when length of filter is short, it has a simple structure but shortcomings of LMS algorithm convergence rate is slow but the convergence speed and noise vector there is a contradiction, accelerate the convergence speed is quicker at the same time noise vector has also increased. Convergence of the adaptive for the choices of gain constant μ is very sensitive. The noise signal and signal power when compared to larger, LMS filter output is not satisfactory, but RLS algorithm convergence rate is faster than the LMS algorithm, the convergence is unrelated with the spectrum of input signal, filter performance is superior to the least mean squares algorithm, but its each iteration is much larger operation than LMS. The required storage capacity is large, is not conducive to achieving a timely manner, the hardware is also relatively difficult to achieve. The simulation results show that more than LMS algorithm and RLS algorithm in the area to cancel the noise has very good results, to complete the task of noise reduction.

A. Output of LMS algorithm on various step sizes (0.0075, 0.0025, 0.025, and 0.075)

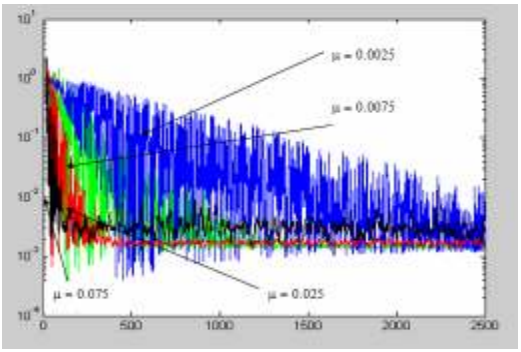

Figure 4: Graph of MSE V/S number of iterations for LMS algorithm

For smallest step sizes, μ= .0075, the convergence is the slowest, and the best steady state average squared error. The convergence time is about 2300 iterations. The steady state average squared error is about 0.001.For large step size, μ = 0.075, the convergence is the fastest, and the worst steady state average squared error. The convergence time is about 100 iterations. The steady state average squared error is about 0.005.

B. Comparison of LMS and variable size LMS

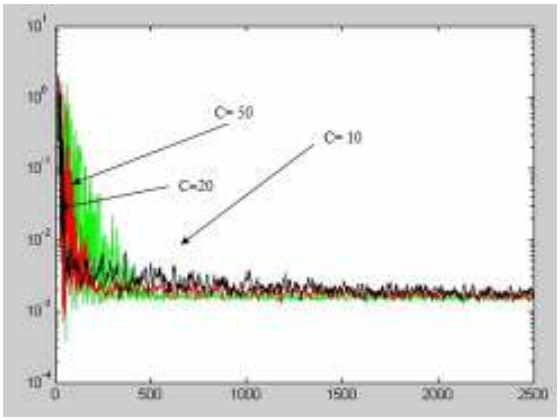

Figure 5: Comparison of LMS and variable size LMS steady state error will finally decrease

C. Comparison of LMS and Sign LMS

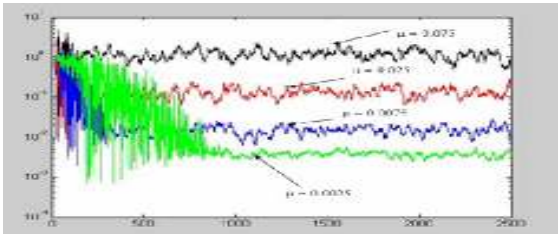

Figure 6: Graph of MSE V/S number of iterations for Sign LMS algorithm.
The steady state error will increase the convergence rate decreases.

D. Comparison of LMS and NLMS

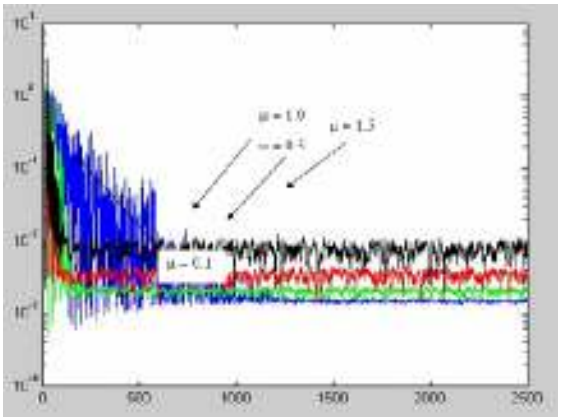

Figure 7: Graph of MSE V/S number of iterations for NLMS algorithm.
The convergence rate may decrease.

E. LMS output Spectrograms

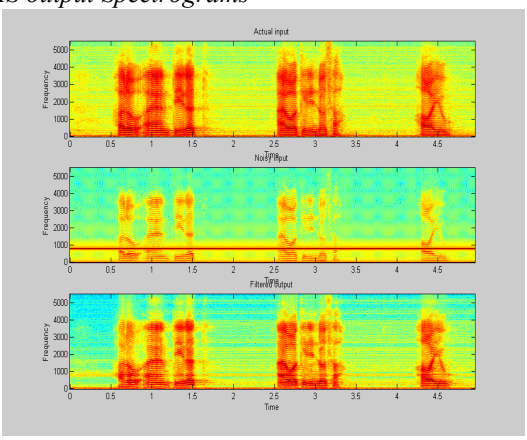

Figure 8: LMS output Spectrum for taps =32
Reducing the number of taps leaves a faint touch of noise component.

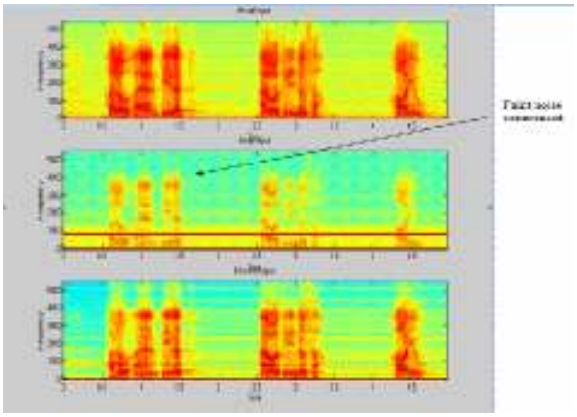

Figure 9: LMS output Spectrum for taps =16
Reducing the number of taps leaves a faint touch of noise component.

VI. CONCLUSION

Decide which algorithm is better as compare to other basis on values of step size and tap weights & check whose performance is better and which convergence graph is better by varying all these parameters. For that taken different – different values of step size parameter and get a result that are from 2500 iterations graph is stable at 20 iterations. So conclude that convergence rate is 20 and draw this graph between MSE and iterations. Same in case of spectrogram take different values of step size and vary the taps getting different results for all algorithms. This spectrogram has to shown three results one is input that is recorded, noise as a input and gives the final result by comparing that on the basis of particular algorithm.

REFERENCES

[1] Sridhar Krishnan, Xavier Fernando, Hongbo Sun, "Non Stationary Noise Cancellation in Infrared Wireless Receivers", CCECE 2003-CCGEI 2003, Montreal
[2] A.Th. Schwarzbacher, J, "VLSI Implementation of an Adaptive Noise Canceller",Irish signal and system Conference Dublin, Irreland,PP368-PP375,June 2000.Timoney
[3] King Tam, amid Sheokhzadeh,Todd Schneider, "Highly Oversampled Sub band Adaptive Filters For Cancellation On A Low-Resource DSP System", Proc. 7th int. conference on spoken language, processing ICSLP Denvee, co, September, 16-20th 2002.
[4] Alexander Mamrashev, Darryl Orris, "Adaptive Noise Cancellation in 30kA Power System", September, 12th 2006.
[5] Hyung-Min Park, Sang-Hoon Oh, and Soo-Young lee, "On Adaptive Noise Cancelling Based On Independent Component Analysis", Brain Science & Engineering Research Program sponsored by Korean Ministry Of Science and Technology.
[6] J., Oravec R., Kadlec J., Cocherova E, "Simulation Of RLS And LMS Algorithms For Adaptive Noise Cancellation In Mat lab".
[7] David J. Darlington, Douglas R.Campbell, "Sub-Band, Dual-Channel Adaptive Noise Cancellation using Normalized LMS", ECSA Research on the Auditory Basis of Speech, Perception Keele University U.K, June, 15-19th 1996.
[8] Thamer M.J. Al-Anbaky, "Acoustic Noise Cancellation Using Sub-Band Decomposition and Multirate Techniques".
[9] T. Himel, S. Allison, P. Grossberg, L. Hendrickson, R. Sass, A. Shoaee, "An Adaptive Noise Cancelling System Used or Beam Control at the the Stanford Linear Acceleration Cante", 8th Real Time Computer Applications in Nuclear Particle and Plasma Physics (RT93) Vancouver, Canada, June, 8-22th 1993.
[10] K Sakuta, K Mizoguti, A Setoguchi and H Itozaki, "System Noise Cancellation By Digital Signal Processing For SQUID Measurement",Publishing,Supercond.Sci.Techno.1,pgS407-410,23 March,2006.
[11] Sergiy A.Vorobyov,ANDREZ Cichocki, "Adaptive Noise Cancellation For Multi Sensory Signal",Fluctuations and Noise Letters Vol.0 No.0 (2001) 000-000 fc World Scientific Publishing Company.
[12] M.R.Sambur, "Adaptive Noise Cancelling For Speech Signals", IEEE Trans.on Acoustics, Speech and Signal Processing,26(5):pg 419-423, October 1978.
[13] M.R.Sambur, "LMS Adaptive Filtering For Enhancing the Quality of Noise Speech",Proc IEEE ICASSP, pg 610-613, 1978.
[14] Manya Afanso,Shiv Datt Joshi, "Wavelet Based Scheme for Adaptive Noise Cancellation From Images",
[15] Simon Haykin, "Adaptive Filter Theory", Prentice Hall, Eaglewood Cliffs, 3rd Edition 1996.
[16] Sanjit K Mitra, "Digital Signal Processing", A Computer Based Approach, Tata Mach Graw Hill Edition.
[17] Edward p. Cunningham, "Digital Filtering", An Introduction, Houghtan Mifflin Company.
[18] L. B. Asl and V. M. Nezhad, "Improved particle swarm optimization for dual-channel speech enhancement," icsap, 2010
[19] M. D. Topa, I. Muresan, B. S. Kirei, and I. Homana, "A digital adaptive echo-canceller for room acoustics improvement," Advances in Electrical and Computer Engineering, vol. 10, pp. 450–453, Apr. 2004.
[20] R. Eberhart and J. Kennedy, "A new optimizer using particles swarm theory," Sixth Int. Symp. on Micro Machine and Human Science, Nagoya, Japan, 1995.
[21] Xiaoang Wang and Yan Bai and Yue Li," A novel particle swarm optimization algorithm," IEEE Conferences, vol:1, pp. 408 – 411,2010
[22] H. Hajian-Hoseinabadi, S. H. Hosseini, and M. Hajian, "Optimal power flow solution by a modified particle swarm optimization algorithm," 43rd Int. Univ. Power Engineering Conference, 2008.
[23] X.Hu,"Particleswarmoptimization."[Online].Available: http://www.swarmintelligence.org/tutorials.php
[24] J. F. Doherty and R. Porayath, "A robust echo canceller for acoustic environments," IEEE Trans. on Circuits and Systems-II: Analog and Digital Signal Processing, vol. 44, May 1997.
[25] "Acoustic-echo cancellation software for hands-free wireless systems," Application Report, Digital Signal Processing Solutions, Texas Instruments, 1997.
[26] Paleologu and b.; Benesty and J.; Grant and S.L.; Osterwise,"Variable step-size NLMS algorithms designed for, 2009
[27] B. Farhang-Boroujeny and Zhongjun Wang ,"Adaptive filtering in sub bands: Design issues and experimental results for acoustic echo cancellation," Signal Processing, Vol61,pp.213-223, Issue 3, September 1997,
[28] Fredric Lindstrom and Christian Schüldt and Ingv echo cancellation " Signals, Systems and Computers, Conference Record of the Forty-Third Asilomar Conference Claesson," A hybrid acoustic echo canceller and suppressor" Blekinge Institute of Technology, Department of Signal Processing, SE-37225 Ronneby, Sweden,2006

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Multilayer Security Mechanism in Computer Networks

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Abstract- In multilayered security infrastructure, the layers are projected in a way that vulnerability of one layer could not compromise the other layers and thus the whole system is not vulnerable. This paper evaluates security mechanism on application, transport and network layers of ISO/OSI reference model and gives examples of today's most popular security protocols applied in each of mentioned layers. A secure computer network systems is recommended that consists of combined security mechanisms on three different ISO/OSI reference model layers : application layer security based on strong user authentication, digital signature, confidentiality protection, digital certificates and hardware tokens, transport layer security based on establishment of a cryptographic tunnel between network nodes and strong node authentication procedure and network IP layer security providing bulk security mechanisms on network level between network nodes. Strong authentication procedures used for user based on digital certificates and PKI systems are especially emphasized.

Index Terms- Multilayered Security Systems, PKI systems, Smart Cards.

I. INTRODUCTION

In computer network systems, only general and multilayered security infrastructure can manage with the possible attacks. This paper presents security mechanisms on application, transport and network layers of ISO/OSI reference model and gives examples of the today most popular security protocols applied in each of the mentioned layers (e.g. S/MIME, SSL and IPSec). We recommend a secure computer network systems that consists of combined security mechanisms on three different ISO/OSI reference model layers: application layer security (end-to-end security) based on strong user authentication, digital signature, confidentiality protection, digital certificates and hardware tokens (e.g. smart cards), transport layer security based on establishment of a cryptographic tunnel (symmetric cryptography) between network nodes and strong node authentication procedure and network IP layer security providing bulk security mechanisms on network level between network nodes – protection from the external network attacks. These layers are projected in a way that a vulnerability of the one layer could not compromise the other layers and thus the whole system is not vulnerable. User strong authentication procedures based on digital certificates and Public Key Infrastructure (PKI) systems are especially emphasized.

II. MULTILAYERED SECURITY INFRASTRUCTURES

In modern computer networks, following important security features should be included:

1) User and data authentication
2) Data integrity
3) Non-repudiation
4) Confidentiality

This means that in secure computer network systems, the following features need to understand:

1) Strong user authentication techniques based on smart cards
2) Integrity of electronic data transferred either via wired or wireless IP networks
3) The non-repudiation function

By using digital signature technology based on asymmetrical cryptographic algorithms, these features are implemented. Also, the confidentiality and privacy protection of transferred data must be preserved during whole transmission data paths and they are done by using symmetrical cryptographic algorithms. In this Section, we will give the overview of modern security mechanisms and cryptographic protocols. The considered security mechanisms are based on Public Key Infrastructure (PKI), digital certificates, digital signature technology, confidentiality protection, privacy protection, strong user authentication procedures and smart card technology. Some overviews of these techniques are given in [2].

The multilayered security architecture is proposed to be implemented in order to limit the potential harmful attacks to the particular network. Modern computer networks security systems consist of combined application of security mechanisms on three different ISO/OSI reference model layers:

1) Application level security (end-to-end security) based on strong user authentication, digital signature, confidentiality protection, digital certificates and hardware tokens (e.g. smart cards) internal network attacks protection.
2) Transport level security based on establishment of a cryptographic tunnel (symmetric cryptography) between network nodes and strong node authentication procedure external network attacks protection.
3) Network IP level security providing bulk security mechanisms on network level between network nodes external network attacks protection.

These layers are projected in a way that vulnerability of one layer could not compromise the other layers and thus the whole system is not vulnerable.

Application Level Security Mechanism

Application layer is on top of the OSI (Open System Interconnectivity) server layer model. This layer handles issues like network transparency, resource allocation and problem partitioning. The application layer is concerned with the user's view of network (e.g. formatting electronic mail messages).

Application level security mechanisms are based on asymmetrical and symmetrical cryptographic systems, which realize the following functions:

1) Authenticity of the relying parties (asymmetrical systems)
2) Integrity protection of transmitted data (asymmetrical systems)
3) Non-repudiation (asymmetrical systems)
4) Confidentiality protection on application level (symmetrical systems)

Application level security domain consists of the most popular protocols like: S/MIME, PGP, Kerberos, proxy servers on application level, SET, crypto APIs for client-server applications, etc. Most of these protocols are based on PKI X.509 digital certificates, digital signature technology based on asymmetrical algorithms (e.g. RSA, DSA, ECDSA) and confidentiality protection based on symmetrical algorithms (e.g. DES, 3DES, IDEA, AES, etc.) [3]. Most of the modern application level security protocols, such as S/MIME and crypto APIs in client server applications, are based on digital signature and digital envelope technology. Nowadays, the most popular cryptographic protocol on the application level is S/MIME standardized protocol for secure e-mail protection. In modern e-commerce and e-business systems, RSA algorithm is mainly used according to PKCS1 standard which is a part of the PKCS set of de-facto standards describing a method for encrypting data using the RSA public-key cryptosystem. Its intended use is in the construction of digital signatures and digital envelopes, according to the syntax described in PKCS7 standard. There is a lot of work on optimization of RSA algorithm implementation in hardware security module based on signal processor [4], [5], [6]. [7], [8], [9].

For digital signatures, the content to be signed is first reduced to a message digest with a message-digest algorithm (such as MD5, SHA-1, RIPEMD-160, SHA-224, SHA-256, SHA-384, SHA-512), and then an octet string containing the message digest is encrypted with the RSA private key operation of the signer of the content. The content and the encrypted message digest are represented together according to the syntax in PKCS7 to yield a digital signature. It should be pointed that the state-of-the-art solution for all the three security functions, authenticity, data integrity and non-repudiation, could be today achieved only by use of the PKI smart cards with signature generation on the card and where the signature private key is generated on the card and never leaves the card. For digital envelopes, the content to be enveloped is first encrypted by a symmetric encryption key with a symmetric encryption algorithm (such as DES, 3DES, IDEA, AES...), and then the symmetric encryption key is encrypted with the RSA public key of the intended recipient of the content. The encrypted content and the encrypted symmetric encryption key are represented together according to the syntax in PKCS7 to yield a digital envelope.

Security systems on application level consist also of the user authentication procedure which could be one, two or three-component authentication procedure.

Transport Level Security Mechanism

Transport-layer security relies on secure HTTP transport (HTTPS) using Secure Sockets Layer (SSL) since it is provided by the transport mechanisms used to transmit information over the wire between clients and providers. Transport security is a point-to-point security mechanism that can be used for authentication, message integrity, and confidentiality. When running over an SSL-protected session, the server and client can authenticate one another and negotiate an encryption algorithm and cryptographic keys before the application protocol transmits or receives its first byte of data. Security is “live” from the time it leaves the consumer until it arrives at the provider, or vice versa, even across intermediaries. The problem is that it is not protected once it gets to its destination. One solution is to encrypt the message before sending.

Transport-layer security is performed in a series of phases, which are listed here:

1) The client and server agree on an appropriate algorithm
2) A key is exchanged using public-key encryption and certificate-based authentication
3) A symmetric cipher is used during the information exchange

TLS/SSL encryption requires the use of a digital certificate, which contains identity information about the owner as well as a public key, used for encrypting communications. These certificates are installed on a server; typically, a web server if the intention is to create a secure web environment, although they can also be installed on mail or other servers for encrypting other client-server communications.

Transport Layer Security (TLS) Protocol provides privacy and data integrity between two communicating applications.

The protocol composed of two layers: the TLS Record Protocol and the TLS Handshake Protocol. At the lowest level, layered on top of some reliable transport protocol (TCP) is the TLS Record Protocol. The TLS Record Protocol provides connection security that has two basic properties:

1) Private - symmetric cryptography is used for data encryption (DES, RC4, etc.) The keys for this symmetric encryption are generated uniquely for each connection and are based on a secret negotiated by another protocol (such as the TLS Handshake Protocol). The Record Protocol can also be used without encryption.
2) Reliable - message transport includes a message integrity check using a keyed MAC. Secure hash functions (SHA, MD5, etc.) are used for MAC computations. The Record Protocol can operate without a MAC, but is generally only used in this mode while another protocol is using the Record Protocol as a transport for negotiating security parameters.

The TLS Record Protocol is used for encapsulation of various higher level protocols.

TLS Handshake Protocol allows the server and client to authenticate each other and to negotiate an encryption algorithm and cryptographic keys before the application protocol transmits

or receives its first byte of data. The TLS Handshake Protocol provides connection security that has three basic properties:

1) The peer's identity can be authenticated using asymmetric or public key, cryptography (RSA, DSS, etc.). This authentication can be made optional, but is generally required for at least one of the peers.
2) The negotiation of a shared secret is secure: the negotiated secret is unavailable to eavesdroppers, and for any authenticated connection the secret cannot be obtained, even by an attacker who can place himself in the middle of the connection.
3) The negotiation is reliable: no attacker can modify the negotiation communication without being detected by the parties to the communication.

TLS is based on the Secure Socket Layer (SSL), a protocol originally created by Netscape. One advantage of TLS is that it is application protocol independent. The TLS protocol runs above TCP/IP and below application protocols such as HTTP or IMAP. The HTTP running on top of TLS or SSL is often called HTTPS. The TLS standard does not specify how protocols add security with TLS; the decisions on how to initiate TLS handshaking and how to interpret the authentication certificates exchanged are left up to the judgment of the designers of protocols which run on top of TLS.

Network Level Security Mechanism

The network layer is responsible for packet forwarding including routing through intermediate routers. The network layer provides the functional and procedural means of transferring variable length data sequences from a source to a destination host via one or more networks while maintaining the quality of service functions.

Network level security mechanisms include security mechanisms implemented in communication devices, firewalls, operating system security mechanisms, etc. These methods provide the base for understanding of Virtual Private Networks (VPN). The complete IP traffic (link encryption) between two network nodes is encrypted to achieve security protection. The most popular network layer security protocols are: IPSec (AH, ESP, IKE), packet filtering and network tunneling protocols, and the widest used is IPSec. IPSec consists of network node authentication based on asymmetrical cryptographic algorithms and link encryption based on symmetrical algorithms, similar to the transport level security protocols. IPSec is a combination of group of protocols consisting of AH – Authentication Header and ESP – Encapsulated Security Payload protocols in transport and tunnel mode, as well as IKE – Internet Key Exchange. AH is used for authentication of the IP packets, ESP is used for encryption and authentication of the IP packets and IKE is used for node authentication and IPSec session key establishment. For security on the network level, the most often used is the IPSec ESP protocol in tunnel mode, since attacker does not know internal addresses (source and destination) – only public addresses of IPSec gateways could be seen externally. Firewalls could be computers, routers, workstations and their main characteristics is to define which information and services of internal network could be accessed from the external world and who from internal network is allowed to use information and services from the external network. Firewalls are mostly installed at breakpoints between insecure external networks and secure internal network. Depending of the needs, firewalls consist of the one or more functional components from the following set: packet filter, application level gateway, and circuit level gateway. There are four important historical examples of elementary firewalls: Packet Filtering Firewall, Dual-Homed Firewall (with two network interface), Screened Host Firewall, and Screened Subnet Firewall (with Demilitarized Zone – DMZ between internal and external networks).

III. CONCLUSION

In this paper, different mechanism in the modern computer security systems are analyzed. It is concluded that only multilayered security architecture protect internal and external attacks in modern computer networks. Also, the most frequently used security mechanisms on the application, transport and network layers are analyzed to conclude that more than one layer should be covered by the appropriate security mechanisms in order to achieve high quality protection of the system. The analysis is done regarding security challenges and appropriate security mechanisms with potential vulnerabilities. It is concluded that, appropriate security mechanism can be applied in a way that vulnerabilities of one layer do not affect another layer, thus the whole system is not vulnerable.

REFERENCES

[1] C. Huitema, "IPV6: The New Internet Protocol," Englewood Cliffs, NJ: Prentice-Hall, Nov. 1999.

[2] W.Ford, M.S.Baum, "Secure Electronic Commerce: Building the Infrastructure for Digital Signatures and Encryption," Second Edition, Prentice Hall PTR, Upper Saddle River, NJ 07458, 2001.

[3] M.Markovi, "Cryptographic Techniques and Security Protocols in Modern TCP/IP Computer Networks," Short- Tutorial, in Proc. of ICEST 2002, Oct. 1-4, 2002.

[4] B.Schneier, "Applied Cryptography," Second Edition, Protocols, Algorithms and Source Code in C, John Wiley & Sons, Inc., New York, Chichester, Brisbane, Toronto, Singapore, 1996.

[5] RSA Laboratories: PKCS standards.

[6] T.Unkaševi, M.Markovi, G.Djorevi, "Optimization of RSA algorithm implementation on TI TMS320C54x signal processors," in Proc. of TELSIKS'2001, September.

[7] G.Djorevi, T.Unkaševi, M.Markovi, "Optimization of modular reduction procedure in RSA algorithm implementation on assembler of TMS320C54x signal processors," DSP 2002, July, Santorini, Greece, 2002.

[8] M.Markovi, T.Unkaševi, G.Djorevi, "RSA algorithm optimization on assembler of TI TMS320C54x signal processors," in Proc. of EUSIPCO 2002, Toulouse, France, Sept. 3-6, 2002.

[9] M.Markovi, G. Orevi, T.Unkaševi, "On Optimizing RSA Algorithm Implementation on Signal Processor Regarding Asymmetric Private Key Length," in Proc. Of WISP 2003, Budapest, Sept. 2003.

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Effect of Certain Feeds on Growth and survival of *Ompok pabo* (Hamilton-Buchanan) Hatchlings in Captive Condition

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Abstract- An experiment was conducted in the laboratory of Department of Zoology, Goalpara College, Goalpara, Assam (India) from August/2008 to September/2009 to investigate the effects of certain feeds on growth and survival of *Ompok pabo* hatchlings during nursery rearing. Four different feeds were tested to four batches of hatchling simultaneously which are assigned as T-1: Rice polish & mustard oil cake (1:1), T-2: Boiled chicken egg and filtered zooplankton, T-3: Chopped earth worms only and T-4: Earth worms and dry fish powder. A feeding frequency of 3 times /day was adopted for all the feeds. The highest gain in weight and length of the hatchlings were 0.581 ± 0.035 g and 4.7 ± 0.2 cm respectively in treatment T-3, fed with chopped earth worms only. The hatchlings showed much interest toward the chopped earth worms feed. Highest specific growth rate (SGR) was found to be 13.67 ± 0.05% shown by the hatchlings fed with chopped earthworms. Similarly, higher survival rate (62.5 ± 1.8%) was observed in the hatchlings fed with chopped earthworms. Water quality parameters of all the nursery tanks were found within the suitable range of fish culture. Finely chopped earth worm was found to be the best food for hatchlings rearing of *Ompok pabo*.

Index Terms- feeds, growth, survival rate, *Ompok pabo*, hatchlings

I. INTRODUCTION

Ompok pabo (Hamilton-Buchanan) commonly known as '*pabo*' is an Indian freshwater cat fish with good market demands particularly in North-Eastern part of India. It is a delicious, tasty, nutritious catfish having relatively few bones. *Ompok pabo* dwells and breeds in the rivers and reservoirs (Mukherjee *et al.*, 2002). In spite of all these characters, it has not received much attention in aquaculture mainly due to non-availability of information regarding feeding, breeding and culture technique of this important fish species. Over the last few decades, its wild population has undergone a steady decline mainly due to over exploitation, loss of habitat, disease, pollution, siltation, poisoning, dynamite and other destructive fishing.

Ompok pabo's fry are very rare in nature because of many adverse changes in their natural breeding and growing habitats (Hossain *et al*., 2006). *Ompok pabo* has already been declared as an endangered species (Datta *et al*., 2003; NBFGR, 2010). So the seed production in captivity will be the only alternative for obtaining optimum quantity of seed for the purpose through induced breeding operation.

The main objective of any hatchery system is to produce maximum number of high quality fish seeds, fry and fingerlings from the available brood stock (Marimuthu and Hanifa, 2007). For propagation of a fish species, knowledge of feeding habit is very essential as it plays a vital role in the growth pattern. Studies of food and feeding habit of fishes have manifold importance in fishery biology (Islam *et al*., 2004). Food is the main source of energy and plays an important role in determining the population levels, rate of growth and condition of fishes (Begum *et al*., 2008). Though the proper growth of fish depends mainly upon the quantity and quality of food having all the essential nutrients, there is a limit of maximum growth for fish even if optimum amount of balanced nutrients is provided (Ghosh *et al*., 2005).

The sustainable culture operation of any fish species requires proper domestication, fry feeding and rearing and culture technique of the species concerned (Sarowar *et al*., 2010). Growth of an organism can be defined as a change in its size (length and weight) over a period of time. The growth rate in fishes is highly variable and depends upon many environmental factors. Quality of food and its availability is one of the important factor influences growth rate of fishes (Khanna, 1996). The growth of larvae is also influenced by the quality of feed and their acceptability (Sahoo *et al.,* 2010). They revealed that the acceptability of feed depends on the feed type and their particle size, which influence the growth and survival rate during their rearing. In aquaculture, feed is the single most important item since nearly 60% cost is associated with fish feed (Hossain *et al.,* 2011). Food and feeding helps to select such species of fishes for culture which will utilize all the available potential food of the water bodies without any competition with one another but will live in association with other fishes (Begum *et al*., 2008). Feeding frequency has direct impact on the growth performance and survival of fry and larvae of *Clarias macrochephalus* (Mollah and Tan, 1982). However, the knowledge of the food items of the fish is very important and essential for the stock enhancement through the seedlings release and it will become a guideline for determining the environmental capacity which is

useful for the prevention of fish starvation and improvement of their growth after the release (Yamagishi *et al*., 2005).

Ompok pabo is a carnivorous fish; which mostly feeds on small fishes, aquatic insect, insect larvae etc. Apart from these, earthworm is also a favorite food for this catfish. As per the existing literature on food and feeding habits of *Ompok* genus, it has been found that they are mostly piscivorous or carnivorous in nature (Booth and Alquezar, 2002; Mahmood, 2006). Considering the above realities, the present work was carried out with an aim to find a suitable feed for optimal growth and survival during rearing of *Ompok pabo* hatchlings.

II. MATERIALS AND METHODS

The present experiment was carried out in the laboratory of Department of Zoology, Goalpara College, Goalpara; Assam. The experiment was conducted from August/2008 to September/2009 during breeding season in four earthen tubs. The tubs were rectangular in shape having the diameter of 100 cm with 50 cm depth. Prior to stocking of hatchlings, each of the tubs was cleaned and prepared with all facilities necessary to run the experiment efficiently. In order to facilitate renewal and removal of water concomitantly, an inlet and an outlet was provided with each of the tubs. Each tub was provided with a gentle shower throughout the experimental period. The outlets were covered by nylon net to stop hatchling escape. Pebbles and some aquatic plants such as *Hydrilla verticiellata*, *Eichhornia crassipes, Pistia* etc were given to the rearing tubs for providing natural microhabitat to them. Hatchlings of pabo (*Ompok pabo*) catfish were produced by artificial breeding following the methods of Bhowmik *et al*. (2000); Mukherjee *et al*. (2002) and Sarkar *et al.* (2005). Earth worms are cultured near the laboratory followed after the methodology of Nagavallemma *et al*., (2004).

In order to study the effect of different feeds on larval growth, a completely randomized design (CRD) with four treatments was followed (Mahmood, 2006; Rahman *et al*., 2008).

Four different feeds were tested. The feeds were assigned to different treatments as:

1. T-1: Rice polish & mustard oil cake (1:1)
2. T-2: Boiled chicken egg and filtered zooplankton
3. T-3: Chopped earth worms only and
4. T-4: Earth worms and dry fish powder.

Ten randomly selected individuals from each treatment were sampled weekly. Five days old larvae were used in the experiment. The physico chemical parameters of tub water were analyzed weekly following the standard method (APHA, 1989). The parameters such as Specific Growth Rate (SGR), Length gain (LG) and Weight gain (WG) were calculated by following the methodology of Brown (1957). This statistical analysis was performed with the help of computer software SPSS programme. SGR (%/day) was calculated using the formula:

$$\frac{\text{Log}_e W_2 - \text{Log}_e W_1}{T_2 - T_1} \times 100$$

Where, W_1 = The initial life body weight (g) at time T_1 (day)

W_2 = The final life body weight (g) at time T_2 (day)

Length gain (cm) = Mean final length – mean initial length

Weight gain (g) = Mean final length – mean initial length

Percentage survival (%) was calculated using the formula=

$$\frac{\text{No of hatchlings alive}}{\text{Total no. of hatchlings stocked}} \times 100$$

III. RESULTS AND DISCUSSION

A. *Effect of different feeds on larval growth:*

It has been found that *Ompok pabo* is a highly carnivorous fish and an opportunistic cannibal. Similar behavior was also observed during the rearing of *Channa striatus* larvae (Mollah *et al*., 2009). During the experimental period, the hatchlings were found to be very aggressive toward the administered food except the formulated feed. Growth in terms of length and weight of hatchlings at weekly intervals is summarized in table 1. Three replications of treatment I, II, III and IV were stocked with 20 hatchlings each. Similar treatment structure was also taken in case of *Channa striatus* with 40 fry each (Sarowar *et al*., 2010). The initial average weight and length of the hatchlings were 0.013 ± 0.001g and 0.8 ± 0.2 cm, respectively for all treatments. The final average weight of the fry of treatment I (fed with rice polish & mustard oil cake), II (fed with Boiled chicken egg and filtered zooplankton), III (fed with Chopped earth worms only) and IV (fed with earth worms and dry fish powder) were 0.492 ± 0.055 g, 0.512 ± 0.063 g, 0.598 ± 0.065 g and 0.537 ± 0.058 g; while the final average length were 5.0 ± 0.2 cm, 5.2 ± 0.2 cm, 5.5 ± 0.3 cm and 5.3 ± 0.2 cm, respectively. The supplied feed was completely finished within few minutes of administration. This illustrates their voracious predatory nature. Similar investigation was also made by Hossain *et al*. (2006) on *Clarias batrachus* larva fed with *Moina* (D-1), chopped *Tubifex* (D-2) and both *Moina* and chopped *Tubifex* (D-3) at 4 hour interval for first 6 days and at 6 hour interval for another 6 days.

The highest gain in weights of the fry were 0.581 ± 0.035 g in treatment T-3 (fed with Chopped earth worms only) which is significantly (P>0.05) higher than those of the other three treatments followed by 0.520 ± 0.033 g in treatment T-4 (fed with earth worms and dry fish powder), 0.496 ± 0.031 g in treatment T-2 (fed with boiled chicken egg and filtered zooplankton) and 0.472 ± 0.037 g in treatment T-1 (fed with rice polish & mustard oil cake). Similarly, the highest length gain was found to be 4.7 ± 0.2 cm in treatment T-3 which is significantly (P>0.05) higher than the rest of the treatments. The highest percent weight gain (91.64%) and percent length gain (54.30%) was also observed in the fry fed with chopped earthworm only (Table 1). After completion of the experiment, the highest specific growth rate was found to be 13.67 ± 0.05% shown by the hatchlings fed with chopped earthworms (Fig. 1) which was significantly (P>0.05) higher compared to those in treatment T-1, T-2 and T-4. According to Mondal *et al*. (2007), growth rate of fish increases with increase in the level of dietary protein till the optimum level is reached. However, the hatchlings fed with formulated feed showed very little interest toward the feed unlike the hatchlings reared with the rest two foods. This might be the reason for the poor growth performance and survival of the hatchlings fed with formulated diet. The fasting hatchlings often showed cannibalistic nature and fed on their siblings. Boonyaratpalin *et al*. (1985) described cannibalistic predation of snakeheads under confined condition during the state of

starvation which coincides with that of the present result. A feeding frequency of 3 times/ day was adopted during the present experiment to avoid water deterioration and easy managements. Feeding frequency has direct impact on the growth performance and survival of fry and larvae of *Clarias macrocephalus* (Mollah and Tan, 1982). They found that a feeding frequency of 3 times/ day was best for rearing the fry and larvae of *Clarias macrocephalus*.

B. Water quality parameters

Water temperature, dissolved oxygen and pH during the fry rearing period in the rearing tubs were found within the desirable range according to Boyd (1979) and Rahman *et al*. (1982). There was no indication of the adverse effect of water quality parameter on the existence, growth and survival of *Ompok pabo* hatchlings. The levels of physico-chemical parameters recorded from the experimental tubs of four treatments are summarized in Table 2. Higher water temperature (31.0 ^{0}C) was measured in T-3 and lowest (30.5 ^{0}C) in T-1. However, no significant ($P > 0.05$) differences were recognized among the treatments. Rahman *et al*. (2008) observed almost similar types of temperature variation in nursery rearing of *Ompok pabda* fingerlings. Water pH was significantly ($P < 0.05$) highest in T-4 and lowest in T-3. However, the range was found to be suitable for fish growth. The mean dissolved oxygen (DO) concentrations were significantly ($P < 0.05$) higher in T-2 (10.12 mg l^{-1}) than rest of the three treatments. Higher level of DO might be due to continuous flow of water during the rearing period. Mean free CO_2 value was found between the ranges of 2.2 and 4.4 mg l^{-1}, but no significant ($P > 0.05$) differences were observed amongst the four treatments. Similar highest FCO_2 value was recorded by Mondal *et al*. (2007) during rearing of *Labeo rohita* fingerlings. Mean total alkalinity differences among the four treatments were not statistically significant ($P > 0.05$). Mean total hardness was significantly ($P < 0.05$) highest in T-2 and lowest in T-3. Mean chloride level was found significantly ($P < 0.05$) higher in T-4, while it was lowest in T-2. However, the value of total alkalinity, hardness and chloride were within the suitable ranges for fish production and survival (Boyd, 1979).

C. Survivality of the hatchlings

The survival rates were found to be 51.4 ± 1.2%, 56.7 ± 1.5%, 62.5 ± 1.8% and 58.2 ± 1.3%, respectively in T-1, T-2, T-3 and T-4 (Fig 2). Significantly ($P>0.05$) higher survival rate was observed in the hatchlings fed with chopped earthworms than rest of the three treatments. Stocking density is known to be one of the important parameters in fish culture, since it directly effects growth and survival, and hence production (Backiel and Lecren, 1978). Haylor (1992) observed that the growth rate of African catfish (*Clarias gariepinus*) larvae was significantly influenced by the density at which they were stocked. However, in the present study the stocking density was found to be suitable without any affect.

The trash fish of *Rasbara* sp., *Puntius* sp., hatchlings of Indian Major Carps are found to be best food for the *Ompok pabo*. A number of researchers have recommended live *tubificid* worms as the best food for rearing of larvae and fry of several fishes (Mollah and Nurullah, 1988; Gheyas, 1998 and Akter *et al.*, 2001). Live-food has been the most useful feed for rearing of fry of *Coregonus lavaretus* (Mahmoudzadeh, 2009). According to Hecht and Appelbaum (1987), the juveniles of *Clarias gariepinus* preferred live feed rather than formulated feed. In the present study, *tubifex* worm is replaced by live earth worm due to its high protein content comparing to that of *tubifex* worm. The percentage composition of protein in earth worm is 67.68% (Kumar *et al*., 2007); while in live *tubifex* worm it is 32.13% (Sarowar *et al*., 2010). In *Ompok pabda*, formulated feed with the addition of piscimix helps to combat mortality, enhances survival rates and allows larger growth (Mukherjee *et al*., 2002). In *Clarias batrachus*, the artificial feed was prepared with a mixture of molluscan meat (70%), egg (20%), soybean cake (10%) and vitamin B premix (500mg / kg feed) and then applied in the form of dough balls (Mahapatra, 2004).

Table 1: Growth performance and of *Ompok pabo* hatchlings after 4 weeks of rearing; mean ± SD with range in parentheses

Parameters	Treatments			
	T-1	T-2	T-3	T-4
Initial length (cm)	0.8 ± 0.2 (0.6-1.0)	0.8 ± 0.2 (0.6-1.0)	0.8 ± 0.2 (0.6-1.0)	0.8 ± 0.2 (0.6-1.0)
Final length (cm)	5.0 ± 0.2 (4.7-5.2)	5.2 ± 0.2 (4.8-5.4)	5.5 ± 0.3 (5.2-5.8)	5.3 ± 0.2 (5.0-5.5)
Initial weight (g)	0.013 ± 0.001 (0.012-0.015)	0.013 ± 0.001 (0.012-0.015)	0.013 ± 0.001 (0.012-0.015)	0.013 ± 0.001 (0.012-0.015)
Final weight (g)	0.492 ± 0.055 (0.438-0.547)	0.512 ± 0.063 (0.454-0.572	0.598 ± 0.065 (0.547-0.650)	0.537 ± 0.058 (0.490-0.583)
Weight gain (g)	0.472 ± 0.037 (0.463-0.509)	0.496 ± 0.031 (0.486-0.527)	0.581 ± 0.035 (0.572-0.616)	0.520 ± 0.033 (0.516-0.553)
Length gain (cm)	4.2 ± 0.3 (4.0-4.4)	4.4 ± 0.2 (4.2-4.6)	4.7 ± 0.2 (4.5-4.9)	4.5 ± 0.3 (4.3-4.8)

Table 2: Mean values (± SD) of water quality parameters of weekly samples over the four weeks experiment

Parameter	Treatments

	T-1	T-2	T-3	T-4
Temperature (^{0}C)	30.5 ± 0.53	30.8 ± 0.61	31.0 ± 0.57	30.9 ± 0.48
pH	8.1 ± 0.1	8.0 ± 0.1	7.9 ± 0.2	8.1 ± 0.1
Dissolved oxygen (mg l^{-1})	9.76 ± 0.84	10.12 ± 0.31	9.85 ± 0.87	10.07 ± 0.54
Free CO_2 (mg l^{-1})	2.2 ± 0.44	3.3 ± 0.22	2.2 ± 0.33	4.4 ± 2.2
Alkalinity (mg l^{-1})	90 ± 8.0	95 ± 7.0	100 ± 5.0	95 ± 4.0
Hardness (mg l^{-1})	57 ± 4.8	62 ± 3.4	59 ± 5.2	61 ± 3.0
Chloride (mg l^{-1})	8.77 ± 1.24	7.25 ± 2.03	8.21 ± 1.91	9.70 ± 1.08

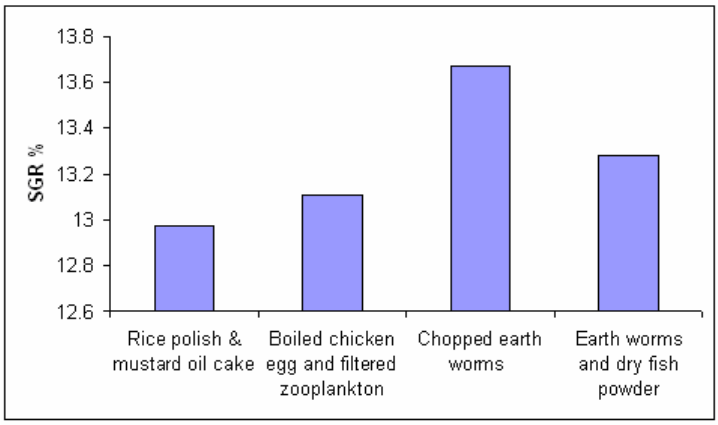

Fig 1: Comparison of specific growth rate (SGR %) of hatchlings during 28 days experimental periods.

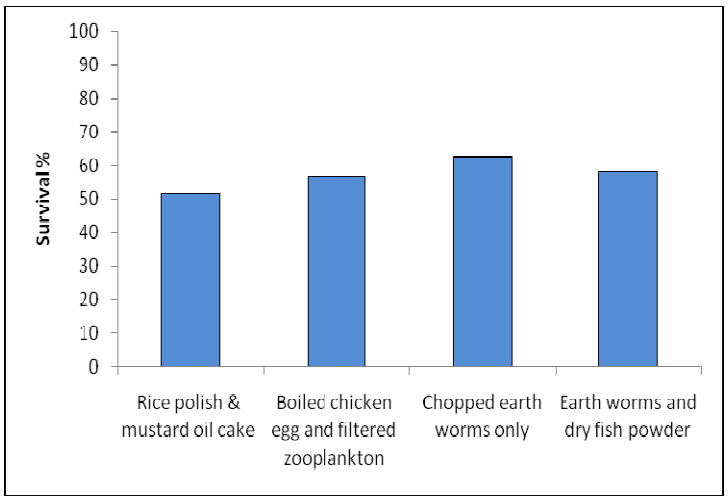

Fig 2: Comparison of survival rate (%) of hatchlings during 28 days experimental periods.

IV. CONCLUSION

From the above experiment, it can be concluded that the hatchlings fed with chopped earth worms have showed significantly highest growth (% SGR) and survival rate among the four treatments. Therefore, finely chopped earthworm is the best food for *Ompok pabo* hatchlings up to a stockable size. The findings of this experiment can help the farmers a lot in rearing and culture of this endangered species in captive condition.

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REFERENCES

[1] Akter, R, Gheyas, A. A and Mollah, M. F. A(2001) Growth and survival of shingi, *Heteropneustes fossilis* (Bloch) larvae under different stocking densities. Bangladesh J. Fish., 24 (1-2), pp. 7-11.

[2] APHA, Standard methods for examination of water and waste water. 17th edi., Washington, 1989, D.C.

[3] Backiel, T and Lecren, E. D (1978) Some density relationship for the population parameters. In: S. D. Gerking (editor). Ecology of Fresh Water Fish Production. Blackwell Scientific Publications, Oxford, pp. 279-302.

[4] Begum, M, Alam, M. J, Islam, M. A and. Pal, H. K (2008) On the food and feeding habit of an estuarine catfish (*Mystus gulio,* Hamilton) in the south-west coast of Bangladesh. Univ. j. zool. Rajshahi Univ, Vol. 27, pp. 91-94.

[5] Bhowmik, M. L, Mondal, S. C, Chakrabarti, P. P, Das, N. K, Das, K. M, Saha R. N and Ayyappan, S(2000) Captive breeding and rearing of *Ompok pabo* (Hamilton-Buchanan)-a threatened species, pp.120-121. In A.G.

Ponniah and U.K. Sarkar (eds). Fish Biodiversity of North East India. NBFGR. NATP Publ. 2, p. 228.
[6] Booth D and Alquezar, R (2002) Food supplementation increases larval growth, condition and survival of *Acanthochromis polyacanthus.* Journal of Fish Biology, 60**,** pp. 1126–1133.
[7] Boonyaratpalin, M, McCoy, E.W and Chittapalapong, T(1985) Snakehead culture and its socio-economics in Thailand. Annual Report, Fisheries and Aquaculture Department, Thailand, 1985, p. 27
[8] Boyd, C. E. (1979) Water quality management for pond fish culture. Elsevier Sci. Publ. Co. Amsterdam-Oxford, New York, pp. 318.
[9] Brown, M.E (1957) Experimental studies on growth. In: M.E. Brown (Ed.). The physiology of Fishes, Academic Press, New York, pp. 361-400.
[10] Datta, S, Rahman, M. M, Haque, M. A, Islam, M. M and Mollah, M. F. A(2003) Chromosomal Studies on *Ompok pabda* (Hamilton). On Line Journal of Biological Sciences, 3(5), pp. 460-465.
[11] Gheyas, A (1998) Studies on cold shock induced gynogenesis and artifical breeding performance in *Heteropneustes fossilis* (Bloch). A thesis submitted to the Department of Fisheries Biology and Genetics for M.S. degree, p. 132.
[12] Ghosh, K, Sen, S. K and Ray, A. K (2005) Feed utilization efficiency and growth performance in Rohu, *Labeo rohita* (Hamilton, 1822), fingerlings fed yeast extract powder supplemented diets. Acta Ichthyologica et Piscatoria, 35 (2) pp. 111–117.
[13] Haylor, G. S (1992) Controlled hatchery production of *Clarias gariepinus* (Burchell): Growth and survival of larvae at high stocking density. Aquacult. Fish. Manage, 23(3), pp. 303-314.
[14] Hecht, T and Appelbaum, S (1987) Notes on growth of *Clarias gariepinus* during the primary nursing phase. Aquaculture, 63, 1987, pp. 195-204.
[15] Hossain, Q, Hossain, M. A and Parween, S(2006) Artificial breeding and nursery practices of *Clarias batrachus* (Linnaeus, 1758). Scientific World, Vol. 4, No. 4, pp. 32-37.
[16] Hossain, A, Hasan, M and Mollah, M. F. A. (2011) Effects of Soybean and Mustard oil cake on the production of Fish life food Tubificid worms in Bangladesh. World Journal of Fish and Marine Sciences 3 (3) pp.183-189.
[17] Islam, M. N, Parvin, S. Hyder, F, Flowra F. A and Masud, A (2004) Food and feeding habit of juvenile *Channa punctatus* (Bloch) from a semi-closed water body in Chalan beel floodplain, Bangladesh. Journal of Biological Sciences 4(3), 352-356.
[18] Khanna, S. S (1996) An introduction to fishes. Central Book Depot, Allahabad, India.
[19] Kumar, P, Sagar, V, Choudhary A. K and Kumar, N. (2007) Vermiculture: Boon for Fish Farmers. Fishing Chimes, Vol. 27, No. 1, pp. 40-42.
[20] Mahapatra, B. K. (2004) Conservation of the Asiatic catfish, *Clarias batrachus* through artificial propagation and larval rearing technique in India. Aquaculture Asia, Vol. IX, No. 4, pp. 8-9.
[21] Mahmoudzadeh, H, Ahmadi M. R and Shamsaei, M (2009)Comparison of rotifer *Brachionus plicatilis* as a choice of live feed with dry feed in rearing *Coregonus lavaretus* fry. Aquaculture Nutrition, 15 (2), pp. 129-134.
[22] Mahmood, S. U (2006) Effects of different feeds on the larval rearing of Pabda, *Ompok pabda.* Bangladesh Journal of Zoology, Vol. 34, (No.1).
[23] Mollah M. F. A and Tan, E. S. P (1982) Effects of feeding frequency on the growth and survival of catfish *Clarias macrocephalus* (Gunther) larvae. Indian J. Fish., 28 (1-2), pp. 1-7.
[24] Mollah, M. F. A and Nurullah, M (1988) Effects of feeding frequency on the growth and survival of catfish (*Clarias batrachus* L.) larvae. Bangladesh J. Fish., 11(2), pp. 9-14.
[25] Mollah, M. F. A, Mamun, M. S. A, Sarowar, M. N and Roy, A(2009) Effects of stocking density on growth and breeding performance of broodfish and larval growth and survival of shol, *Channa striatus* (Bloch), J. Bangladesh Agril. Univ. 7(2), pp. 427-432.
[26] Mondal, K, Kaviraj, A. Mukhopadhyay, P. K, Datta, M. and Sengupta, C.(2007) Evaluation of Fermented Fish Offal in Formulated Diet of the Indian Major Carp, Rohu, *Labeo rohita* (Hamilton). Acta Ichthyologica et Piscatoria, 37(2), pp. 99–105.
[27] Marimuthu K and Haniffa, M. A (2007) Embryonic and Larval Development of the Striped Snakehead *Channa striatus.* Taiwania, 52(1), pp. 84-92.
[28] Mukherjee, M, Praharaj A, and Das, S (2002) Conservation of endangered fish stocks through artificial propagation and larval rearing technique in West Bengal, India. Aquaculture Asia, Vol-VII, No-2, pp. 8-11.
[29] Nagavallemma, K. P, Wani, S. P, Stephane, L,. Padmaja, V. V, Vineela, C,. Babu M. R and Sahrawat K. L. Vermicomposting: Recycling Wastes in to Valuable Organic Fertilizer. Global Theme on Agroecosystems Report no. 8, Patancheru 502324, Andhra Pradesh, India: International Crops Research Institute for the Semi-Arid Tropics, pp. 20.
[30] NBFGR, (2010) Threatened freshwater fishes of India. Published by National Bureau of Fish Genetic Resource (ICAR). Lucknow, U.P., pp.1-20.
[31] Rahman, M. S, Chowdhury, M. Y, Haque, M. A and Haque, M. S(1982) Limnological studies of four ponds. Bangladesh J. Fish., 2-5 (1-2), pp. 25-35.
[32] Rahman, A, Yeasmine, S and Khan, M. M. (2008) Growth, survival and production of threatened silurid catfish, *Ompok pabda* (Hamilton) fingerlings in nursery ponds. Malay. Appl. Biol., Vol. 37 (1), pp. 47-56.
[33] Sahoo, S. K, Giri, S. S, Chandra, S and Sahu, A. K(2010) Management in seed rearing of Asian catfish, *Clarias batrachus*, in hatchery conditions. Aquaculture Asia Magazine, Vol. XV, No. 1, pp. 23-25.
[34] Sarkar, U. K, Deepak, P. K, . Negi, R. S, Paul, S. K and. Singh, S. P(2005) Captive breeding of an endangered fish *Ompok pabda* (Hamilton-Buchanan) using different doses of Ovaprim. J. Inland Fish. Soc. India. 37(2), pp. 37-42.
[35] Sarowar, M. N, Jewel, M. Z. H, Sayeed, M. A and Mollah, M. F. A(2010) Impacts of different diets on growth and survival of *Channa striatus* fry, Int. J. BioRes. 1(3), pp. 08-12.
[36] Yamagashi, Y, Mitamura, H, Arai, H. N. Mitsunaga, Y, Kawabata, Y, Khachapicha M and Viputhanumas, T(2005) Feeding habits of hatchery reared young Mekong giant catfish in a fish pond and in Mae Peum reservoir. Proceeding of the 2nd International symposium on SEASTAR 2000 and Asian Bio logging Science (The 6th SEASTAR 2000 Workshop). Arai, N. (ed.), pp. 17 – 22.

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Autonomous Network Security for Detection of Network Attacks

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Abstract- As a use of network increases for critical transaction, so huge damages are caused by intrusion attacks hence there is the need of Computer network security. To protect network against various active and passive attack, various technique have been suggested .Traditional methods depends on specialized signatures of previously seen attacks, or on expensive and difficult to produce labeled traffic datasets for profiling and training. In this paper, network attack are detected in unsupervised way without following the traditional way of signatures or labeled traffic.

Index Terms-Anomaly Detection; Intrusion Detection System; Automatic Generation of Signature; Autonomous Security

I. INTRODUCTION

Network attack detection is the very challenging task for the network operator in today's internet. It is being challenging task because network attack are moving targets, they are not steady. Attacker may launch every time new attack, which is not seen previously. So there is the need of detection system that will be able to detect various attacks of different range and with variety of characteristic [3]. This detection system should use the very less amount of previous knowledge or no use of any type of information at all.

In research literature and commercial detection systems there are two different approaches namely signature based detection and anomaly detection for detection of attack. Signature based detection relies on the use of specifically known pattern of unauthorized behavior. It depends on sniffing packet. It monitors and compares the packet with predetermined attack patterns which are also known as signature. That is signature based detection system is used to detect those attacks which they are program to alert on. This detection system cannot defend against unknown attack. On the contrary, Anomaly detection builds normal operation traffic profile which detects anomalies as the activities that deviate from the baseline [5]. Thus it uncover abnormal pattern of behavior. This detection system can detect new, previously unseen attack. But as it has to build normal operation profile and it require training to construct normal operation profile and hence it is being time consuming. The new services and applications are constantly emerging and this type of detection is being difficult.

In this paper the approach is used to detect both known as well as unknown attack. this is done by the production of signature that determine the attack in an online basis algorithm that is being applied for characterizing attack will run in consecutive three stages, which is being represented by flow as shown below in figure 1.

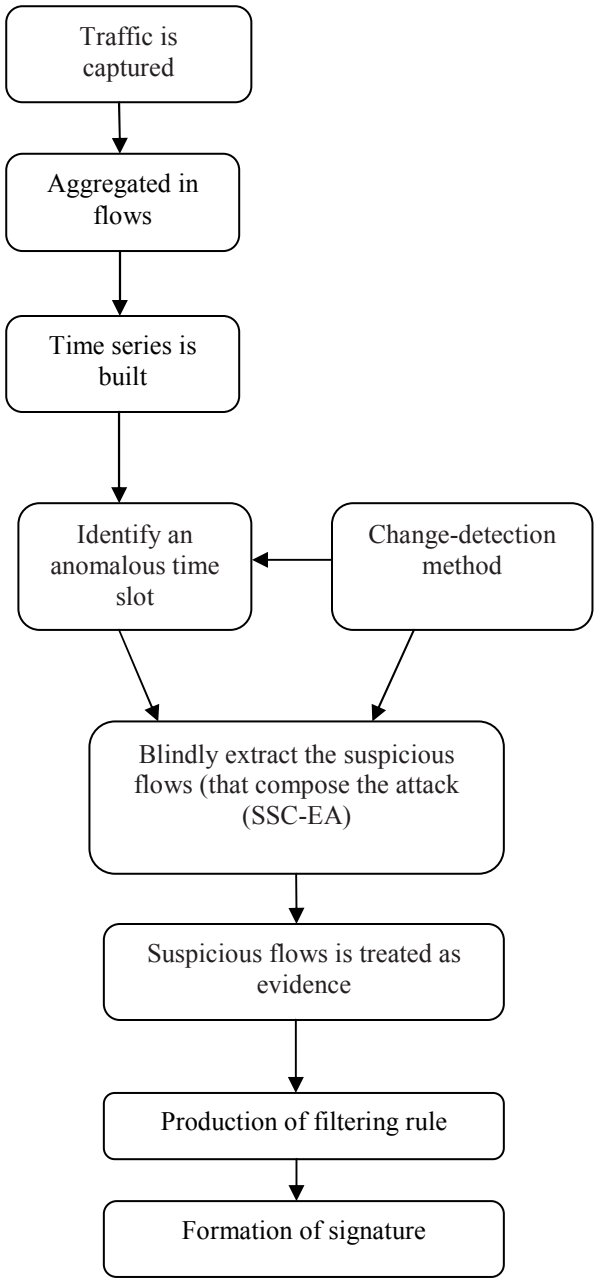

Figure 1: Flow of algorithm

The algorithm follows in three consecutive stages. Firstly, using a temporal sliding-window approach, traffic is captured and it is aggregated in flows. This is done using different levels of traffic aggregation. For simple traffic metrics such as number of bytes, flows in each time slot, time series are built. And any change-detection method is applied to identify an anomalous time slot.

In the second stage unsupervised detection algorithm begins. It uses the output of first stage as the input. Subspace clustering (SSC) and Evidence Accumulation (EA) provides method which can extract the abnormal or suspicious flow from the previous output.SSC and EA will provide the traffic structure which further can be used to produce filtering rule. Filtering rule helps to provide characteristic of attack[8] .But when the network operator deal with the unknown attack, the characterization of attack may became much more difficult as it require good, easy, simple information as the input .To remove this issue, new traffic signature is developed by combining relevant filtering rules. This signature will detect the attack coming in future; this is the important step toward autonomous security.

II. PREVIOUS WORK

Network attack is any activity that compromises the stability and security of information. It includes the activity such as destabilizing the network as the whole, gaining unauthorized access to the file or some time it is simply mishandling the software. The main objective of building the autonomous system is to detect such intrusion attack by scanning automatically the network activity. Because of the commercialization of the Internet, intrusion incidents to computer systems are increasing. Due to its extended network connectivity, Computer systems are turning out to be more and more susceptible to attack. As it is not theoretically possible to set up a system with no vulnerabilities, intrusion detection has emerged as a significant field of research, from a large quantity of routine communication activities. Several machine learning, Intrusion detection has emerged as a significant field of research. to detect intrusion activities
(ML) algorithms, for instance Neural Network , Support Vector Machine , Genetic Algorithm ,Fuzzy Logic , and Data Mining have been extensively employed [6].

Over the years, attacks have become both increasingly numerous and sophisticated. Not only has there is a markable increase in the number of attacks, but along with that the sophistication and complexity has also increased. Thus many attacks are now relatively ‘‘user-friendly’’ and in-depth technical knowledge is no longer required to launch an attack. This has led to the rise of various groups of attackers, such as ‘‘script-kiddies’’, who while ignorant of how their attack works, can cause great damage. In Lipson (2002), this trend is represented graphically as shown in Figure 2. of Attack sophistication vs. intruder technical knowledge. Due to such scenario of network attack, it became important for the researchers and operators to know about trends in network traffic.

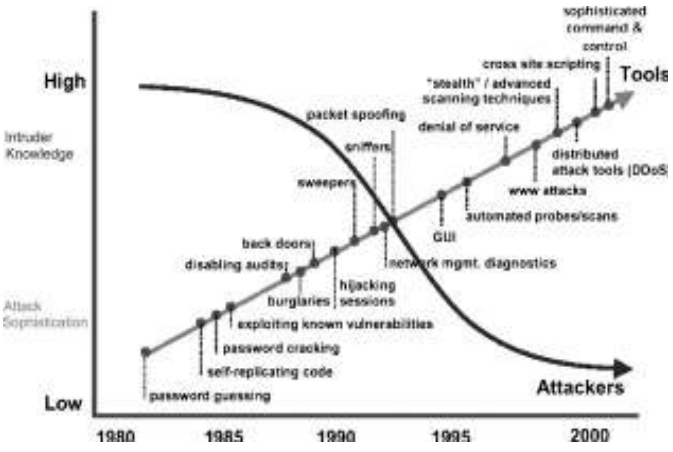

Figure 2: Attack sophistication vs. intruder technical knowledge

In the last few decades, Signature based detection technique is used for network attack detection in which; using network data the feature are extracted. These feature value are being compared with attack signature provided by human expert. Thus signature based detection relies heavily on use of specifically known pattern of unauthorized behavior.

Other approaches make the use of machine learning and mining of data techniques to train labeled network data. **Misuse Detection and Anomaly Detection** is the two major categories of data mining-based intrusion detection.

In anomaly detection system, system tries to define what is normal and then detect how analyzed data is different from normal model [8]. But meanwhile if some intrusion arises, it will not be considered as normal. It detects them initially. It is also possible that training data will contain traces of intrusion, so in such case future instance of the attack may not be detected rather, they will be treated as normal.

In misuse detection, set of labeled data is use to train the machine learning algorithm and the detection model is built. This detection model will be similar to the signature describe earlier. But this is also similarly vulnerable to new type of attack as the signature based method.

Various approaches are used to address the problem in anomaly detection. These approaches are dependent on analysis of data that is being available. Network data can be obtained at multiple levels of granularity such as end-user-based or network-based.

Today anomaly detection system should be able to detect a wide range of anomalies with diverse structure, using the minimum amount of previous information, or no knowledge at all.

It is being called as unsupervised anomaly detection. For that there is the use of KDD CUP data set[14]. For evaluating IDS, Lincoln Laboratory along with DARPA, launched DARPA 1998 dataset. It consists of testing data of two weeks and seven weeks of training data. The refined version of DARPA dataset that consist of only the network data is the KDD dataset. It consists of 4,900,000 connection vectors. Large number of unsupervised detection schemes proposed in Literature survey is based on clustering and outlier detection technique.

Autonomous Network Security using Unsupervised Detection of Network Attacks will work in the different way. It is

advantageous as the name suggests it is completely autonomous that is without any kind of calibration or previous knowledge, if it is plugged in monitoring system, it starts to work .Second advantage is that signatures build by the system are compact and easy which can characterize attack in effective way. Third and most important advantage is that it combines the robust clustering techniques such that many clustering problem are avoided.

III. UNSUPERVISED NETWORK ATTACK DETECTION

There are two knowledge based approaches, signature-based detection and anomaly detection as discussed above. IDSs, IPSs, and firewalls uses signature based detection. Signature based detection system can detect those attack which it is train to alert on. While anomaly detection uses labeled data for the creation of normal operation traffic profiles. But as this approach requires training for profiling, thus it becomes time consuming work. Thus this paper concentrates on tackling anomaly detection problem. There is the requirement of analysis technique which is not depending on knowledge that is knowledge independent technique.

Aiming at discovering Knowledge Independent system, new proposed algorithm is unsupervised network attack detection algorithm. The figure describing algorithm is as shown in figure 3.

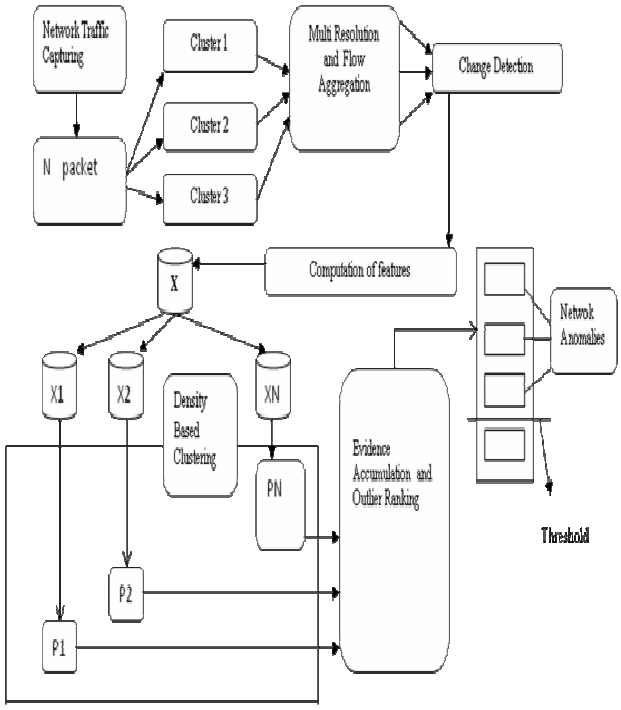

Figure 3: Description of unsupervised network attack detection

1. Detecting Anomalous Time Slot:

Initially traffic is captured and packets are analyzed by aggregating them in multi resolution flow. On the top of these flow, different time series is built. And anomalous change is defined by change-detection algorithm based on time-series analysis.

2. Determining degree of abnormality:

There is the use of robust clustering algorithm like Sub-Space Clustering (SSC), Density-based Clustering, and Evidence Accumulation Clustering (EAC) as combination of these approaches for providing traffic structure. These traffic structures are used as the evidence for determining by how much degree the traffic is not normal. Thus the output of second stage is outlying flow.

3. Declaring anomalies:

Using a simple threshold detection approach, outlying flow which is top ranked is flagged as anomalies.

IV. MULTI-RESOLUTION FLOW AGGREGATION AND CHANGE DETECTION

Unsupervised network attack detection algorithm performs unsupervised anomaly detection. These are captured in consecutive time slot of fixed length. These are further aggregated in IP flows. At different flow-resolution levels IP flow are additionally aggregated using 9 different aggregations key. Thus there is coarser to finer-grained resolution.

Now to detect anomalous time slot, time series is built for traffic metrics which include IP flows per time slot, number of bytes, packets. For doing this aggregation key is used. Change detection method is then used on time series, such that at arrival of every new time slot, change detection method analyses different time series by using each aggregation key.

V. UNSUPERVISED ATTACK DETECTION THROUGH CLUSTERING

IP flows in the flagged time slot are used as the input for unsupervised attack detection. At this step unsupervised network attack detection algorithm ranks the degree of abnormality of every flow by using clustering and outliers analysis techniques. For doing so, at two different resolutions, using either IP source or IP destination aggregation key IP flows is analyzed. There are two different anomalies on the basis of which traffic anomalies can be classified, 1-to-N anomalies and N-to-1 anomalies. When many IP flows are transferred from same source to different destination they are said to be 1-to-N anomalies. Example of 1 to N includes worms or virus. Likewise N-to1 means IP flows when transferred from different sources to one destination. Examples consist of DDoS attacks and flash crowds. 1-to-N anomalies are highlighted by IPsource. While N-to-1 anomalies are more easily detected with IP dst key. Even there are highly distributed anomalies, but the use of both key i.e, IPdestination key and IPsource key number of IP flows, can be represented as outliers. Unsupervised network attack detection algorithm is based on clustering technique. Homogeneous groups of similar characteristics or clusters are formed by partitioning a set of unlabeled samples. Outliers are those Samples that do not belong to any of these clusters. It is important to identify the cluster properly to determine the outlier. Our aim is to determine or ranking how much different these are. Different partitions of data are produce by Different clustering algorithms. Or different results are produce, even the same clustering algorithm are used

by using different initialization parameters. Thus present clustering algorithm is not robust. To remove this major drawback of lack of robustness it is done by using the notions of clustering ensemble and multiple clustering combination. For unsupervised network attack detection the combination of Subspace and evidence accumulation clustering is used.

VI. CONCLUSION

The completely unsupervised algorithm for detection of network attacks has many interesting advantages with respect to previous proposals. Exclusively unlabeled data is used for detection and characterization of network attacks; it does not depend or assume any signature, model, or data distribution. Thus new previously unseen attack can be detected, without using statistical learning. Robustness is removed by combining the notions of Sub-Space Clustering and multiple Evidence Accumulation, the algorithm avoids the lack of robustness of general clustering approaches, improving the power of discrimination between normal-operation and anomalous traffic.

REFERENCES

[1] E. Kohler, J. Li, V. Paxson, and S. Shenker. Observed Structure of Addresse in IP Traffic. In Internet Measurement Workshop, Marseille, November 2002

[2] Y. Zhang, S. Singh, S. Sen, N. Duffield, and C. Lund. Online Identification of Hierarchical Heavy Hitters: Algorithms, Evaluation, and Applications. In Internet Measurement Conference, Taormina, Italy, October 2004

[3] S. Kim and A. L. N. Reddy. A Study of Analyzing Network Traffic as Images in Real-Time. In IEEE International conference of communication, 2005.

[4] S. Kim, A. L. N. Reddy, and M. Vannucci. Detecting Traffic Anomalies through Aggregate Analysis of Packet Header Data. In Networking, 2004.

[5] A. Lakhina, M. Crovella, and C. Diot. Characterization of Network-Wide Anomalies in Traffic Flows (Short Paper). In Internet Measurement Conference, 2004.

[6] A. Lakhina, M. Crovella, and C. Diot. Diagnosing Network-Wide Traffic Anomalies. In ACM Special Interest group on Data Communication, Portland, August 2004.

[7] K. Xu, Z.-L. Zhang, and S. Bhattacharyya. Profiling Internet Backbone Traffic: Behavior Models and Applications. In ACM Special Interest group on Data Communication, 2005.

[8] Pedro Casas,Johan Mazel .Steps Toward Autonomous Network Security :Unsuperised Detection of Network Attacks,IEEE International conference of communication , 2011.

[9] Wiilliam Stalling Cryptography and Network Security , third edition.

[10] D. Fasulo, \An analysis of recent work on clustering," Tech. Rep., University of Washington, Seatle. http://www.cs.washington.edu/homes/dfasulo/clustering.ps. http://citeseer.nj.nec.com/fasulo99analysi.html, 1999.

[11] D. Judd, P. Mckinley, and A. K. Jain, \Large-scale parallel data clustering," IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 19, no. 2, pp. 153{158, 1997).

[12] S. K. Bhatia and J. S. Deogun, \Conceptual clustering in information retrieval," IEEE Trans. Systems, Man, and Cybernetics, vol. 28, no. 3, pp. 427-536, 1998.

[13] C. Carpineto and G. Romano, \A lattice conceptual clustering system and its application to browsing retrieval," MachineLearning, vol. 24, no. 2, pp. 95-122, 1996.

[14] L. Parsons et al., “Subspace Clustering for High Dimensional Data: a Review”, in ACM SIGKDD Expl. Newsletter, vol. 6 (1), pp. 90-105, 2004.

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Estrogenic Nature and Effects of Endosulfan in White Albino Mice

Queen Sarma, Dr. Jogen Kalita

Abstract- An invisible assault on life is underway. The indiscriminate and injudicious use of organochlorine pesticides for better agricultural productions and protection of crops respectively invariably leads to their accumulation in crop products and thereby affect the whole environment. Endosulfan is one of the most commonly used organochlorine pesticides with moderate toxicity. In the present study two doses of endosulfan were administered (s.c) to ovariactomised albino mice. The first dose of the chemical 500 µg/kg/BW showed increase in uterine weight (normal 27.5 mg, treated 105.3mg) decrease in serum cholesterol level (normal-459.57mg/100ml, treated-182.97mg/100ml), increase in uterine protein concentration (normal-234 µg/gm, treated-1136.33 µg/gm). The initiation of oestrous cycle in overiactomized female mice in the treated group also indicated significant biological effect. That was a clear indication of oestrogenic nature of Endosulfan. The above-mentioned effects were found to be dose dependent. Nevertheless, in dose concentration 1000µ g/kg/BW there was a trend towards the decrease in uterine weight. In male mice reduction in epidedymal sperm count (normal 30500/µl, treated-5750/µl), decrease in testes weight (Normal-0.08745gm, treated-0.04953gm) were observed. The oestrogenic activity of endosulfan in the present study was found to be about 10,000 fold less than that of 17B-oestradiol, i.e. the endogenous estrogen. This study established the estrogenic nature and effects of endosulfan in mice.

Index Terms- environmental oestrogens, estrongenic nature, effects of endosulfan, white albino mice, effects of organochlorine pesticides on mice, endocrine disruption

I. GENERAL INTRODUCTION

For a number of years concern has been growing over changes in the health and fecundity of both humans and wildlife which may be associated with the disruption of the hormonal system by environmental chemicals .The issue of environmental disruptors has become a focus of considerable media attention through out the world and is now on the agenda of many experts groups, panels and steering committees of governmental organizations, Industries in USA, Europe and Japan. The major findings driving this interest are derived from experimental and epidemiological studies on humans and wildlife, particularly those pertaining to effects on reproductive health, which may result from exposure to endocrine disruptors early in life.

The mechanisms through which endocrine disruptors interfere with the hormonal system are complex and not yet well understood. The extent of disruptors effect on human beings is still being debated, as many factors limit research and prevent researchers from leading conclusions as easily as they do for wildlife. Since the endocrine system is sensitive to perturbation, it is likely to target for disturbance. In contrast to natural hormones found in animals plants some of the components and by product of many manufactured organic compounds that interfere with the endocrine system are persistent and undergo bio magnification in the food web, which makes them of greater concern as endocrine disruptors.

Man made chemicals range across all continents and oceans. This endodisruptors are found in native population from the Arctic to the tropics, as because of their persistence in the body, can be passed from generation to generation. The seriousness of the problem is exacerbated by the externally by the low levels of hormones produced naturally by the endocrine system which are needed to moderate and induce appropriate responses. In contract many endocrine disrupting chemicals even if less potential than the natural products, are presents in living tissues at concentrations millions of times higher than the natural hormones. Wild life, laboratory animals and human exhibit adverse health effects at contemporary environment concentration of man made chemicals that act as endocrine disrupt.

The main hypothesis of my study includes as Organochlorine pesticides especially Endosulfan is a such harmful group of compound that bind to the hormone receptors and it can induce inappropriate endocrine system responses and have oestrogenic activity. It can bind to progesterone receptors, inhabits synthesis of androgen leading to reproductive health effects.

II. REVIEW OF LITERATURE

The indiscriminate and injudicious use of chemicals, apart from the occupational hazard in the developing world, is today posing a serious threat to human heart causing disruption of the endocrine system. Deformity and embryo mortality in birds and fish caused by exposure to organochlorine insecticides, depressed thyroid and immunofunction in fish eating birds, feminization of fish near municipal effluent outlets. Source: Environmental and endocrine disrupting substances in the Environment 2000.

A literature review reported an another research by scientist when male fetouses were inadvertently exposed to abnormal doses of synthetic estrogens such as diethyl stilbeztrol , observe a decrease in sperm count increase in disease in male genital organs. These results have blazed a trail for the world scientific community, which is now studying the issue of active compounds in the environment in relation to the human population. Over the past years many countries have witnessed an increase in diseases related to most functions of the endocrine system. In Canada, Ontario has experienced an 2% increase each year in the Endocrine of testicular cancer (60% over 30 years)

Some studies indicate that most of the studied products appear to have at least some Expects on mammals. Other studies suggested that the effects of endocrine disruptions are seen parentally .A Danish study of 18 organochlorine products has linked the incidences of breast cancer to pesticide and has shown that some organochlorines may have slight estrogenic effects.

Scientists agree on at least the current data on endocrine disruption are inadequate. More comprehensive studies of the endocrine system and toxic substances must be conducted to establish clearly the scope of the problem and to develop strategy for prevention and intervention Hopefully, this short review has illustrated that there nece chemicals which are still not studied due to inadequate data and raises uncertainty if these estrogenic chemicals causes damage to the health or might be beneficial to the endocrine system.

The expanding definition and hypothesis of Endocrine disruption: -

Originally, the concern over endocrine disruption was based on perceived effects on the reproductive system and it was usual to refer to the chemicals concerned as oestrogen or oestrogenic chemicals, later chemicals were found that could block oestrogenic responses or androgenic responses and it was soon recognized that chemicals could effect other elements of the endocrine system via interaction with hormone receptors. The term endocrine disruptor is now preferred because it allows inclusion of health effects thought to results from interference with any part of the endocrine system, including thyroid; thymic acid, pituitary hormones.

In order to establish concensus on the scope of the endocrine disruptor issue, it essential to agree a precise definition of an endocrine disruption (ED).According to a major European Workshop "An Endocrine disruption is an exogenous substance that causes adverse health effects in an intact organism, or its progeny , subsequent to changes in endocrine function. The U.S. environmental Protection Agency (EPA) risk assessment forum

"An endocrine disruption is an exogenous agent that interferes with synthesis, secretion, transparent, binding, action on elimination of natural hormones in the body that are responsible for the maintenance of homeostasis, reproductive development and behavior."

Hypothesis:

The hypothesis of environmental endocrine disruption may be stated in the following manner: -

"Environmental pollutants that bind to hormone receptors are able to induce inappropriate or disproportionate endocrine system responses, thereby causing adverse disruption of normal physiologic function."

III. TOXICITY OF ENDOSULFAN

A. Classification

Primary use - Insecticde
Secondary use - Acaricide
Chemical Group - Organochlorine compound.

B. Chemical Identity

Technical grade endosulfan contains atleast 94% of 2 pure isomers, and endosulfan (Mair –Bode 1968,NRCC 1975). The and isomers of endosulfan are present in the ratio of 7:3, respectively.

Pesticide Action Network (PAN), an international network focused on protecting community health and the environment applauds the recent recommendations by Government chemical experts that politicians include the toxic chemical endosulfan on the Prior Informed Consent (PIC) list of the Rotterdam Convention in 2008.

"This deadly pesticide is a leading cause of poisonings world wide," says –Carima Weber of PAN Germany.

"Communities should not have to suffer from exposure to Endosulfan when so much is known about its dangers". Endosulfan is acutely toxic, is known to disrupt the hormone system, can damage the human reproductive system and has been linked to breast cancer among other health effects.

C. Acute toxicity to wild life

Endosulfan is acutely toxic to wildlife, cats, dogs, housefly, hone fly, birds, amphibians, fish, aquatic insects, crustaceans, alligators, crocodiles, turtles, soil microorganisms, and arthropods.

It has caused excessive fish kills in numerous countries, including Germany, Canada, USA, and decline of amphibians.

Endocrine Disruption - Endosulfan is known to interface with hormonal mechanism at any low level of concentration and existing levels of environmental contaminations pose a threat to the long term verbility of animal population, and of chronic illness and health in humans.

It can blind to progesterone receptors, increasing the risk of miscarriages. It also inhibits testicular synthesis of Androgen and alters sex ratio. Impacts on male reproductive health impacts include –Reduce sperm count , testicular damage, delayed sexual maturity.

D. Chronicle effects

Damages blood cells, thyroid, kidneys, liver, and muscles. It is hepatotoxic, genotoxic, mutagenic, inhibits immune function.

It has produced malignant neoplasm and lymph sarcomas in rats.

E. Persistence

It is volatile and persistent and also has evidence of wide spread in human, environment and food chain contamination mood of world.

Residues of endosulfan have been detected in the environment in areas far distant from where it has been used, in air in the arctic and Mount. Everest regions, lichen, snow-water, lake-water, snow samples in California Mountains

F. Bioaccumulation

The US EPA considers endosulfan as having high potential to bioaccumulate in fish, and hence may affect animals higher up the food chain. It has been found in trout from lakes in North America, and in fish in Benin, Nigeria and Uganda.

Again residues were found in human umbilical cord blood, placental tissue, breast milk, fat, blood, urine-in Columbia, Japan, India, Spain.

IV. RESEARCH METHODOLOGY

A. Study of oestrous cycle (Ref-Allen's method)

10 mice were taken for this experiment driven from a colony maintained, by a grant from the Animal house of the zoology department. 4 groups were made for the study- Control group ii) Concentration -1 iii) concentration-2IV) Vehicle group

With the help of loop the vaginal smear was taken in the slide, when dried methanol is poured and lastly stained with methylene blue. After staining with methylene blue for about 15 minutes, slides were washed, dried and examined. Thus for a week continuous cycle was studied.

B. Ovariactomy of Mice

Ketamine dilution - 1:9 ratio.200mg/kg (ref. Lamb ,W, and Jones E1984,vet, Anasthesia, 2nd ED-K.M.Verghese and co, Bombay,pg-435), taken 350 mg/kg

Xylazine, 50 mg/kg.=10mg/ml.1:9 dilution .

Thus the mixture of 2 ml katamine and 1 ml xylazine were injected to the mice and after 2 minutes mice are ovariactomized. Both ovaries are removed from the body. Now with the help of thread and needle incision portion is stitched , newspaper is applied and kept for 14 days After 14 days,

C. Concentration of Endosulfan ie.5 mg/kg BW and1 mg/kg BW were prepared.

G_1 - Treated with oestradiol (2) Animals =.1ml

G_2 - Concentration - 1.5mg /kg BW (3) animals =500 mg/kg BW

G_3 - Concentration - 2.1mg /kg BW (3) animals=1000mg/kgBW

G_4 - Vehicle group = Olive oil =.1 ml.

Chemicals were applied for 1 week.

D. Determination of Protein from Uterine tissue

Frozen tissue is grinded using Mortes, and pested adding liquid N_2 - Homogenized to make 1% Homogenate with DH_20 - 1 ml of 1% homogenate taken in a test tube - 1ml of cold 10% TCA added and stand for 10 minutes - Centrifugal at 400 RPM for 10 minutes - Supernatant disordered and 5% TCA (2.5) ml. added to the precipitate - Centrifugal at 1000 RPM for 5 minutes - Supernatant dishoarded and precipitate in 2.5 ml 95% ethanol - Centrifugal at 1000 RPM for 5 minutes - The ppt mixed with 2-3 ml of alcoholic ethane (3:1) - Centrifugal twice at 3000-4000 rpm for 5 minutes. Supernatant dishoarded and to be containing pallet inverted on a tissue paper for 30 minutes 3ml of .1N NaOH added to the tubes and kept at 30c for 3-4 hrs.

Black Standard Unknown

1ml of DH2O taken – 5 no's of different concentration .1ml of sample in one test tube.

S_1 - 100ml+.9ml of DH_2O .9 ml of DH_2O

S_2 . 200ml+.8 ml of DH_2O

S_3 - 400ml+.6 ml of DH_2O

S_4 - 800ml+.2 ml of DH_2O

S_5 - 1ml

.5ml of solution D added and allowed to stand for 15 minutes - .5ml of Folino-phenal reagent for 30 minutes - O.D. measured at 670 mm.

E. Estimation of Serum Cholesterol levels

jepidymal sperm is collected and then diluted with .5ml of saline. Now from the diluted solution , 1ml is poured over j

F. Sperm count

From the sacrificed 1ml of epidymal sperm is collected and then diluted with .5ml of saline. Now from the diluted solution, 1ml is poured over the slide and covered with cover slip and observed under microscope.

V. RESULTS AND DISCUSSION

A. Case Study 1 - Study of the estrous cycle after treatment

GROUP	Hour PE	E	ME	DE	TOTAL
G1-1	48 hrs	48 hrs	124hrs	48 hrs	168hrs
G1-2	48 hrs	48 hrs	24hrs	48 hrs	168hrs
G2-1	24hrs	48 hrs	24hrs	48 hrs	144hrs
G2-2	48 hrs	48 hrs	24hrs	48 hrs	168hrs
G2-3	48 hrs	48 hrs	24hrs	48 hrs	168hrs
G3-1	24hrs	48 hrs	24hrs	48 hrs	144hrs
G3-2	24hrs	48 hrs	48 hrs	48 hrs	168hrs
G3-3	24hrs	24hrs	48 hrs	48 hrs	144hrs
G4	X	X	X	X	X

Fig - Study of estrous cycle

Conclusion - Endosulfan has estrogenic activity which induces estrous cycle. Initiation of estrous cycle was observed in the ovariactomized mice of the treated group whether in the normal group there was no trace of estrous cycle. In the G_1NO-2 estrous cycle completed in 7 days .G_2NO-2 showed completion in 7 days .Thus it can be concluded that endosulfan has estrogenic activity which induces estrous cycle.

B. Case Study 2 - Determination of cholesterol level in female group

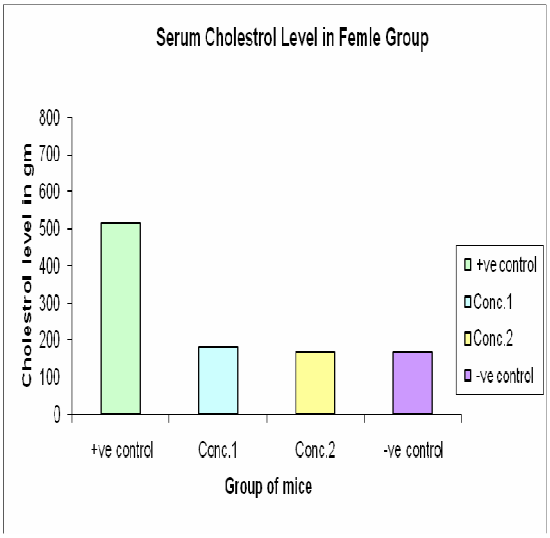


Fig - Level of cholesterol in the female mice

Conclusion - From the above analysis it can be concluded that endosulfan decreases the serum cholesterol level in the treated groups of mice.

C. Case Study 3 - Estimation of Uterine protein

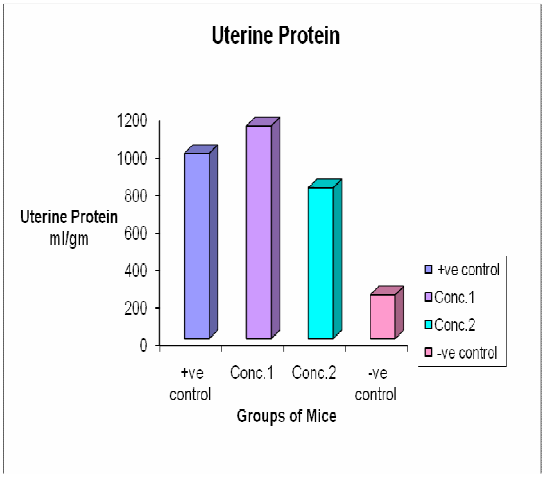


Fig - Estimation of uterine protein concentration

From the analysis it is found that the protein concentration increases suddenly when the first dose concentration was applied but remarkably decreases again with the increase of the dose concentration.

Conclusion - It can be concluded the protein level increases to a optimum level but decreases afterwards with the increase of endosulfan dose.

D. Case Study 4 – Sperm count using haemocytometer

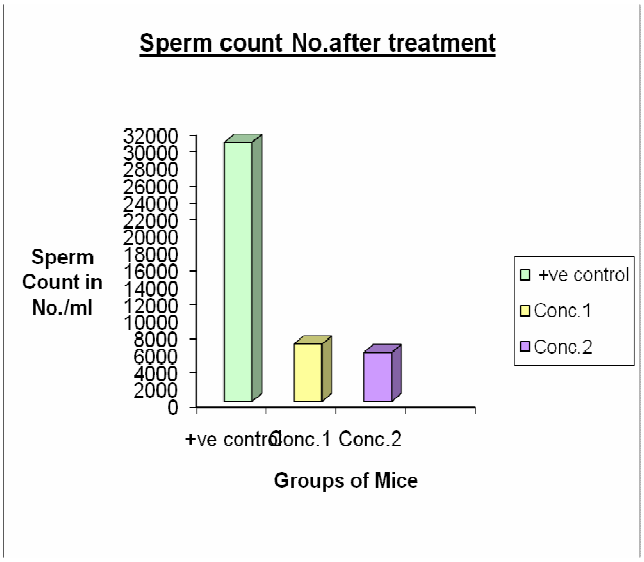


Fig - Sperm count from epidedymal fluid

Conclusion - From the analysis it is seem that is use of normal group sperm count is very high. But suddenly it decreases drastically in the treatment group. Infect the no of sperm decreases with the increase of the dose concentrations.

E. Case Study 5 – Uterine weight after treatment

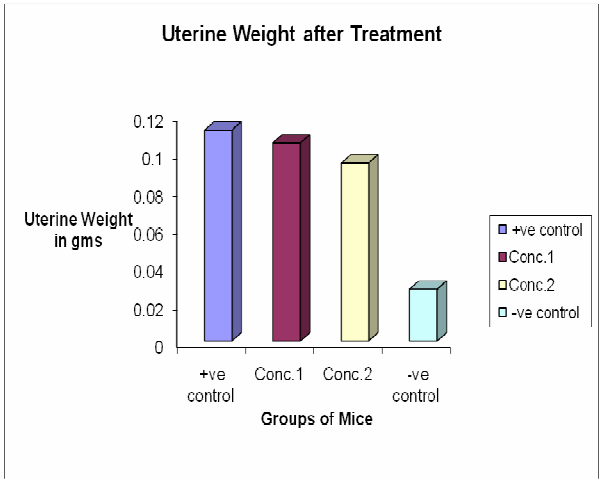


Fig - Estimation of uterine weigh after treatment

Conclusion - From the above analysis it is seem that as the dose concentration increases upto 500ml gradually the weight of the uterine muscles increases but after getting its optimum level uterine weight starts declining. At the concentration level of 1000ml it gets minimum.

F. Case Study 6 - Determination of testes weight after treatment

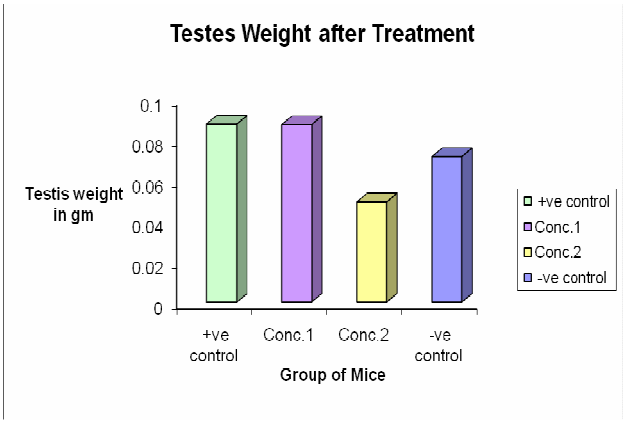
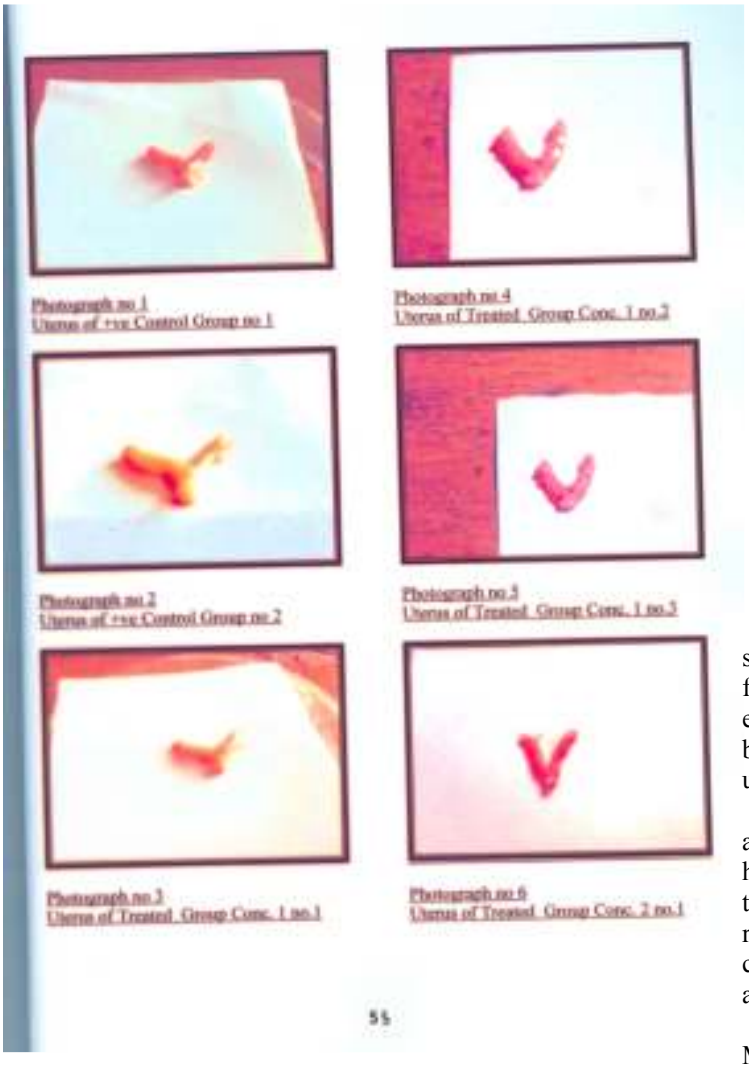


Fig - Determination of testes weight

Conclusion - The calculation of values also indicate that at dose concentration of 500ml/kg, the weight of testes reduces than the normal mice. But after getting an optimum value at concentration 1000 ml/mg little amount of weight increases and remains this. It shows that endosulfan has effects on testes structure .It degrades the testes histo architecture also.



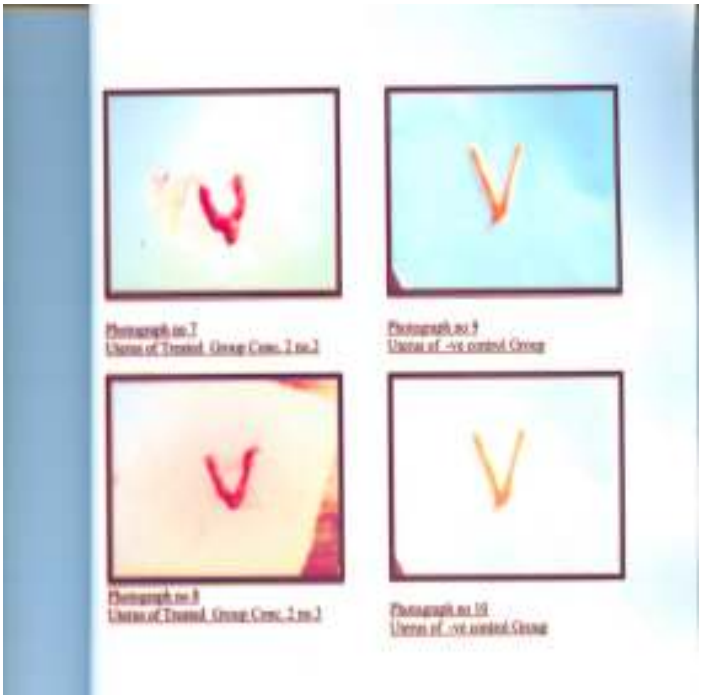


Fig - Uterus pictures of treated mice

VI. CONCLUSION

We are living in a newly made sea of estrogenic chemicals and similar toxic substances. There is growing evidence that risk from exposure to these toxic chemicals have been grossly under estimated. As a result the foundation of our health interaction between endocrine, immune and nervous system is being undermined by modern chemicals.

We are told the amounts of these toxicants entering our bodies are so tiny like a few grains of sand on the beach how can they hurt? Because of the exquisite complexities of life are designed to respond to natural hormones in the parts per quadrillion ranges. And now we are learning that this endo disrupting chemical exists at similar levels in our everyday environment and are assaulting our intricate biological system.

In the concluding part of the study there is a humble quote by Madam Rachel Carson “It is not my contention that chemical insecticides must never be used. I do contend that we have put poisons and biologically potent chemicals indiscriminately into hands of persons largely or wholly ignorant of their potentials for harm”.

From the study of my project work it is seen that endosulfan is acutely toxic substance causing serious health hazards and there should have more research on the topic.

ACKNOWLEDGEMENT

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REFERENCES

[1] Abu Zeid .1.etal 2000 , Behavioral and Biochemistry changes induced in a fresh water catfish [Unpublished]
[2] Brandt, v,etal -2001. exposure to endosulfan infarmers;2 case studies :American journal of Industrial medicine 39:646
[3] EXTOXNET, 1996.Extension toxicology Network. Pesticide information profile; endosulfan 3-
[4] International joint commission .1994.Supplemental information to the seventh biennial report.Washington,DC &Ottawa, Ontario.
[5] The endocrine disruptor resource centre ,Institute For Agriculture and Trade policy.
[6] U.S. general Accounting Office,1991 .Reproductive and developmental toxicants
[7] Joshi ,S.2001, children of Endosulfar .Down to earth 19:28 Feb 649
[8] Lang, L. 1993,Are pesticide a problem? Environmental Health Perspectives 101.578-583
[9] "Male reproductive Health and Environmental Xenoestrogen"Jorma Topiary .
[10] Myers's. 2000.Cotton Tangles. New Interventions list 323 [May 2000]
[11] PANAP;1996. Endosulfan data sheet . Pesticide action network-Asian Pacific, Malaysia.
[12] THANAL. 2001 Preliminary findings of the summery on the Inputs of Aerial spryly on the people and the ecosystem
[13] Ton,P. 2000 Endosulfan toxicology deaths and poisoning in Benn. Pesticide News 47;12-14
[14] Raloff .J. 1998 .common pesticides elobbers amphibians .Science News 159:150
[15] Pollner,f.1993.A holistic approach to breast cancer research.Environ.Health perspectives 101:116-120.

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iGain - Apriori: An interest gain based rule assessment for Association Rule Mining

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Abstract- At recent times many algorithms have evolved for excavating or mining the association rules. But only few of them got the significance. One among them that got prominence is the Apriori algorithm. The main ideology of this algorithm is to determine the continuously existing sets which allow deriving the important association rules and these rules must match up with the values of min support threshold and min confidence threshold. Keeping in view, the progress of effective mining and aim of fulfilling the customers desires our paper has put forward enhanced algorithms by presenting a new item measuring model interest gain along with interest items and frequency threshold. For validating these algorithms, effective testing has been done. The test considers the key values like the space and time complexity of the each algorithm and our algorithm has advanced many of the conventional ones.

Index Terms- apriori algorithm, dynamic mining, interest item, frequency threshold

I. INTRODUCTION

The world is advancing on the technical side, mostly in the field of artificial intelligence, progressing of database and statistical methodology likewise the development of the area of research, that is association rules is the most significant field for the new inventions of transaction database has also advanced the mining of the association rules especially in the knowledge. The mining is done from the huge sized data through which the inter relation between the item sets and their connection can be known through these association rules [1, 2].There are an unlimited technologies and methodologies at present for excavating the data or technically called mining. Some of them are association rules, clustering, neural networks, rough sets, genetic algorithms and so on. The most procedure in demand is the apriori algorithm and we utilize this algorithm which is a set of items that is connected as a relation among the rules.

The procedure consists of a categorization of solving two problems [3, 4]. They are:

1. We need to determine the item sets that occur recurrently which matches the minimum support.
2. Next is utilizing these determined item sets and relating them to minimum credibility to derive the association rules.

Among the two problems the initial one has the more concentration because it is transparency of time and space by which many association rules that are prevailing in recent times are working especially on determining the item sets that occur recurrently. To enhance the system of determining the item sets and expand the efficiency of association rules, there introduced some methodologies like the numeric association rules [5], multi-level association rules [6].

Following this methodology of improving the association rules a huge number of algorithms have been come into existence. But the algorithm that is above all the rest and that is utilized in our paper is the Apriori algorithm. Here we made an approach of using the apriori by presenting the new objects like the interest items and frequency threshold in order to dissolve the time complexity for the database to check for the items. Another advantage if this is that it can place the dynamic mining also in it for fulfilling the desires of the users and increase the performance of the algorithm to the maximum extent.

II. ASSOCIATION RULES

Let us assume the difficulties in a mall and the association rules are derived for those difficulties. These rules enable us to find out the connections among the various products available at the mall. The connections of the various products reveal the general interest of the consumer of the product and this methodology can be functionalized in consumer shopping, directory design, commercial publishing mail. The procedure of excavating the association rules was a concept of deep methodology mostly on the side of research which comprises of an uncountable amount of algorithms for the sake of excavation of the association rules. Due to the presence of these many algorithms the association rule excavation has become more profitable in all the research fields. The mining have a vast categorization and the data mining is highly established one [7, 8].

A. *Related Concepts*

Sequentially while starting the algorithm let us consider some assumptions for the clear understanding of the about the algorithm like:

Consider a transaction database $D = \{T_1, T_2, \ldots, T_n\}$ which constitutes of the following

- For the above transaction database i is a property assigned with some value.
- $I = \{i_1, i_2 \ldots, i_n\}$ is a set of all such properties existing consequently in the transaction.
- $T = \{i_1, i_2, \ldots, i_m\}(m \le n)$ is the transaction.
- $|D|$ is the count of the occurrences of the transaction database transactions in the sense that how many times a particular transaction database $D = \{T_1, T_2, \ldots, T_n\}$ has occurred. This provides the facility of reoccurring

iteratively. But there exists some obstacles due to this looping that is there is a chance of occurrences of the duplicate transactions. So to evade and resolve such kind of problems a distinct id has been given in our procedure for the individual transaction in the database namely TID.

- Sup(X) which is termed as the supportive degree is defined as the ratio of quantity of the X involved in the transaction database D.
- Conf (A⇒ B) represents the confidence when we consider the association rule (A⇒ B). This is defined as probability based on the condition that, existence of an item set B in the same constraint where the item set A exists.
- Coming to the Minimum support threshold minSup, it is defined as the least value that is to be attained by the item sets in processing the excavation.
- The Minimum confidence threshold minConf is the least value that should be attained by the association rules.

The entire item sets does not have the value of their supportive degree more than or equal to the value of the minSup. Only few of them have that value and they are classified as the frequent or recurrent item sets.

B. The introduction of traditional Apriori algorithm

At the outset, we excavate all the recurrent item sets, these are names as 1-itemsets, and this procedure is iterated recursively to excavate recurrent k-item sets (k> 1).The same methodology is followed even in the case of association rules. Initially we excavate all the association rules and later we determine the recurrent association rules. In particular we carry out the excavation of individual recurrent k-itemsets by considering those, whose minimum confidence threshold minSup is least in order to sort out significant individual recurrent k-itemsets. At last all the individual recurrent itemsets(k>0) are merged up to make the associating rules confidence value larger than the specified minimum confidence.

C. Illustration of the Apriori algorithms

A Transaction database is displaced in the table in given Table I, min Sup =50%,minConf =70%. The recurrent association rules in transaction database D have been the sent a request.

TABLE:1 TRANSACTION DATABASE

Tid	Itemsets
1	ABCDE
2	ABC
3	CDEF
4	ABE

The process performance is mentioned in below steps:
Initial step : Determining the frequent or recurrent item sets

1) Frequent 1 – itemsets
{{A},{B},{C},{D},{E}}
2) Frequent 2 – itemsets
{{AB},{AC},{AE},{BC},{BD},{CD},{CE}}
3) Frequent 3 – itemsets
{ABC}

Summary
$L=L_1 \cup L_2 \cup L_3$={{A},{B},{C},{D},{E},{AB},{AC},{AE},{BC},{BD},{CD},{ABC}
Secondary Step : looking up for the association from {ABC} Only

$$\{AC\} \to \{B\}, \{BC\} \to \{A\}, \{A\} \to \{B\}, \{B\} \to \{A\}$$

match up the requirement for setting the confidence level is 100.

III. THE DECRIPTION OF ENHANCED ALGORITHM

A. Introduction of enhanced algorithm

The major Drawbacks of conventional Data mining are

1. Too much recurrently examining the database.
2. The minSup and minConf values are predefined i.e. they do not alter. If the consumer wants to alter the values of minSup and minConf, the data should be mined again, which provides lot of ambiguity to the consumers.
3. In general there should be no focus of EF, i.e. the operation of mining should not take place on EF, which is feasible in conventional data mining.

When we verify the exceeding performance of the procedure, the previously mentioned drawbacks are prevailing.

Property1. If $A \to B$ exists in the association, then $|AB| \geq \min Count$ .so if $|T| < \min Count$, This results in the relationships that comprise the any subset of T doesn't match up with the minimum confidence.

Property2. If $A \to B$ exists in the association, this proves that A and B are considered as frequent item sets, but there is no feasibility that AB compulsorily be a frequent item set

Definition1: A group of items which are concerned by the customers as this place a major role mining is defined as interested item I.

Definition2: The transaction database is numbered with some items set which are preferred with some concernment of subset of items that is termed as item frequency.

Definition3: The least count of items presented in the Association rules is termed as support of the frequency threshold shortly named as minSupCount .

$$\min SupCount = |D| * \min Sup$$

Definition4: The least count in the Association rule A⇒ B is termed as frequency threshold also called as minCount .

*min count=min supcount*minconf*

Definition5: The impact of the itemset in the given rule set under is referred as interest gain in short iGain. iGain can measure as fallow.

$$iGain_i = \frac{rC\,\mathrm{ov}\,erage_i}{|D_{left}| + |D_{right}|} * support_i$$

Here

$iGain_i$ is interest gain of itemset i

$rC\,\mathrm{ov}\,erage_i$ is coverage of itemset i in rule-set D

$|D_{left}|$ is total number of left items in rule-set D

$|D_{right}|$ is total number of right items in rule-set D

$support_i$ support of itemset i

Definition 6: Rule $A \Rightarrow B$ is an interesting rule if $iGain_A \geq iGain_B$

B. Procedures in the Algorithm

Apriori algorithm has been developed by us by encapsulating three insufficient properties of the conventional mining algorithm and rest of the two properties. The development steps are as follows:

Initial step: The subset of items of frequency consists of variety of interest items are represented in this article.

1. The mining transactional database and interest items values are to be submitted
2. The transaction database is examined.
3. The database is stored with every sub-set of items. The frequency and the final count of attributes D are also be stored and subset is saved.

Secondary step: determine the association

1. The values of minSup and minConf are to be submitted and value of minSup in the minSupCount.
2. To determine the recurrent item sets and eliminate those subsets with frequency smaller than the minCount the saved subset with interest items is examined.
3. The output of the association rules is generated for which the confidence is more than the minConf

C. The Association Rule Mining for Interested Elements pseudo-code

Step 1: To calculate occurrences of the item for every subset of interested items.

Input: Transaction database (D); Interested items (I)

Output: The recurrence of Items for every subset of interested items and store the item id values in the database.

Considering every individual $i \in I$ do // Negotiating each Interested items

Count++ // store the count of interested items

End for

$I_{sum} = subset(I)$ // determine the no. of subsets of Interested items

Considering every log $d \in D$ do

Considering every individual $i \in d$ do // Negotiating each Interested items

If $i \in I$ // whether the item is in the Interested items

$d_i \cup = i$ // calculating every one of the Interested items

End if

$I_d = subset(d_i)$

End for

Considering every Item in I_d // Negotiating every item in the set.

$itemcount++$ // for every item count is incremented in the set

End for

$Count++$ // store the count of the item id values in the database

End for

Pseudo-code of *subset* (I) is mentioned below:

$foreach(i)$ $_{where}$ $i = 1..I_{count}$

Return $I_{sum} \cup = I_i \cup I_i I_{i+1} .... \cup I_i I_{i+1} .... I_{count}$

End for

Step 2: Calculating the association of I_{sum}

Input: Minimum support threshold ($\min Sup$); Minimum confidence threshold ($\min Conf$)

Output: The credibility and requirements to be matched up by the AR.

$\min SupportCount = count * \min Sup * \min Conf$

Considering every individual $I \in I_{sum}$ do

$if\ (I_{itemsCount} < \min SpportCount)$

Delete I // I is eliminated out of the I_{sum} if it's frequency value is less than minSupCount

Else

if ($I_{itemCount} \geq \min Count$) do

$L \cup = l$ // When the frequency value is more than the minCount then I is stored as a recurrent item $lcount++$ // Store the count of the recurrent items.

End if

End if

End if

End for

Considering every individual $l \in L$ do //Negotiating all the items of L

$foreach(i)$ where $i = 1..lcount$ // Negotiating every one of the items of L

$if\ (L_i.Items \cap L_k.Items)$ // if the items in L_i and L_k vary

$if\ ((L_i.Items \cup L_k.Items) \in I_{sum})$ // if the combination of items in L_i and L_k are all present in I_{sum}

$if\ (\frac{(L_i.Items \cup L_k.Items).count}{L_i.Items.count} \geq \min Conf)$ do

$if\ (iGain_{l_i} \geq iGain_{l_k})$

Return $L_i \Rightarrow L_k, confidence(L_i \Rightarrow L_k)$

End if

End if

End if

End if

End for

End for

Algorithm's time complexity: The storage count of database (m) is constantly a huge value. But when we consider an invariable

value n, the interested items of the customer is very low. So, the algorithm complexity is derived as $O(m*(2^n-1))$.

IV. EXPERIMENT AND EXPERIMENTAL ANALYSIS

The values of the objective data forms and interested items are given as the input for the enhanced algorithm flowchart and examine the every item sets in the database. By this examining we derive the value of frequency of the item sets and that is stores on the list-L. The threshold of credibility and support degree is given as the inputs and they are well examined to be considered as authorized input or not.

By validating the L, the frequencies of items with values less than the frequency threshold, are all eliminated.

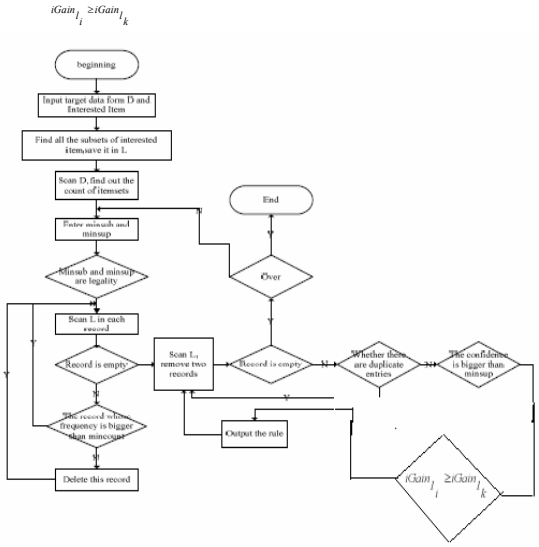

Figure 1. The Interest gained Association rules - ARM for Interested Items algorithm flowchart

By considering all the associative rules we excavate the AR. Eventually, check whether more mining is necessary or not. And if the verification came true, loop the processes of delivering the input of extra threshold values related to support and creditability to persist the mining. Or if the verification is set false then terminate out of the program. The enhanced algorithm flowchart is illustrated in Fig.1.

V. PERFORMANCE EVALUATION OF IMPROVED APRIORI ALGORITHM

In our article, the evaluation of the performance of the algorithm resulted firstly in deriving the minimum support of degree and credibility that have the property of flexibility which provides basic demands of the users significantly. While considering the next step, there is an enhancement of effective mining by this refined Apriori mining algorithm which uses the précised attributes. This enhancement leads to the condensing of time and space complexity. In this article a comparison has been put forward between the conventional algorithm and our sophisticated Apriori algorithm by the author considering a similar situation for the two cases that is listed in the above Table I, and the subsequent outcome is illustrated in Fig. 2(a).

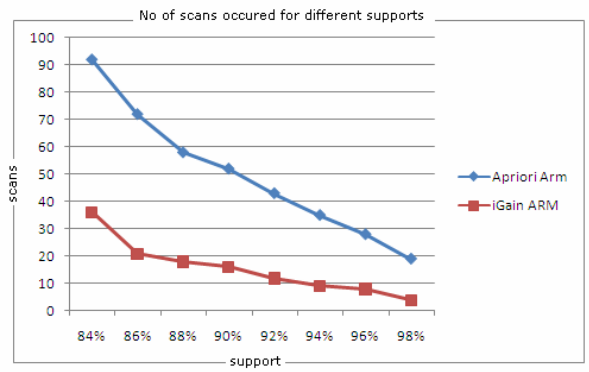

Figure 2. Performance outcome of iGain-ARM

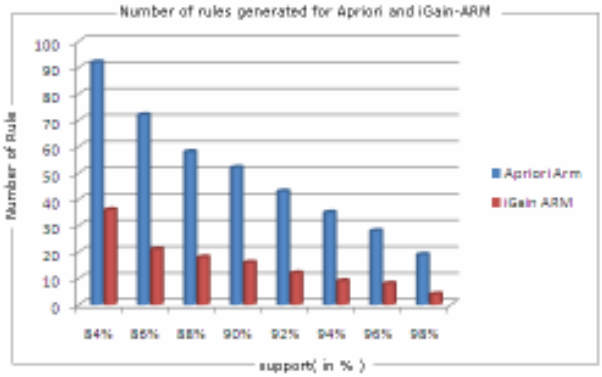

Figure 3: No of rule generated for Apriori and IGain based ARM

VI. CONCLUSION

Computational effectiveness, which is the primary concern faced by the Apriori algorithm is defined by our research. On analyzing of Apriori algorithm, we winded up our approach that the algorithm can trim down the frequency on examining the database and number of rules generated, shrink the set of items that is unfeasible for mining association, enhanced the elasticity for being an intelligible mining algorithm, which makes algorithm in well organized manner.

Some of the chief characteristics came into concern like developing effective mining when processing the huge quantity of information and setting up supportive degrees, admirable in several layered database where customers wants to excavate additional vital rules, mining of unusual item set in extra effective procedures[9, 10] can be considered in future research and development.

REFERENCES

[1] WANG Li-Zhen, ZHOU Li-Hua, et al. Data warehouse and data mining principles and applications. Beijing, Science Press, 2005.

[2] T.Uno, M.Kiyomi,and H.Arimura. Lcm ver.2:Efficient mining algorithms for frequent/closed/maximal itemsets. In B. Goethals,M. J. Zaki,and R.Bayardo,editors, Proceedings of the IEEE ICDM Workshop on Frequent Itemset Mining Implementations (FIMI'04), volume 126 of CEUR Workshop Proceedings, Brighton, UK, 2004.

[3] B.R'acz.nonordfp:An FP-growth variation without rebuilding the FPtree .In B.Goethals, M.J.Zaki,and R.Bayardo, editors, Proceedings ofthe IEEE ICDM Workshop on Frequent Itemset Mining Implementations (FIMI'04), volume 126 of CEUR Workshop Proceedings, Brighton, UK, 2004.

[4] Adhikari A□Rao P R□A framework for synthesizing arbitrary Boolean expressions induced by frequent itemsets 3rd Indian Intemat Conference on Artificial Intelligence□2007□
[5] M.Kuramochi and G.Karypis. Frequent subgraph discovery. In Proceedings of the first IEEE International Conference on Data Mining, pages313–320, 2001.
[6] M. Elhadef, K. Abrougui, S. Das, Nayak, A parallel Probabilistic system-level fault diagnosis approach for large multiprocessor systems, Processing Letters, 1(2006),63~79.
[7] Eberhart R C,Dobbins R W.Neural Network PC Tools:A Practical Guide [M].Academic Press,1990.
[8] Wu X,Wu Y,Wang Y,et al.Privacy-aware market basket data set generation:A feasible approach for inverse frequent set mining SIAM Internat Conference on Data Mining, 2005.
[9] Adhikari A,Rao P R.A framework for synthesizing arbitrary Boolean expressions induced by frequent itemsets 3rd Indian Internat Conference on Artificial Intelligence, 2007.
[10] A. Inokuchi,T.Washio,and H. Motoda.An apriori-based algorithm for mining frequent substructures from graph data.In Proceedings of the 4th European Conference on Principles of Data Mining and KnowledgeDiscovery, pages13–23. Springer-Verlag, 2000.
[11] Libing Wu; Kui Gong; Yanxiang He; Xiaohua Ge; Jianqun Cui; , "A Study of Improving Apriori Algorithm," Intelligent Systems and Applications no., pp.1- 4, 22-23 May 2010.

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Optimization and Simulation of WDM-RoF Link

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Abstract- In this paper, we introduce WDM radio over fiber (RoF), which is one of enabling technologies for 3G and beyond. To minimize the problem of high attenuation, power loss and to improve the efficiency of frequency reuse, the Performance Evaluation of WDM(wavelength division multiplexing) radio over fiber transmission system (RoF), based on various performance measures such as Q-factor, eye opening, BER and jitter has been made at different data rates.

Index Terms- WDM RoF System; BER; Q factor; Eye Opening; Timing jitter

I. INTRODUCTION

Nowadays communications target to transmit a variety of services. Those are classical telephony, facsimile transmission, but also the Internet traffic, data transmission, radio and television broadcasting etc. Consequently, various transmission media are used as metal and fiber cables, and microwave, millimeter wave, and optical free space communication links. However, owing to top performance of contemporary optical fibers there is a tendency to exploit optics as far as possible. Thus fibers are used not only for digital voice or Internet
Traffic transmission, but also for expanding Radio-over-Fiber transmission applications that exploit the optical carrier wave amplitude modulation with a microwave carrier, including analogue cable television transmission

The next generation of access networks is rushing the needs for the convergence of wired and wireless services to offer end users greater choice, convenience, and variety in an efficient way. This scenario will require the simultaneous delivery of voice, data, and video services with mobility feature to serve the fixed and mobile users in a unified networking platform. In other words, new telecom systems require high-transmission bandwidths and long haul with reliable mobility [1]. Radio over Fiber (RoF) application has attracted much attention recently because of the increasing demand for capacity/coverage and the benefits it offers in terms of low-cost base station deployment in macro cellular system. RoF systems are now being used extensively for enhanced cellular coverage inside buildings such as office blocks, shopping malls and airport terminal. RoF is fundamentally an analog transmission system because it distributes the radio waveform, directly at the radio carrier frequency, from a central unit to a Radio Access Point (RAP) [2].

Wireless communications is entering a new phase where the focus is shifting from voice to multimedia services. Present consumers are no longer interested in the underlying technology; they simply need reliable and cost effective communication systems that can support anytime, anywhere, any media they want. Furthermore, new wireless subscribers are signing up at an increasing rate demanding more capacity while the radio spectrum is limited [3].

Second generation (2G) mobile communication systems based on digital signal processing techniques has been very successful for decades. It leads to the development of third generation mobile systems. Third generation (3G) mobile communication systems, wideband code-division multiple access (WCDMA), and CDMA2000, were initially proposed and designed to be a high performance and high bandwidth system to carry high data rate services, systems that can support various service types and various users' demand [4] .To satisfy this increasing demand, the high capacity of optical networks should be integrated with the flexibility of radio networks. The deployment of optical fiber technology in wireless networks provides great potential for increasing the capacity without largely occupying additional radio spectrum [5].

RoF system consists of central Station (CS) and Base Station (BS) connected by an optical fiber link or network. Modulated radio signals have to be available at the input end of the RoF system, which subsequently transported them over a distance in the form of optical signals.

The RoF basic concept is to distribute the radio-frequency (RF) signals by optical transmission to radio access points (RAPs) so that the RAPs are not required to perform complicated functionalities such as modulation, coding, up/down conversion and multiplexing. RoF systems can provide specialized coverage of wireless services by using an extended optical backbone. These systems are suitable for variety applications, such as in-building coverage, outdoor cellular systems, and broadband fixed and mobile wireless access. They are entirely transparent to the system frequency, protocol, and bit rate. This characteristic makes them extremely interesting for the convergence of optical and mobile systems. RoF technology has been investigated by many Research Groups in the last years. However, the great majority of works published in literature are based on simulations and/or experiments carried out in laboratories. RoF technology is a technology by which microwave (electrical) signals are distributed by means of optical components and techniques [7]. RoF systems depicted in Fig. 1 are used to transport microwave signals.

Radio over Fiber (RoF) application has attracted much attention recently because of the increasing demand for capacity/coverage and the benefits it offers in terms of low-cost base station deployment in macro cellular system. RoF systems are now being used extensively for enhanced cellular coverage

inside buildings such as office blocks, shopping malls and airport terminal. RoF is fundamentally an analog transmission system because it distributes the radio waveform, directly at the radio carrier frequency, from a central unit to a Radio Access Point (RAP). Note that although this transmission system is analog, the radio system itself may be digital such as GSM.

Mainstream optical fiber technology is digital. Telecommunication networks use synchronous digital hierarchy transmission technology in their cores. Fiber-based data networks such as fiber distributed data interface and gigabit Ethernet all use digital transmission. Fiber transmission links to base stations in mobile communications systems are digital. Digital optical fiber transmission links are therefore ubiquitous in telecommunications and data communications, constituting a high volume market worth billions of dollars worldwide.

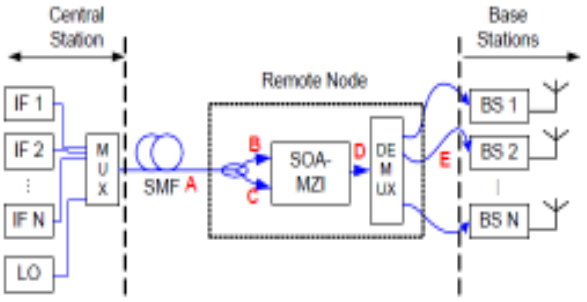


Fig 1: WDM ROF Transmission system

The electrical signal may be baseband data, modulated IF, or the actual modulated RF signal to be distributed is used to modulate the optical source. The resulting optical signal is then carried over the optical fiber link to the remote station where the data is converted back into electrical form by the photo detector.

II. Benefits of ROF systems

Advantages and benefits of the RoF technology include the following:

2.1 Low Attenuation Loss

Electrical distribution of high frequency microwave signals either in free space or through transmission lines is problematic and costly. In free space, losses due to absorption and reflection increase with frequency. Use of optical fibers, offer much lower losses. These losses are much lower than those encountered in free space propagation and copper wire transmission of high frequency microwaves. Therefore, by transmitting microwaves in the optical form, transmission distances are increased several folds and the required transmission powers reduced greatly [5].

2.2 Large Bandwidth

Optical fibers offer enormous bandwidth. There are three main transmission windows, which offer low attenuation, namely the *nm* 850, *nm* 1310 and *nm* 1550 wavelengths. The high optical bandwidth enables high speed signal processing that may be more difficult or impossible to do in electronic systems [5].

2.3 Immunity to Radio Frequency Interference

Immunity to electromagnetic interference is a very attractive property of optical fiber communications, especially for microwave transmission. This is so because signals are transmitted in the form of light through the fiber [5].

2.4 Easy Installation and Maintenance

In RoF systems, complex and expensive equipment is kept at the CSs, thereby making remote base stations simpler. For instance, most RoF techniques eliminate the need for a local oscillator and related equipment at the Remote Station (RS) [5].

2.5 Reduced Power Consumption

Reduced power consumption is a consequence of having simple RSs with reduced equipment. Most of
The complex equipment is kept at the central SC [5].

III. Performance Measures

The right choice of the performance evaluation criteria for the characterization of optical transmission links represents one of the key issues for an effective design of future long-haul optical systems [8]. The evaluation criteria should provide a precise determination and separation of dominant system limitations, making them crucial for the suppression of propagation disturbances and a performance improvement. The most widely used performance measures for performance evaluation are the Q-factor, BER and jitter, eye opening [10].

3.1 Q-factor

Q-factor represents the signal-to-noise ratio at the receiver decision circuit in voltage or current unit.

3.2 BER

The BER can be estimated from following Equation. The BER gives the upper limit for the signal because some degradation occurs at the receiver end [8].

$$BER = \frac{1}{2} erfc\left(\frac{Q}{\sqrt{2}}\right) = \frac{\exp\left(-Q^2/2\right)}{Q\sqrt{2\Pi}}$$

3.3 Eye opening

Considering only samples at the optimum sampling instant, it is the difference between the minimum value of the samples decided as logical ‘‘1’’ and the maximum value of the samples decided as logical ‘‘0’’.

3.4 Jitter

Jitter value is evaluated as the standard deviation of the position of the maximum of the received signal referred to the bit frame.

IV. System Description and Results

In order to compare the transmission performances of various fibers figure shows the simulation model of the system. Fig.2 indicates a simulation model of an optical communication system at 10 Gb/s around 1550 nm central wavelength .The simulation has been carried out using a commercial simulation package Optisystem 8.0.

Simulation is done for 10 km length of various fibers like standard single-mode (SM) fiber, Dispersion compensation fiber,

teralight fiber etc. Standard SM fiber has loss 0.2 dB/km and dispersion 16 ps/nm/km at reference frequency. It has zero dispersion at 1391.53354633 nm wavelength, fiber average beat length 5m. CW Lorentzian Laser used was having center emission wavelength 1550 nm; CW power 1mWand FWHM line width 10MHz as main characteristics was used as the optical source. Amplitude dual-arm Mach Zehnder modulator is used here to modulate the optical signal of desired format having the following parameters: excess loss 0 dB, offset voltage corresponding to the phase retardation in the absence of any (on both arms) electric field 0.5 V, extinction ratio 20 dB, chirp factor 0 and average power reduction due to modulation 3 dB.

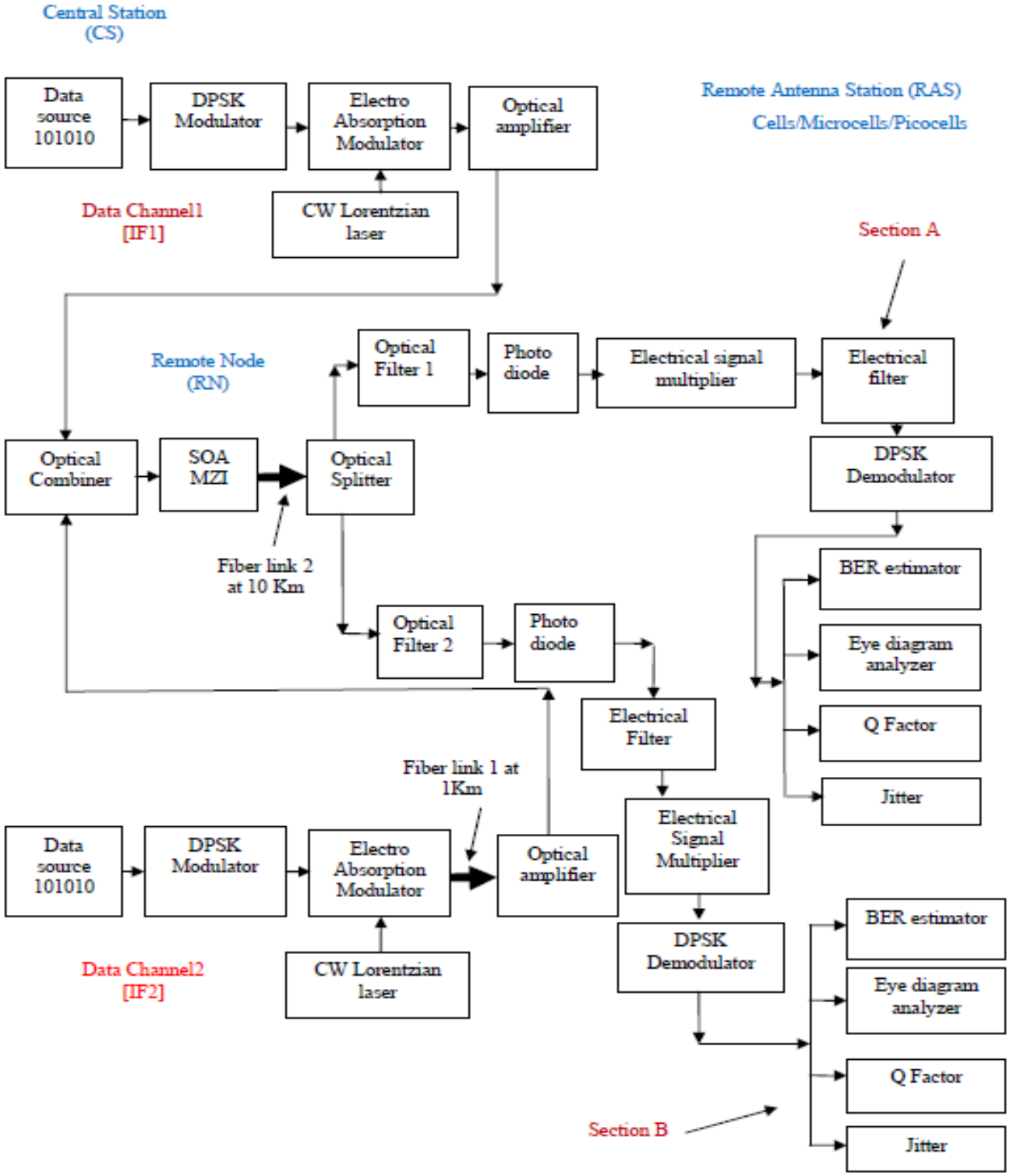


Fig 2: WDM RoF Transmission link considered for simulation.

V. RESULTS

Table 5.1 & 5.2: Comparative study of the performance metric indices of WDM RoF System at various Data rates

#At Section A:

S.No.	Parameters Data rate[Gbps]	Q value [dB]	Jitter [ns]	BER	Eye opening [a.u.]
1.	1.5	9.686512	0.0312685	0.00114414	3.39938e-007
2.	2.0	10.206633	0.0318283	0.000618246	3.17119e-007
3.	3.5	10.060838	0.0313109	0.000764695	3.60716e-007
4.	4.0	10.371890	0.0316091	0.0004985	4.76325e-007
5.	5.5	10.620311	0.0316927	0.000365147	8.48817e-007
6.	6.5	9.632132	0.0316949	0.00122341	1.97337e-008
7.	7.0	9.722221	0.0313288	0.00112138	6.57325e-008
8.	8.5	9.836501	0.0316139	0.000957761	3.62001e-007
9.	9.0	10.560282	0.0317983	0.000370819	4.28472e-007
10.	10.0	11.000574	0.0319599	0.000199306	4.63927e-007

Table 5.1: Simulation results at different data rates on WDM RoF Remote Antenna Station A.

#At Section B:

S.No.	Parameters Data rate[Gbps]	Q value [dB]	Jitter [ns]	BER	Eye opening [a.u.]
1.	1.5	9.742236	0.0314526	0.00107178	3.27156e-007
2.	2.0	9.714900	0.0317134	0.00115153	3.21517e-007
3.	3.5	9.605962	0.0308473	0.00125388	1.52769e-006
4.	4.0	9.312404	0.0310956	0.00173913	2.29042e-007
5.	5.5	8.474493	0.0309313	0.00398179	2.0033e-007
6.	6.5	10.209459	0.0317742	0.000661857	6.52316e-007
7.	7.0	9.020807	0.0311503	0.00241097	3.52251e-007
8.	8.5	9.053125	0.0307204	0.00229256	6.3256e-007
9.	9.0	9.018063	0.0308247	0.00263116	3.19057e-007
10.	10.0	9.746002	0.0317006	0.00123162	6.26198e-007

Table 5.2: Simulation results at different data rates on WDM RoF Remote Antenna Station B.

A pseudo random sequence length of bits taken one bit per symbol is used to obtain realistic output values at the receiver. Firstly, to observe the impact of data rate upon system performance, simulation results are obtained for different data rates varying from 1.5Gbps to 10Gbps. It was observed that for the data rate up to 10Gbps, Q factor for the system remains nearer to 10dB and also BER at data rate 6.5 Gbps is at minimum value & jitter remains almost nearer to the value of 0.0307 that shows a good performance of WDM RoF system. As we increases the data rates further, impact upon the Q factor, jitter, eye opening etc. comes into play. It is investigated that system provides optimum results at data rate of 9.5 Gbps (refer Table 5.1 & 5.2). The eye diagrams obtained for the system at various data rates are shown in figures (refer Fig. 3 to 12).

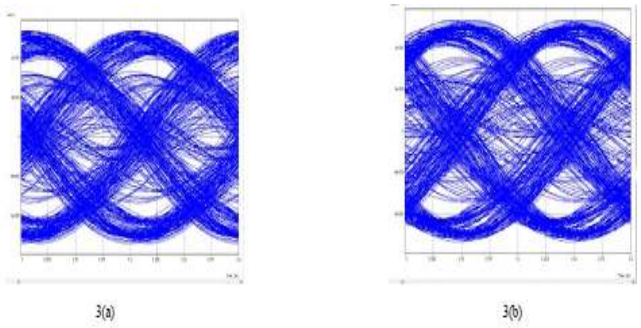


Fig. 3(a) Eye Diagram at 1.5 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 3(b) Eye Diagram at 1.5 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm.

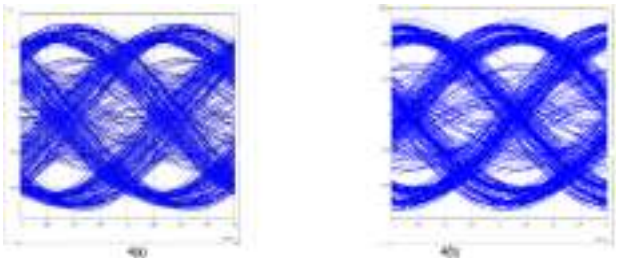


Fig. 4(a) Eye Diagram at 2.0 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 4(b) Eye Diagram at 2.0 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

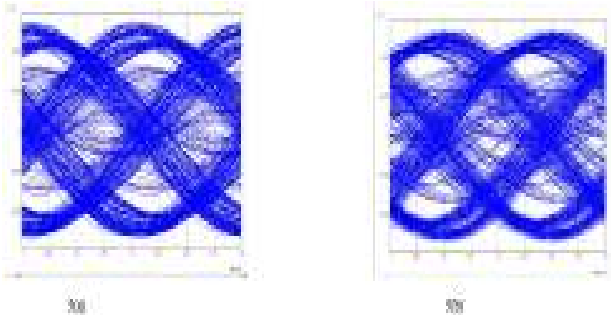


Fig. 5 (a) Eye Diagram at 3.5 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 5 (b) Eye Diagram at 3.5 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

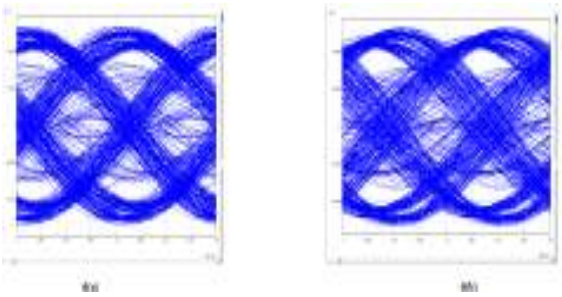


Fig. 6 (a) Eye Diagram at 4.0 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 6 (b) Eye Diagram at 4.0 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

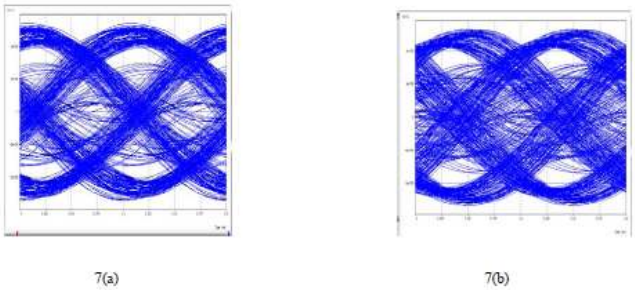


Fig. 7 (a) Eye Diagram at 5.5 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 7 (b) Eye Diagram at 5.5 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

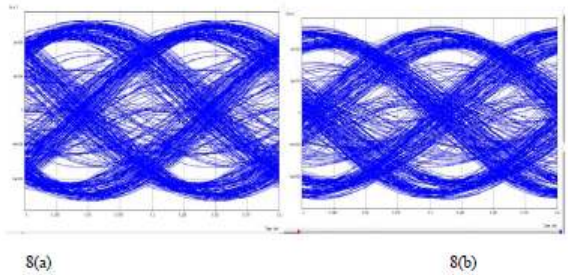


Fig. 8 (a) Eye Diagram at 6.5 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 8 (b) Eye Diagram at 6.5 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

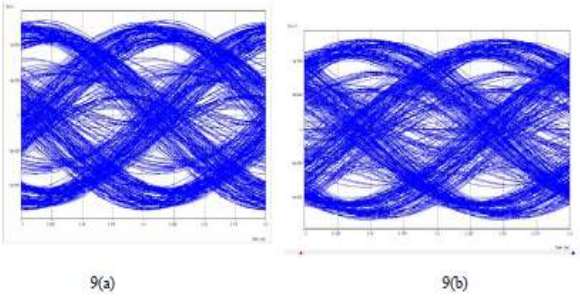


Fig. 9 (a) Eye Diagram at 7.0 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 9 (b) Eye Diagram at 7.0 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

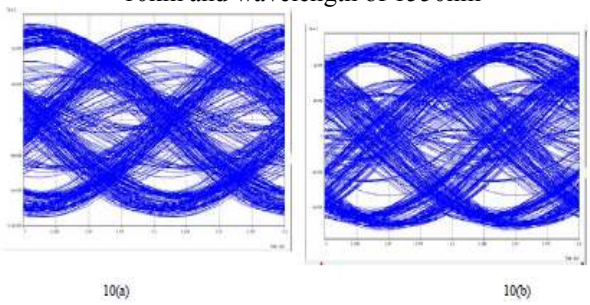


Fig. 10 (a) Eye Diagram at 8.5 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 10 (b) Eye Diagram at 8.5 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

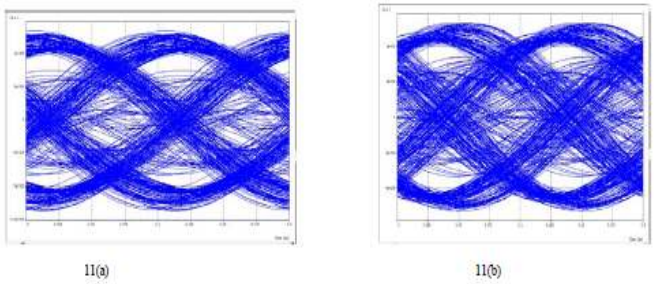


Fig. 11 (a) Eye Diagram at 9.0 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 11 (b) Eye Diagram at 9.0 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

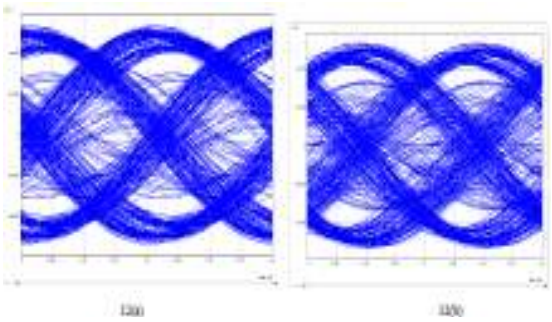


Fig. 12 (a) Eye Diagram at 10.0 Gbps for Section A for standard SM fiber at 10km and wavelength of 1550nm & 12 (b) Eye Diagram at 10.0 Gbps for Section B for standard SM fiber at 10km and wavelength of 1550nm

VI. CONCLUSION

In this paper, we have proposed a novel WDM RoF system and experimentally demonstrated the simultaneous generation and transmission of the 1.5 to 10 Gbps, 0 to 50-GHz signals over 10-km Standard SM fiber and wavelength of 1550 nm with less power penalties. It is investigated that system provides optimum results at data rate of 9.5 Gbps The system is of low cost & can be scaled to higher data rates.

REFERENCES

[1] David J. T. Heatley, "Optical Wireless: The Story So Far", IEEE 1998, pp 72-82.

[2] Michel Goloubkoff, "I Outdoor and Indoor Applications for Broadband Local Loop with Fibre supported mm-wave Radio Systems", IEEE, 1997,pp 31-34.

[3] Mohammad Shaifur Rahman, Jung Hyun Lee, Youngil Park, and Ki-Doo Kim, "Radio over Fiber as a Cost Effective Technology for Transmission of WiMAX Signals" World Academy of Science, Engineering and Technology 56 (2009).

[4] Hoon Kim, "Radio-over-Fiber Technology for Wireless Communication Services", Samsung Electronics Oct. 13, 2005.

[5] Anthony Ngoma, "Radio-over-Fiber Technology for Broadband Wireless Communication Systems", 2005

[6] W. D. Jemisona, "Fiber radio: from links to networks", IEEE, 2001, pp 169-172

[7] Kwansoo Lee, "Radio over Fiber for Beyond 3G", IEEE, July 2005.

[8] Hyoung-Jun Kim, and Jong-In Song, "Full-Duplex WDM-Based RoF System Using All-Optical SSB Frequency Up conversion and Wavelength Re-Use Techniques" IEEE Transactions on Microwave Theory and Techniques, July 2010.

Mobile Healthcare – Proposed NFC Architecture

A Devendran, Dr T Bhuvaneswari

Abstract- Mobile devices offer new ways for users to access health care data and services in a secure and user-friendly environment. Mobile health is delivering health, defined as the state of complete physical, mental and social well being, via the mobile channel. Mobile healthcare (m-healthcare) systems are regarded as a solution to healthcare costs without reducing the quality of patient care. We are developing a basic architecture for m-healthcare services using Near Field Communication (NFC) to facilitate the provisioning of healthcare to people anywhere, anytime using mobile devices that are connected through wireless communication technologies.

Index Terms- healthcare, mobile phone, mobile healthcare service, near field communication.

I. INTRODUCTION

Mobile devices are personal, always on, always with the patient and are location aware; the patient can use them for self help or to communicate with a professional and or to monitor the health of the patient this makes the cell phone a much more appropriate device for remote healthcare than any other media.

II. BACKGROUND

The advancement of science and technology in the field of healthcare has improved the quality of people's life. At the same time mobile phones are gradually adopted for solving some tough healthcare issues. "No Health without Research" according to the World Health Organization's (WHO's) report 2012 justify that research helps, and that research is essential to improve health outcomes. Diseases are by far the leading cause of mortality in the world, which places an ever enormous strain on the world's healthcare industry.

III. RECENT DEVELOPMENT

Health monitoring is mostly implemented in hospital or health care center. The requirements for mobile monitoring are increasing rapidly.

In mobile health monitoring applications, the patients are located at a distance or mobile. Small portable devices such as mobile phones, personal digital assistants (PDAs), Tablets, Watches, and Key chain rather than settled equipment, are used for collecting and processing health information. Transmission technologies such as Bluetooth, USB, global system for mobile communication (gsm), general packet radio service (gprs) and radio frequency identification (rfid) tags are used to communicate information between patients and healthcare providers.

The increased use of wireless technologies in the Healthcare industry can have an enormous impact on the both the quality and cost of healthcare. The level of patient care can be increased dramatically though more consistent monitoring and better integration with Healthcare providers.

IV. MOBILE - HEALTH

Mobile – Health is delivering health, defined as the state of complete physical, mental and social well being, via the mobile channel .No agreed industry definition for m-health. Note m-health is not a subset of or mobilization of e-health. Mobile devices have unique attributes, including being personal to the patient, always with the patient, and always on and as well as helping to provide social context, e.g. Location. This makes mobile a more appropriate channel for delivering health than any other mass media.

In the past few years, mobile health, or m-health, has drawn a lot of interest. This isn't surprising as it's one of several sectors, where mobile really makes senses and make a difference in myriad situations, from the persons who falls ill in a rural village in India (There are 5.3 billion mobile subscribers (that's 77 percent of the world population). Growth is led by China and India.

V. NEAR FIELD COMMUNICATION TECHNOLOGY FOR THE FUTURE

In today's world, technology is advancing at a blistering pace, helping to make our lives easier in every aspect imaginable. We as a society for the most part have embraced each new technology with open arms and little regard to security and reliability. However, in past few years many concerns over these aforementioned issues have become an integral part in enhancing and progressing technology and winning over the public's trust. The answer is Near Field Communications, an up and coming technology that has proven to be as reliable and secure as it is innovative.

As a society we have placed our trust into technologies that handle our health care, credit lines, financials, enhancement of education and many more. These technologies have added a level of ease into our lives that usually goes unnoticed and often taken for granted.

VI. WHAT IS NFC?

NFC is a short range wireless RFID technology that makes use of interacting electromagnetic radio fields. It is meant for application where physical touch, or close to it, is required in order to maintain security.

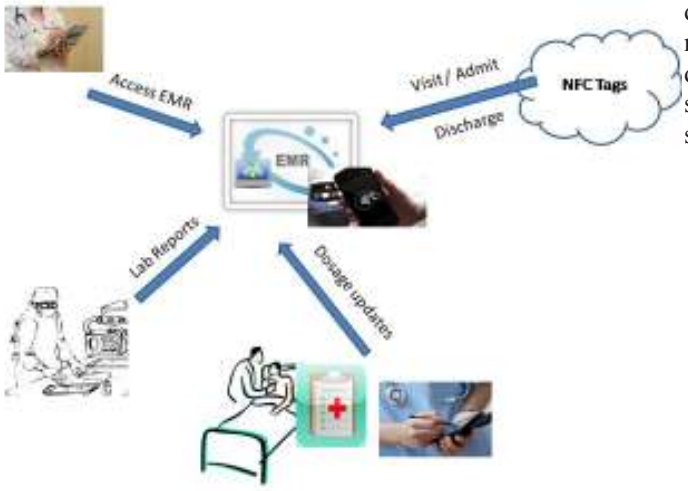
VII. APPLICATION IN NFC

Near field Communications to work, the mobile phone needs to come with bundled with the technology at the time of

manufacture. There would be a chip inside the mobile device which holds the details of patient's information.

Near field communication is the technology of the future to make payments through mobile phone devices. Besides that it can be used to pay for mobile ticketing in public transport, device acting a debit/credit card to make payments, read RFID tags.

VIII. BASIC PROPSED ARCHITECTURE



The above diagram represents a NFC using EMR. Electronic Medical Records (EMR) system makes the entire process of patient record keeping easier, more accurate and comprehensive, and more efficient. With an EMR system, doctors use specialized software that allows them to enter their patient records electronically. The software stores the patient information on a server and each patient's complete history is available instantly, including digitized copies of x-rays, lab results, prescriptions ordered and other necessary medical data. Physicians can use their desktop, laptop, or an electronic clipboard-type computer to navigate through their patient charts and record notes. EMR software also coordinates with their medical billing software, such as transferring diagnosis and procedural codes in order to facilitate the billing process after each patient visit.

There are lots of NFC tags available in global market. We use this NFC tags to store the complete health information about a person.

1. While a person gets Admit/Visit to the hospital, the health information about the person will be accessed through there NFC tags which will be synchronized and stored temporarily on that particular hospital Electronic Medical Record (EMR) Database .The doctor can easily access full information about the patient by viewing the patient EMR instead of going through bundle of paper reports.
2. If the patient is been asked to take any tests then those test reports will also be updated in that EMR.
3. Based on the test the updates which the doctor prescribed will be updated too in their EMR.
4. Finally while the patient Leave/Discharge all those information which have been updated in his EMR will be synchronized and transferred back to his NFC tag which will hold the complete medical report about what happened that particular day.

IX. NFC TAGS

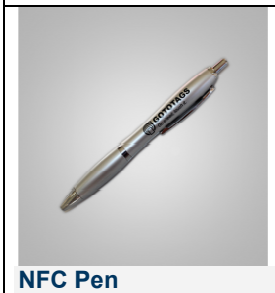
NFC tags contain data and are typically read-only but may be rewriteable. They can be custom-encoded by their manufacturers or use the specifications provided by the NFC Forum, an industry association charged with promoting the technology and setting key standards. The tags can securely store personal data such as debit and credit card information, loyalty program data, PINs and networking contacts, among other information. The NFC Forum defines four types of tags which provide different communication speeds and capabilities in terms of configurability, memory, security, data retention and write endurance.

Printed NFC Key Fob

Anti-Metal NFC Sticker

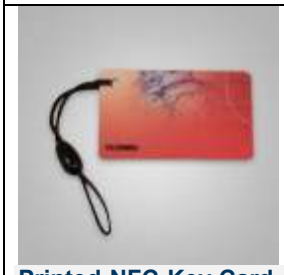
GOTOTAGS Windows NFC App

ACS ACR122U NFC USB Reader

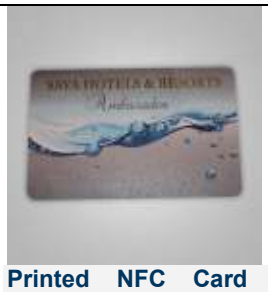


NFC Pen

Printed NFC Wristband - ULC



Printed NFC Key Card - ULC



Printed NFC Card - DESFire EV1 2K

X. PROS OF NFC USED IN HEALTHCARE

Care providers, whether they are within health institutions or delivering healthcare at patients' homes, need to optimize the cost of quality care. Real-time reporting is needed, but should not distract from the main task of patient care.

NFC technology allows individual acts to be reported with the wave of a mobile phone near a low cost tag.

- Room / bed / medication identified by low cost tag
- Time / place / care giver identified by mobile phone
- Quick fill, multiple choice forms in option for additional information

Real- time feedback for care personal.

XI. FUTURE RESEARCH

This paper has presented a solution to improve quality assurance in healthcare sector; this is reaching reducing clinical errors caused by drug interaction dose etc. For that purpose, we have proposed an EMR-architecture using NFC such as mobile device, PDAs, laptops and smart phones, where is being considered the incipient NFC technology. This solution also offers support for a legacy identification solution based on healthcare before that NFC technology is widely implemented in new devices, is substituted by NFC tags.

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REFERENCES

[1] NFC Forum, http://www.nfc-forum.org/home
[2] NFC Research, http://www.nfc-research.at/home
[3] NFC World, http://www.nfcworld.com/home
[4] Laukkanen, M. 2007. Towards Operating Identity-based NFC Services. IEEE International Conference on Pervasive Services
[5] ECMA, "NFC white paper". ECMA International.
[6] Chen, JCH,Dolan, M. & Lin B(2004), Improve process on Healthcare : current issues and future trends. International journal of electronic healthcare 1(2) 149-164
[7] Cocosila, M, Coursaris, C & Yuan, Y. M- healthcare for patient self management. International journal of electronic healthcare 1(2) 221-241
[8] G. Madlmayr, J. Langer, C. Kantner, J.Scharinger.NFC Devices: Security and Privacy. In Third International Conference on Availability, Reliability and Security, pages 642–647, 2008

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Algorithm for sharpening Raised Cosine Pulse shaping Digital filter and Analysis of Performance of QAM system when subjected to Sharpened Raised Cosine Filter

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Abstract- This paper proposes an algorithm for sharpening a pulse shaping Raised Cosine filter. Filter sharpening could be used when improved filtering is needed, but insufficient ROM space is available to store more filter coefficients, or as a way to reduce ROM requirements. QAM is one of widely used modulation techniques because of its efficiency in power and bandwidth. In this paper, the coefficients of raised cosine and sharpened raised cosine filter are generated in MATLAB. Utilizing these coefficients the performance of raised cosine filter and sharpened raised cosine filter is observed under different QAM(16QAM, 32QAM and 64QAM) by comparing their error rates and SNR using VSG (vector signal generator) and VSA(vector signal analyser).

Index Terms- error vector magnitude, filter sharpening, magnitude error, Phase error , pulseshaping, raised cosine filter, QAM, signal to noise ratio

.

I. INTRODUCTION

In digital telecommunication, pulseshaping is the process of changing the waveform of transmitted pulses. Its purpose is to make the transmitted signal better suited to the communication channel by limiting the effective bandwidth of the transmission and reducing the intersymbol interference (ISI). The raised-cosine filter is a filter frequently used for pulse shaping in digital modulation due to its system[5-6] .Its spectrum exhibits odd symmetry about, 1/2T where *T* is the symbol-period of the communications system. Filter sharpening is a technique for creating a new filter from an old one. When processing data by filters, we often find it necessary to improve the performance of the filter, either by increasing the out-of-band rejection (loss) or by decreasing the error in the passband, or both. A first approach is to process the data by repeated passes through the same filter. Each pass, while increasing the out-of-band loss, also increases the passband error, often to an undesirable level [4]. Improved filtering can also be achieved by increasing the order of a filter. But increasing the order would mean storing more filter coefficients and if insufficient ROM space is available, then definitely one has to go for sharpening technique, which reduces the ROM requirements. In addition, in some hardware filter applications using *application -specific integrated circuits* (ASICs), it may be easier to add additional chips to a filter design than to design a new ASIC. In the late seventies, Kaiser and Hamming described a simple technique for filter sharpening that can be applied to symmetric non-recursive filters with both less passband error and greater out-of-band, or stopband, loss [1]. This technique has been successfully implemented to low pass FIR filter [4] and Window functions [7].

In this paper, the sharpening technique has been generalized into an algorithm which may be applied multiple number of times as long as the digital communication system shows improvement in its performance. Sharpening a pulseshaping filter is a new research area which we have considered in this paper. Since the Raised Cosine filter exhibits symmetric property, we have applied the so designed sharpening algorithm to a Raised cosine filter.

In 16QAM the symbol rate is one fourth of the bit rate. It is more efficient than BPSK (symbol rate is same as bit rate) or QPSK (symbol rate is half of bit rate) or 8PSK (symbol rate is one third of bit rate). Another variation is 32QAM, the symbol rate of which is one fifth of the bit rate. A 64QAM signal that can send six bits per symbol is very spectrally efficient.. A 64QAM system enables the same amount of information to be sent as BPSK using only one sixth of the bandwidth. It is six times more bandwidth efficient. In this paper, QAM system of digital modulation is chosen from the BW efficient point of view using a vector signal generator(VSG). The vector signal generator combines outstanding RF performance and sophisticated baseband generation to deliver calibrated test signals at baseband, IF, and RF frequencies up to 50 MHz. Offering an internal baseband generator with arbitrary waveform and real-time I/Q capabilities the VSG is equipped to test today's complex wireless systems In this paper Raised cosine filter is designed in MATLAB using cut off frequency=250KHz and transition BW = 250KHz and sampling frequency=10MHZ for three successive orders N = 11, 22 and 44 and each time it is sharpened using the sharpening algorithm presented in this paper. For each of these orders the coefficients are calculated in MATLAB for RC filter and sharpened RC filter. The performance of the RC filter and sharpened RC filter is observed in 16, 32 and 64 QAM systems by feeding the coefficients of the so designed RC filter and sharpened RC filter in VSG . To maximize the spectral efficiency we have used premodulation raised Cosine filtering to reduce the occupied bandwidth. To make filtering even more efficient we have sharpened the RC filter prior to filtering using a sharpening algorithm designed in

this paper. Comparative analysis of RC & sharpened RC when fed to 16/32/64 QAM system is presented by taking careful observations in VSA(vector signal analyser) with the help of which we can quickly evaluate and troubleshoot digitally modulated signals with both qualitative displays and quantitative measurements and visualize the system performance rapidly and intuitively with familiar display formats and view the time/frequency spectrum, measure phase error, evm ,magnitude error,SNR [6] or view these for an individual channel in a computer connected to the VSA. Thus the present paper deals with design and computer aided performance analysis of sharpened pulseshaping RC filter for QAM system of communication.

II. DESIGN ISSUES FOR DESIGNING RAISED COSINE FILTER IN MATLAB

The roll-off factor (β) gives a direct measure of the occupied bandwidth of the system and is calculated as *occupied bandwidth = symbol rate* X *(1 +* β*)*.In a perfect world, the occupied bandwidth would be the same as the symbol rate, but this is not practical since β= zero is impossible to implement. The occupied bandwidth (for β =1) = symbol rate X (1 + 1) = 2 X symbol rate. Using β of 0.5, the transmitted bandwidth decreases from 2 times the symbol rate to 1.5 times the symbol rate. This results in a 25% improvement in occupied bandwidth. Hence we chose β=0.5.

The sampling frequency of the digital circuitry (VSG) through which the signal would pass is 10MHz. It has been assumed that the raised cosine filter impulse response to be designed to span five symbols. If a digital filter is used for pulseshaping, then it must operate at a sample rate of at least twice the data rate to span the frequency response characteristic of the raised cosine pulse. That is ,the filter must oversample the data by at least a factor of two. More oversampling yields a more accurate frequency response characteristic. If the filter oversamples by a factor of two (2 samples/symbol) and the desired impulse response duration is five symbols then 10 samples are required (2 x 5 = 10). However, N=11 is chosen to avoid the half-symbol delay associated with an even number of taps. The raised cosine filter will operate at 5MHz. This is well within the specified 50 MHz operating range of the digital circuitry (VSG), so the design is not in jeopardy.

We wish to see the affect of sharpening by increasing the order of the filter, so we have increased N=11 to twice i.e N=22 and four times i.e N=44. For N=22 and 44, the RC filter operates at 2MHz and 1.1MHz respectively which are both within the specified limit of 50MHz and hence again the design is not jeopardized.

The Magnitude response of the Raised Cosine FIR Filter designed in MATLAB for N=11, 22 and 44 using cut-off frequency = 250KHz and transition BW = 250KHz and sampling frequency= 10MHZ, β=0.5 is shown below.

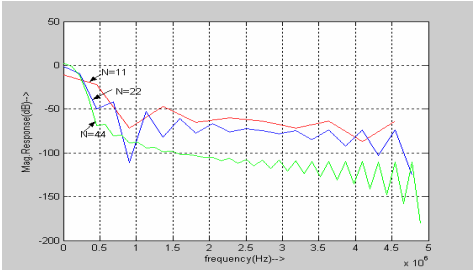

Fig.2.1 Magnitude Response of Raised Cosine Filter (N=11, 22, 44)

III. DESIGN ISSUES FOR DESIGNING RAISED COSINE FILTER IN MATLAB

If one is given a filter whose transfer function is G(z). Assume that in the passband the frequency response is supposed to be 1 and in the stopband the frequency response is supposed to be 0. Suppose that one has a fillter whose frequency response is moderately close to one throughout the fiter's pass-band and is moderately close to zero throughout the filter's stopband. Suppose one needs a better filter.If one had a function, F(z), that took numbers that were near zero and made them closer to zero that would be a step in the right direction. One would consider the filter defined by F(G(z)) and one would know that its frequency response was better than the frequency response of G(z).The most obvious choice for F(z) is z^2 . The function $1+(z-1)^2$ performs a similar task for filters that are near 1 in their passband. The problem with these functions is that the first function improves performance in the stopband but hurts performance in the passband. The second function helps performance in the passband but hurts it in the stopband. We would like to find a function that helps us in both the passband and the stopband. What is needed is a function, F(x),that satisfies four conditions:

1. F(0) = 0
2. F'(0) = 0
3. F(1) = 1
4. F'(1) = 0

If one would like a polynomial to satisfy these four conditions then the polynomial must, at the very least, be cubic(highest order value in polynomial, k=3) any lower order polynomial will not have enough coefficients to allows us to meet all of the conditions.

Algorithm to obtain sharpened transfer function when k=3

Step 1: Find the polynomial: $F(x)=a+bx+cx^2+dx^3$

Step 2: Find derivative of the polynomial: $F'(x)=b+2cx+3dx^2$

Step 3: Assign known values to the polynomial and its derivative

i) At x=0, F(x) =0 and F'(x) =0

ii) At x=1, F(x) =1 and F'(x) =0

Step 4: Substitute values at Step3 for Step1 and Step 2 equations.

i) a=0 and b=0

ii) c+d = 1 and 2c+3d = 0

Step 5: Derive the coefficient values a=0, b=0, c=3, d = -2

Step 6: Find the reduced polynomial: $F(x) =3x^2 - 2x^3$

It is easy to see that any value of x near zero is made smaller by this function and any number near one is made nearer to one by F(x).

Stating this function as sharpened filter Hs (z) in terms of H(z) we have

$Hs(z) = 3H(z)^2 - 2H(z)^3$

H s (z) is called the sharpened version of H (z)

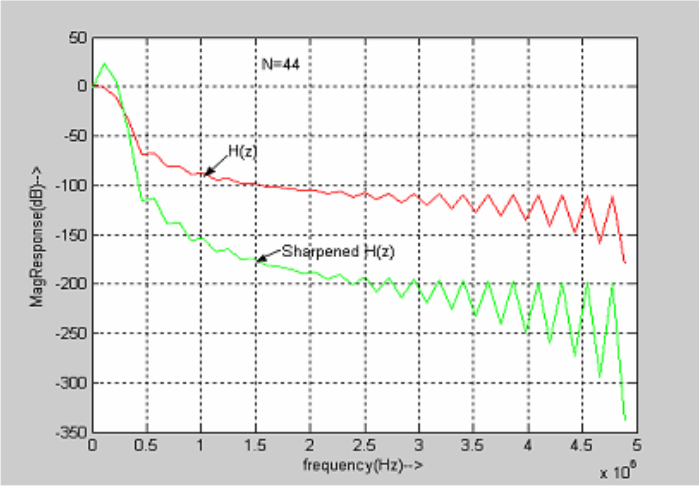

Fig. 3.1 Magnitude Response of Raised cosine and Sharpened Raised cosine filter (N=44))

The technique stated above can be extended to higher orders to obtain still better sharpened filters.

General Algorithm to obtain sharpened transfer function when k>=3

Step 1: Find the polynomial of degree k such that k>=3 degree:

$F(x) = a_0+a_1x+a_2x^2+ - - - - -a_kx^k$

Step 2: Find derivative of the polynomial: $F'(x)= a_1+2a_2x+ - - - - -ka_kx^{k-1}$

Step 3: Assign known values to the polynomial and its derivative

At x=0, F(x) =0 and F'(x) =0

Step 4: Substitute values at Step3 for Step1 and Step 2 equations.

$a_0=0$ and $a_1=0$

Step 5: Find the reduced polynomial after the values of coefficients obtained in Step 4 is substituted in the polynomial equation in Step1 .

$F(x) = a_2x^2+ - - - - -a_kx^k$

Step6: Assign a new constant n =k-3

Step7: Assign coefficients of the first n terms (starting from the lowest power of x) equal to zero in the polynomial obtained from Step5.

Step8: Find the reduced polynomial:

$F(x) =a_{k-1}x^{k-1}+ a_kx^k$

Step9: Assign known values to the polynomial and its derivative

At x=1, F(x) =1 and F'(x) =0

Step10: Substitute values at Step9 for polynomial obtained in step8 and its derivative.

Step 11: Derive the coefficient values of a_k and a_{k-1} .

Step12: Find the reduced polynomial substituting the values obtained in Step 11 in the polynomial obtained in Step 8.

The above algorithm is applied to obtain the transfer function of the sharpened filter with increasing values of k ,the highest order of H(z), starting with k=3., We define a new parameter K called Sharpening parameter which indicates the number of times sharpened. Corresponding to k=3, we have K=1, and both increase as shown in Table3.1.

k=1 implies no sharpening algorithm has been applied to the filter, hence Sharpening parameter K=0.

Table3.1- Sharpened Functions and their stopband attenuation (calculated from the following response curve)

Highest order of H(z) k	No. of times sharpened K	Function	Stopband attenuation
1	0	H(z)	68dB
3	1	$3H(z)^2 - 4H(z)^3$	118dB
4	2	$4H(z)^3 - 5H(z)^4$	240dB
5	3	$5H(z)^4 - 6H(z)^5$	302dB
6	4	$6H(z)^5 - 7H(z)^6$	492dB
7	5	$7H(z)^6 - 8H(z)^7$	650dB

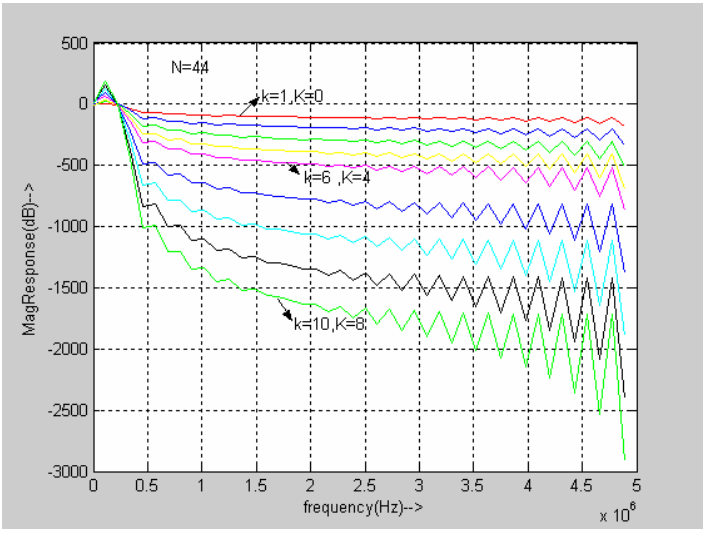

Fig .3.3 Magnitude Response of Sharpened Raised Cosine filter upto 8th sharpening(K=8)

IV. QAM SYSTEM APPLIED TO SO DESIGNED RAISED COSINE FILTER

The raised cosine filter and the sharpened raised cosine filter so designed in Matlab for order N=11, 22,44 and the respective coefficients as calculated in MATLAB are each applied to QAM (16, 32, 64) system of communication. The performance of QAM is checked w.r.t EVM (error vector magnitude), magnitude error,

phase error and SNR for both raised cosine and sharpened raised cosine filter.

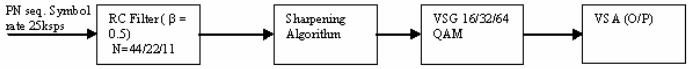

Fig.4a

4.1 QAM system applied to so designed Raised Cosine Filter and Sharpened Raised Cosine Filter of order 44

Table 4.1a Raised Cosine Filter applied to 16QAM (N=44)

No. of times sharpened(K)	0	1	2	3	4	5	6	7	8	9	10	11	12
EVM(% rms)	22.7	21.2	20.8	20.0	19.5	19.0	18.7	18.9	19.0	19.2	19.8	19.7	19.8.
Magnitude error(% rms)_	11.7	11.2	10.8	10.0	9.7	9.0	8.8	8.9	9.0	9.3	9.8	9.9	9.8.
Phase Error (deg)	18.8	17.6	17.3	17.0	16.8	16.5	16.0	16.8	16.4	16.6	16.8	16.9	16.9
SNR	8.9	9.0	9.2	9.6	9.9	10.4	10.9	10.7	10.3	10.0	9.8	9.3	9.1

Table 4.1b Raised Cosine Filter applied to 32QAM (N=44)

No. of times sharpened(K)	0	1	2	3	4	5	6	7	8	9	10	11	12
EVM(% rms)	18.3	17.8	17.5	16.8	16.3	16.0	15.8	16.0	16.2	16.4	16.2	16.0	1.2
Magnitude error(% rms)_	9.2	9.0	8.5	8.2	8.0	7.8	7.2	7.6	7.8	8.2	8.4	8.5	8.9
Phase Error (deg)	14.6	14.4	14.2	13.8	13.3	13.0	12.8	12.6	12.2	13.9	13.6	13.7	13.8
SNR	10.5	10.9	11.2	11.6	11.8	12.7	12.9	13.0	12.2	12.0	12.5	12.3	12.3

Table 4.1c Raised Cosine Filter applied to 64QAM (N=44)

No. of times sharpened(K)	0	1	2	3	4	5	6	7	8	9	10	11	12
EVM(% rms)	9.6	9.0	8.5	8.2	8.0	7.6	7.2	7.6	7.8	8.1	8.4	8.5	8.4
Magnitude error(% rms)_	4.8	4.3	4.0	3.8	3.1	2.7	2.2	3.2	3.4	4.2	4.5	4.6	5.4
Phase Error (deg)	10.6	10.2	9.8	9.2	8.5	8.2	8.0	7.8	9.7	9.9	10.2	10.0	9.9
SNR	11.5	11.8	12.3	12.8	13.3	13.9	14.3	12.8	13.2	12.4	12.3	11.3	11.3

4.2 QAM system applied to so designed Raised Cosine Filter and Sharpened Raies Cosine Filter of order 22

Table 4.2a Raised Cosine Filter applied to 16QAM (N=22)

No. of times sharpened(K)	0	1	2	3	4	5	6	7	8	9	10	11	12
EVM(% rms)	23.0	22.4	22.0	21.6	21.3	21.0	20.8	20.4	20.2	20.0	19.8	20.0	20.2
Magnitude error(% rms)_	18.8	18.6	18.3	18.0	17.8	17.5	17.2	16.8	16.4	16.2	16.0	16.0	16.4
Phase Error (deg)	17.9	17.6	17.2	16.8	16.3	16.0	15.8	15.6	15.0	14.8	14.2	14.0	14.0
SNR	8.5	8.8	9.2	9.7	10.1	10.4	10.7	10.9	11.2	11.6	11.8	11.3	11.0

Table 4.2b Raised Cosine Filter applied to 32QAM (N=22)

No. of times sharpened(K)	0	1	2	3	4	5	6	7	8	9	10	11	12
EVM(% rms)	15.3	14.8	13.5	13.1	12.8	12.4	12.0	11.8	11.6	11.7	11.2	11.0	11.2
Magnitude error(% rms)_	10.2	9.75	9.5	9.2	8.8	8.5	8.2	8.0	7.8	7.6	8.2	8.4	8.4
Phase Error	16.8	16.6	16.2	15.8	15.3	15.0	14.8	14.6	14.2	13.9	13.5	13.5	13.5

(deg)													
SNR	11.5	12.4	12.8	13.2	13.8	13.7	13.9	14.0	14.2	14.0	13.5	13.3	13.3

Table 4.2c Raised Cosine Filter applied to 64QAM (N=22)

No. of times sharpened(K)	0	1	2	3	4	5	6	7	8	9	10	11	12
EVM(% rms)	11.2	11.0	10.8	10.7	10.3	10.2	10.0	9.8	9.6	9.1	8.8	9.2	9.4
Magnitude error(% rms)_	6.8	6.3	6.1	6.0	5.8	5.6	5.4	5.2	5.0	4.8	4.5	5.3	5.4
Phase Error (deg)	6.3	6.0	5.9	5.7	5.5	5.3	5.1	5.0	4.8	4.7	4.3	5.3	5.4
SNR	13.8	13.6	13.2	12.8	12.6	12.2	12.0	11.8	11.7	11.9	12.2	12.0	12.2

4.3 QAM system applied to so design Raised Cosine Filter and Sharpened Raised Cosine Filter of order 11.

Table 4.3a Raised Cosine Filter applied to 16QAM (N=11)

No. of times sharpened(K)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
EVM(% rms)	21.6	21.0	20.6	19.8	19.3	18.8	18.0	17.7	17.2	16.8	16.2	16.0	15.8	16.0	16.2
Magnitude error(% rms)_	17.2	17.0	16.8	16.2	16.0	15.8	15.2	15.0	14.8	14.3	14.0	13.7	13.1	13.4	14.0
Phase Error (deg)	15.7	15.2	15.0	14.3	14.0	13.7	13.2	13.0	12.6	12.2	11.8	11.2	11.0	11.4	11.8
SNR	7.8	8.2	8.8	9.2	9.6	10.1	10.3	10.9	11.5	11.8	12.2	12.5	12.9	12.2	11.7

Table 4.3b Raised Cosine Filter applied to 32QAM (N=11)

No. of times sharpened(K)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
EVM(% rms)	17.8	17.3	17.0	16.5	16.0	15.6	15.0	14.7	14.2	13.8	13.0	12.7	12.2	13.0	13.2
Magnitude error(% rms)_	15.2	15.0	14.6	14.2	13.8	13.2	12.7	12.3	12.0	11.7	11.2	10.7	10.1	11.4	12.0
Phase Error (deg)	12.7	12.2	11.8	11.1	10.7	10.1	9.7	9.2	8.6	8.2	7.8	7.2	6.8	7.4	7.8
SNR	10.6	10.9	11.2	11.8	12.3	12.9	13.4	13.8	14.3	14.8	15.3	15.7	16.3	16.2	15.7

Table 4.3c Raised Cosine Filter applied to 64QAM (N=11)

No. of times sharpened(K),	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
EVM(% rms)	10.3	10.0	9.6	9.2	8.8	8.2	7.6	7.2	6.8	6.2	5.5	5.2	5.0	5.2	5.4
Magnitude error(% rms)_	13.2	13.0	12.8	12.2	12.0	11.8	11.2	11.0	10.8	10.3	10.0	9.8	9.1	10.0	10.3
Phase Error (deg)	11.7	11.4	11.0	10.7	10.0	9.7	9.2	9.0	8.6	8.2	7.5	7.2	7.0	8.2	8.8
SNR	11.8	12.2	12.8	13.2	13.6	14.1	14.3	14.9	15.5	15.8	16.2	16.5	16.9	16.2	16.0

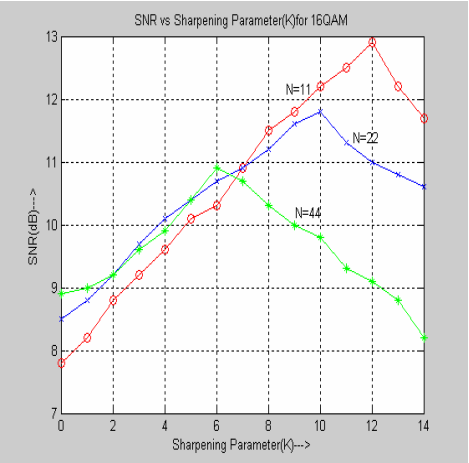

Fig. 4c

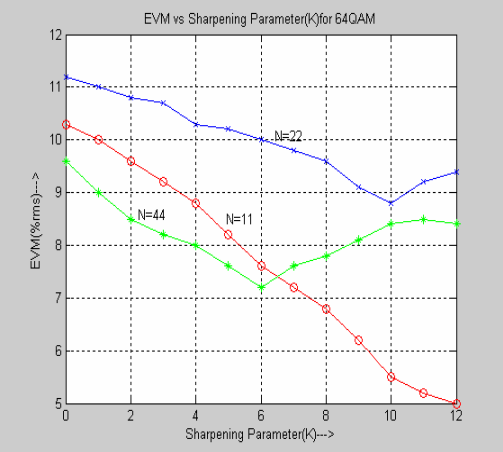

Fig. 4d

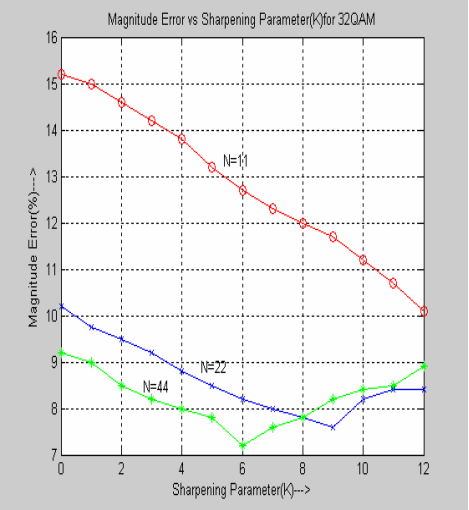

Fig.4e

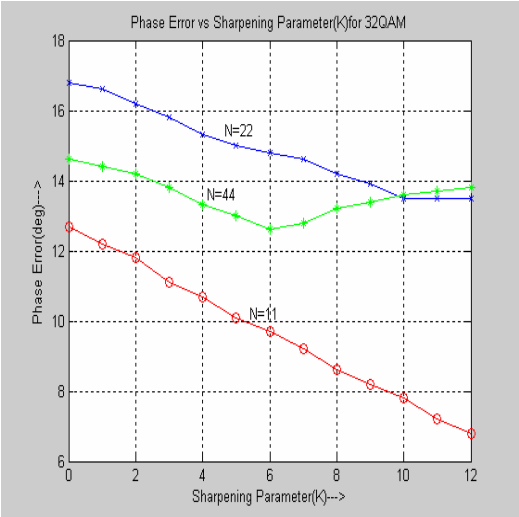

Fig.4f

V. RESULT AND DISCUSSION

From this response curve Fig.2.1 it can be seen that as the order of the RC filter is increased the filter response curve becomes sharper. Increasing the order of filter implies increasing the design complexities and hence increasing the cost, so this is avoided.

As can be seen from Fig.3.3 the sharpening increases with increasing values of both k and K. From the response curve Fig.3.3 and the table 3.1 it is clear that the sharpening algorithm increases the stopband attenuation which is highly desirable.

The effect of sharpening pulseshaping RC filter under QAM (16/32/64) system can be observed from each of the observation tables (4.1, 4.2, and 4.3). When K=0 i.e. when there is no sharpening used in the raised cosine filter, the values of EVM, magnitude error and phase error are greater than the successive values of EVM, magnitude error and phase error when sharpening has been used i.e K=1, K=2, K=3 etc.

Also SNR values with no sharpening (K=0) is lower than the successive SNR values with sharpening (K=1, 2, 3 etc.) in RC filter

From these observation tables it is also clear that 64QAM works better than 32QAM which in turn performs better than 16QAM when subjected to Raised cosine and sharpened Raised Cosine filter. As the sharpening parameter K is increased performance of QAM (16,32, 64) all improve as the EVM,. Magnitude Error and Phase Error each decrease and SNR increase with increasing value of K.

Different error mechanisms will affect a signal in different ways, perhaps in magnitude only, phase only, or both simultaneously. Knowing the relative amounts of each type of error can quickly confirm or rule out certain types of problems. Thus, the first diagnostic step is to compare the relative sizes of the phase error and the magnitude error.

When the average phase error (in degrees) is larger than the average magnitude error (in percent) by a factor of about five or more as can be seen in Table 4.1a(16QAM, N=44), Table 4.1b(32QAM, N=44), Table 4.1c(64QAM, N=44),Table 4.2b(32QAM, N=22), this indicates that some sort of unwanted phase modulation is the dominant error mode. In such cases one

should proceed with further measurements to look for noise, spurs, or cross-coupling problems in the frequency reference, phase-locked loops, or other frequency-generating stages. Residual AM is evidenced by magnitude errors that are significantly larger than the phase angle errors as can be seen in Table 4.3a(16QAM, N=11), 4.3b(32QAM,N=11),4.3c(64QAM,N=11).In many cases, the magnitude and phase errors will be roughly equal as can be seen in Table 4.2c(64 QAM, N=22). This indicates a broad category of other potential problems including compression, clipping, and zero- crossing non-linearities.

Large error vectors, both at the symbol points and at the transitions between symbols, can be caused by problems at the base- band, IF or RF sections of the transmitter. In-channel spurious cause interference in the modulation. A single spur combines with the modulated signal. We see that by using the sharpening algorithm, %rms value of EVM decreases, which means decrease in spurious signals.

From the Tables 4.1a, 4.1b, 4.1c we see that sharpening improves performance of QAM (16/32/64) for N=44, till K=6(no. of times sharpened =6), after which the performance of QAM degrades.

From the Tables 4.2a, 4.2b, 4.2c we see that sharpening improves performance of QAM (16/32/64) for N=22, till K=10(no. of times sharpened =10), after which the performance of QAM degrades.

From the Tables 4.3a, 4.3b, 4.3c we see that sharpening improves performance of QAM(16/32/64) for N=11, till K=12(no. of times sharpened =12), after which the performance of QAM degrades.

These verifications can be observed clearly from the Graphs as shown in Fig. 4c, 4d, 4e& 4f.

Thus we can say order of Raised Cosine filter (N) is inversely proportional to the sharpening parameter K upto which QAM improves i.e. **N ά 1/K**

N= order of Raised Cosine filter

K= sharpening parameter (upto which QAM improves).

VI. CONCLUSION

The main goal of this paper was to sharpen a pulseshaping raised cosine filter and observing the effect of sharpening on QAM system, of communication. The RC filter designed in MATLAB is sharpened by applying the sharpening algorithm. Each time the RC filter is sharpened by the sharpening algorithm, its stopband attenuation increases as shown in Table 3.1.The coefficients of these sharpened RC filter is calculated in MATLAB. These coefficients are then fed to QAM system in VSG to see the effect of sharpening on QAM system. The outputs checked in the computer connected to VSA verifies that QAM system shows improved performance till twelfth sharpening when order of the filter is 11 i.e .N=11; till tenth sharpening when order of filter is 22 i.e. N=22, and till sixth sharpening when order of the filter is 44,i.e N=44. Thus if an engineer wishes to improve the performance of QAM system of communication without increasing the order of the RC filter, he may do so by sharpening the RC filter. In this paper the order of the RC filter is chosen as N=11, 22 &44 without jeopardizing the design.

For each of these orders N it is proved that firstly performance of QAM system improves by sharpening the RC filter and using it prior to modulation; secondly 64QAM performs better than 32QAM which in turn performs better than 16QAM and thirdly QAM(16/32/64) system shows improvement by sharpening the RC filter K (sharpening parameter) times where K is found to be inversely proportional to the order N of the RC and sharpened RC filter.

APPENDIX

A. Error Vector Magnitude (EVM), Magnitude error and Phase Error

The error vector magnitude or EVM is a measure used to quantify the performance of a digital radio transmitter or receiver. A signal sent by an ideal transmitter or received by a receiver would have all constellation points precisely at the ideal locations, however various imperfections in the implementation (such as carrier leakage, low image rejection ratio, phase noise etc.) cause the actual constellation points to deviate from the ideal locations. Informally, EVM is a measure of how far the points are from the ideal locations. An error vector is a vector in the I-Q plane between the ideal constellation point and the point received by the receiver. In other words, it is the difference between actual received symbols and ideal symbols. The average power of the error vector, normalized to signal power, is the EVM. For the percentage format, root mean square (RMS) average is used.The error vector magnitude is equal to the ratio of the power of the error vector to the root mean square (RMS) power of the reference. It is defined in dB as

$EVM(dB) = 10 \log_{10} (P_{error} / P_{reference})$

where P_{error} is the RMS power of the error vector. For single carrier modulations, $P_{reference}$ is, by convention, the power of the outermost (highest power) point in the reference signal constellation. EVM, as conventionally defined for single carrier modulations, is a ratio. as a percentage of the square root of the mean power of the ideal signal,(as a percentage of the square root of the average symbol) to the peak signal level, usually defined by the constellation's corner states. The EVM value depends on the peak and means signal power is dependent on constellation geometry, different constellation types (e.g. 16-QAM and 64-QAM), subject to the same mean level of interference, will report different EVM values.

The error vector is the vector difference at a given time between the ideal reference signal and the measured signal. Expressed another way, it is the residual noise and distortion remaining after an ideal version of the signal has been stripped away. EVM is the root-mean-square (RMS) value of the error vector over time at the instants of the symbol (or chip) clock transitions.

While the error vector has a phase value associated with it, this angle generally turns out to be random, because it is a function of both the error itself (which may or may not be random) and the position of the data symbol on the constellation (which, for all practical purposes, is random). A more useful angle is measured between the actual and ideal phasors (I-Q error phase or phase error), which contains information useful in troubleshooting signal problems. Likewise, I-Q error magnitude, or magnitude error, shows the magnitude difference between the actual and ideal signals. The magnitude of the error vector versus time

measurement shows the error vector magnitude variations as a signal changes over time—that is, at and between symbol decision timing points.

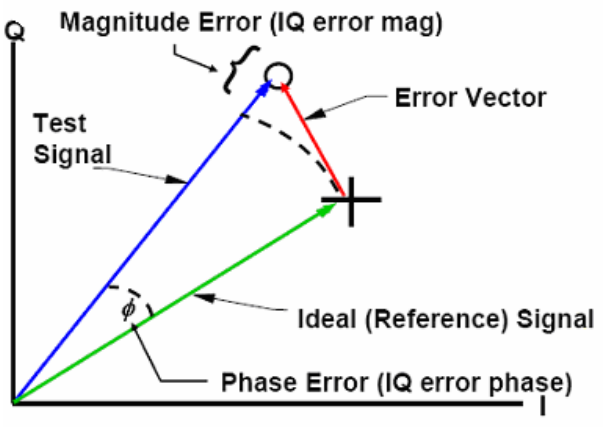

Fig.4b

B. Signal-to-noise ratio (often abbreviated SNR or S/N)

It is a measure used in science and engineering to quantify how much a signal has been corrupted by noise. It is defined as the ratio of signal power to the noise power corrupting the signal. A ratio higher than 1:1 indicates more signal than noise. In less technical terms, signal-to-noise ratio compares the level of a desired signal (such as music) to the level of background noiseSNRs are often expressed using the logarithmic decibel scale. In decibels, the SNR is defined as :

$SNR(dB) = 10 \log_{10} (P_{signal} / P_{noise})$

C.Vector Signal Generator

The vector signal generator combines outstanding RF performance and sophisticated baseband generation to deliver calibrated test signals at baseband, IF, and RF frequencies up to 3 GHz. Offering an internal baseband generator with arbitrary waveform and real-time I/Q capabilities, ample waveform playback and storage memory, and a wide RF modulation bandwidth, the VSG is equipped to test today's complex wireless systems. .

The VSG is an adaptable platform with optional capabilities to customize the instrument for baseband and RF test applications ranging from simple distortion test and general purpose troubleshooting to baseband coding algorithm development, advanced transceiver design verification, and high volume manufacturing.

The Coefficients of Raised Cosine filter and sharpened Raised Cosine filter designed in Matlab is fed in VSG when the filter chosen in VSG is user- defined (FIR). The modulation chosen in VSG is QAM (16/32/64)

D.Vector Signal Analyserr

The vector signal analyzer (VSA) facilitates faster and easier communication system design from initial design simulation to final hardware prototype. It offers 36 MHz bandwidth capacity for measuring signals such as cellular and satellite communications, digital video, wireless LAN (WLAN), and local multipoint distribution service (LMDS).

It offers digital demodulation and has facility of IQ measurement.

We can quickly evaluate and troubleshoot digitally modulated signals with both qualitative displays and quantitative measurements and visualize the system performance rapidly and intuitively with familiar display formats and view composite measurements of the code domain power (CDP), time, spectrum, phase error, evm and magnitude error. or view these for an individual channel.

In addition, a new code domain error measurement provides a histogram of error vector magnitude (EVM) versus channel. We can display our results in constellation, eye, trellis, or spectrum diagrams. In VSA we can detect intersymbol interference, quadrature balance and error, and spurious responses.

REFERENCES

[1] J. K aiser and R. H amming , " Sharpening the Response of a Symmetric Nonrecursive Filter by Multiple Use of the Same Filter , " *IEEE Trans. Acoustics, Speech, Signal Proc.* , vol. ASSP - 25 , no. 5 , 1977 , pp. 415 – 422 .

[2] R. Hamming , *Digital Filters* . Prentice Hall , Englewood Cliffs , 1977 , pp. 112 – 117 .

[3] R. Hamming , *Digital Filters* , 3rd ed. Dover, Mineola , New York , 1998 , pp. 140 – 145 .

[4] M. Donadio, \Lost Knowledge Refound: Sharpened FIR Filters," IEEE Signal Processing Magazine, 20 (5), pp. 61-63, Sept. 2003.

[5] Glover, I, Grant P 2004 Digital Communication (2ed) Pearson Education Ltd.

[6] Proakis, J (1995) Digital Communications (3 ed)McGraw Hill.

[7] Window Sharpening

[8] Shlomo Engelberg, Gil Freidlin, and Assaf Vaknin ,IMTC 2008 - IEEE Instrumentation and Measurement Technology ConferenceVictoria, British Columbia, Canada, May 12-15, 2008

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Association Rule Mining based on Ontological Relational Weights

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Abstract- Data mining has emerged to address the problem of transforming data into useful knowledge. On account of enormous of rules that can be produced by data mining algorithms, knowledge validation is one of the most problematic steps in an association rule discovery process. in this paper we propose a new WARM (weighted association rule mining) approach to prune and filter discovered rules based on the Ontological relational weights. We propose to use ontologies in order to improve the integration of user knowledge. An interesting real-life example and experimental results on different types of data are given; to reduce the numbers of rules to several dozen are less.

Index Terms- data mining, post processing, ontology, ORWM algorithm.

I. INTRODUCTION

ASSOCIATION rule mining, introduced in [1], is considered as one of the most important tasks in Knowledge Discovery in Databases [2]. Among sets of items in transaction databases, it aims at discovering implicative tendencies that can be valuable information for the decision-maker. An association rule is defined as the implication $X \rightarrow Y$, described by two interestingness measures support and confidence where X and Y are the sets of items and $X \cap Y = \phi$;. Apriori [1] is the first algorithm proposed in the association rule mining field and many other algorithms were derived from it. Starting from a database, it proposes to extract all association rules satisfying minimum thresholds of support and confidence.

Unfortunately, the lower the support is, the larger the volume of rules becomes, making it intractable for a decision-maker to analyze the mining result. Experiments show that rules become almost impossible to use when the number of rules overpasses 100. Thus, it is crucial to help the decision-maker with an efficient technique for reducing the number of rules.

To overcome this drawback, several methods were proposed in the literature. On the one hand, different algorithms were introduced to reduce the number of itemsets by generating closed [3], maximal [4] or optimal itemsets [5], and several algorithms to reduce the number of rules, using nonredundant rules [6], [7], or pruning techniques [8]. On the other hand, postprocessing methods can improve the selection of discovered rules. Different complementary postprocessing methods may be used, like pruning, summarizing, grouping, or visualization [9]. Pruning consists in removing uninteresting or redundant rules. In summarizing, concise sets of rules are generated. Groups of rules are produced in the grouping process; and the visualization improves the readability of a large number of rules by using adapted graphical representations. However, most of the existing post processing methods are generally based on statistical information in the database. Since rule interestingness strongly depends on user knowledge and goals, these methods do not guarantee that interesting rules will be extracted.

The classical model of association rule mining employs the support measure, which treats every transaction equally. In contrast, different transactions have different weights in real-life data sets. For example, in the market basket data, each transaction is recorded with some profit. Much effort has been dedicated to association rule mining with pre assigned weights However, most data types do not come with such pre assigned weights, such as Web site click-stream data. There should be some notion of importance in those data. For instance, transactions with a large amount of items should be considered more important than transactions with only one item. Current methods, though, are not able to estimate this type of importance and adjust the mining results by emphasizing the important transactions. Apriori[1] is the first algorithm proposed in the association rule mining field and many other algorithms were derived from it. Unfortunately, the lower the support is, the larger the volume of rules becomes, making it intractable for a decision-maker to analyze the mining results.

In this paper, we introduce w-support, a new measure of item sets in databases with only binary attributes. The basic idea behind w-support is that a frequent item set may not be as important as it appears, because the weights of transactions are different. These weights are completely derived from the internal structure of the database based on the assumption that good transactions consist of good items. This assumption is exploited by extending Kleinberg's HITS[11] model and algorithm to bipartite graphs. Therefore, w support is distinct from weighted support in weighted association rule mining (WARM).where item weights are assigned. Furthermore, a new measurement framework of association rules based on w-support is proposed. Experimental results show that w-support can be worked out without much overhead, and interesting patterns may be discovered through this new measurement.

The rest of this paper is organized as follows: First, WARM is discussed. Next, we present the evaluation of transactions with HITS [11], followed by the definition of w-support and the corresponding mining algorithm. An interesting real-life example and experimental results on different types of data are given.

This paper is structured as follows section 2 introduces related work. Section 3 introduces ontologies in data mining. Section 4 presents proposed framework and its elements. Section 5

presents experimental results, finally section 6 presents conclusion.

is article guides a stepwise walkthrough by Experts for writing a successful journal or a research paper starting from inception of ideas till their publications. Research papers are highly recognized in scholar fraternity and form a core part of PhD curriculum. Research scholars publish their research work in leading journals to complete their grades. In addition, the published research work also provides a big weight-age to get admissions in reputed varsity. Now, here we enlist the proven steps to publish the research paper in a journal.

II. RELATED WORK

In Data Mining, the usefulness of association rules is strongly limited by the huge amount of delivered rules. To overcome this drawback, several methods were proposed in the literature such as itemset concise representations, redundancy reduction, and postprocessing

The CLOSET algorithm was efficient method for mining closed itemsets. CLOSET uses a novel frequent pattern tree (FP-tree) structure, which is a compressed representation of all the transactions in the database. Moreover, it uses a recursive divide-and-conquer and database projection approach to mine long patterns. Another solution for the reduction of the number of frequent itemsets is mining maximal frequent itemsets [4]. The authors proposed the MAFIA algorithm based on depth-first traversal and several pruning methods as Parent Equivalence Pruning (PEP), FHUT, HUTMFI, or Dynamic Recording. However, the main drawback of the methods extracting maximal frequent itemsets is the loss of information because the subset frequency is not available; thus, generating rules is not possible.
Zaki and Hsiao used frequent closed itemsets in the CHARM algorithm [9] in order to generate all frequent closed itemsets. They used an itemset-tid set search tree and pursued with the aim of generating a small nonredundant rule set [6]. To this goal, the authors first found minimal generator for closed itemsets, and then, they generated nonredundant association rules using two closed itemsets. Pasquier et al. [7] proposed the Close algorithm in order to extract association rules. Close algorithm is based on a new mining method: pruning of the closed set lattice (closed itemset lattice) in order to extract frequent closed itemsets. Association rules are generated starting from frequent itemsets generated from frequent closed itemsets. Nevertheless, Zaki and Hsiao [9] proved that their algorithm CHARM outperforms CLOSET, Close, and Mafia algorithms. Most of the existing systems, being generally based on statistical information, most of these methods do not guarantee that the extracted rules are interesting for the user. Both closed and maximal itemsets mining still break down at low support thresholds. Thus, it is crucial to help the decision-maker with an efficient postprocessing step in order to reduce the number of rules & ease of Use.

III. ONTOLOGIES IN DATA MINING

In the early 1990s, ontology was defined by Gruber as a formal, explicit specification of a shared conceptualization [10]. By conceptualization, we understand here an abstract model of some phenomenon described by its important concepts. The formal notion denotes the idea that machines should be able to interpret ontology. Moreover, explicit refers to the transparent definition of ontology elements. Finally, shared outlines that ontology brings together some knowledge common to a certain group, and not individual knowledge. Ontologies, introduced in data mining for the first time in early 2000, can be used in several ways: Domain and Background Knowledge Ontologies, Ontologies for Data Mining Process, or Metadata Ontologies. Background Knowledge Ontologies organize domain knowledge and play important roles at several levels of the knowledge discovery process. Ontologies for Data Mining Process codify mining process description and choose the most appropriate task according to the given problem; while Metadata Ontologies describe the construction process of items.

IV. ASSOCIATION RULE MINING USING ONTOLOGICAL RELATIONAL WEIGHTS

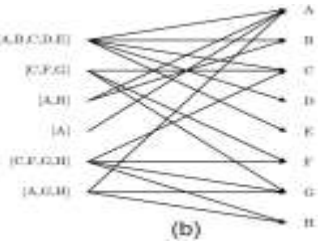
The concept of association rule proposed support-confidence measurement framework and reduced association rule mining to the discovery of frequent item sets. Much effort has been dedicated to the classical (binary) association rule mining problem since then. Numerous algorithms have been proposed to extract the rules more efficiently .These algorithms strictly follow the classical measurement framework and produce the same results once the minimum support and minimum confidence are given.

In this paper, we introduce w-support, a new measure of item sets in databases with only binary attributes. The basic idea behind w-support is that a frequent item set may not be as important as it appears, because the weights of transactions are different. These weights are completely derived from the internal structure of the database based on the assumption that good transactions consist of good items. This assumption is exploited by extending Kleinberg's HITS model and algorithm to bipartite graphs. Therefore, w support is distinct from weighted support in weighted association rule mining (WARM).where item weights are assigned. Furthermore, a new measurement framework of association rules based on w-support is proposed. Experimental results show that w-support can be worked out without much overhead, and interesting patterns may be discovered through this new measurement. The rest of this paper is organized as follows: First, WARM is discussed. Next, we present the evaluation of transactions with HITS, followed by the definition of w-support and the corresponding mining algorithm. An interesting real-life example and experimental results on different types of data are given.

ORW-ARM generalizes the traditional model to the case where items h ave weights Ram kumar et al introduced weighted support of association rules based on the costs assigned to both items as well as transactions. An algorithm called WIS was proposed to derive the rules that have a weighted support larger than a given threshold. Cai et al defined weighted support in a similar way except that they only took item weights into account. The definition broke the downward closure property. As a result, the proposed mining algorithm became more complicated and time consuming. Tao et al provided another definition to retain the "weighted downward closure property."

TID	Transaction
100	[A, B, C, D, E]
200	[C, F, G]
300	[A, B]
400	[A]
500	[C, F, G, H]
600	[A, G, H]

(a)



(b)

Figure 12: The bipartite graph representation of a database. (a) Database. (b) Bipartite graph.

In conclusion, the methodology of ORW-ARM is to assign weights to items, invent new measures (weighted support) based on these weights, and develops the corresponding mining algorithms.

A directed graph is created where nodes denote items and links represent association rules. A generalized version of HITS is applied to the graph to rank the items, where all nodes and links are allowed to have weights. However, the model has a limitation that it only ranks items but does not provide a measure like weighted support to evaluate an arbitrary item set. Anyway, it may be the first successful attempt to apply link-based models to association rule mining.

A. Algorithm Proposed

In the PROPOSED ORWM (Ontological relational weights measure) algorithm, the first step is to retrieve the set of results to the search query. The computation is performed only on this result set, not across all items.

However, little work has been done on weights by considering the authorities and hubs. Authority and hub values are defined in terms of one another in a mutual recursion. Authority is considered as the number of items with in the transactions. An authority value is computed as the sum of the scaled hub values that point to that transaction. Items relevant to the process of finding the authoritative items known as hubs. A hub value is the sum of the scaled authority values of the items it points to.

The algorithm performs a series of iterations, each consisting of two basic steps:

Authority Update: Update each node's Authority score to be equal to the sum of the Hub Scores of each node that points to it. That is, a node is given a high authority score by being linked to by pages that are recognized as Hubs for information.

Hub Update: Update each node's Hub Score to be equal to the sum of the Authority Scores of each node that it points to. That is, a node is given a high hub score by linking to nodes that are considered to be authorities on the subject.

The Hub score and Authority score for a node is calculated with the following algorithm:

1. Start with each node having a hub score and authority score of 1.
2. Run the Authority Update Rule
3. Run the Hub Update Rule
4. Normalize the values by dividing each Hub score by the sum of the squares of all Hub scores, and dividing each Authority score by the sum of the squares of all Authority scores.
5. Repeat from the second step as necessary.

B. ORWM - Exploration

To begin the ranking, $\forall p$, auth(p) = 1 and hub(p) = 1. We consider two types of updates: Authority Update Rule and Hub Update Rule. In order to calculate the hub/authority scores of each node, repeated iterations of the Authority Update Rule and the Hub Update Rule are applied. A k-step application of the Hub-Authority algorithm entails applying for k times first the Authority Update Rule and then the Hub Update Rule.

i. Authority Update Rule

$\forall p$, we update auth(p) to be:

$$\sum_{i=1}^{n} \text{hub}(i)$$

Where n is the total number of items connected to p and i is a item connected to p. That is, the Authority score of a item is the sum of all the Hub scores of items that point to it.

ii. Hub Update Rule

$\forall p$, we update hub(p) to be:

$$\sum_{i=1}^{n} \text{auth}(i)$$

Where n is the total number of items p connects to and i is a item which p connects to. Thus a items's Hub score is the sum of the Authority scores of all its relating items.

iii. Normalization

The final hub-authority scores of nodes are determined after infinite repetitions of the algorithm. As directly and iteratively applying the Hub Update Rule and Authority Update Rule leads to diverging values, it is necessary to normalize the matrix after every iteration. Thus the values obtained from this process will eventually converge.

C. Pseudo Code

```
1.  G := set of items
2.  for each item p in G do
3.  p.auth = 1 // p.auth is the authority score of the item p
4.  p.hub = 1 // p.hub is the hub score of the item p
5.  function HubsAndAuthorities(G)
6.  for step from 1 to k do // run the algorithm for k steps
7.  norm = 0
8.  for each item p in G do  // update all authority values
    first
9.  for each item q in p.incomingNeighbors do //
    p.incomingNeighbors is the set of items that link to p
10. p.auth += q.hub
11. norm += square(p.auth) // calculate the sum of the
    squared auth values to normalize
12. norm = sqrt(norm)
13. for each item p in G do  // update the auth scores
14. p.auth = p.auth / norm  // normalize the auth values
15. norm = 0
16. for each item p in G do  // then update all hub values
17. for each item r in p.outgoingNeighbors do //
    p.outgoingNeighbors is the set of items that p links to
18. p.hub += r.auth
19. norm += square(p.hub) // calculate the sum of the
    squared hub values to normalize
```

20. norm = sqrt(norm)
21. for each item p in G do // then update all hub values
22. p.hub = p.hub / norm // normalise the hub values.

V. EXPERIMENTAL RESULTS

A. Example 1: consider the bellow transactions as input

TID	TRANSACTIONS
1	1 2 3 4 5
2	3 6 7
3	1 2
4	1
5	3 6 7 8
6	1 7 8

Table 1: Transactional database

From the above transactions bipartite graph representation is

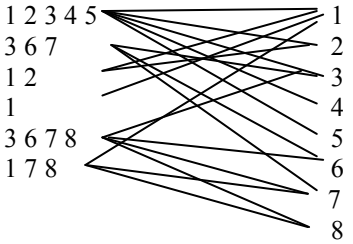


Figure 2: bipartite graph

From the above graph according to our ORWM process compute the authority weights, hub weights and W-support listed in bellow figure 3.

Where vertex weights considered as Authority weights (u) let us perceive that the two update operations described in the figure 3 translated by $v=A^t.u$, $u=A.v$. In order to target the most interesting rules, we gave a support of 0.2 percent; confidence of 7 percent gives number of frequent sets 7 and generates the number of Association rules 2. Those are $\{7\}\rightarrow\{3\}$ with 44.44 confidence, $\{3\}\rightarrow\{7\}$with 37.03 confidence. For support of 0.2 percent, confidence of 10 percent gives number of frequent sets 3 and generates the number of Association rules 0.

Support (%)	Confidence (%)	No.of Frequent item sets	Number of Association Rules
0-1	9	3	0
0-2	10	3	0
0-2	7	7	2
0-5	8	0	0
0.5	10	0	0

Table 2 Results of ex.1 based on weights

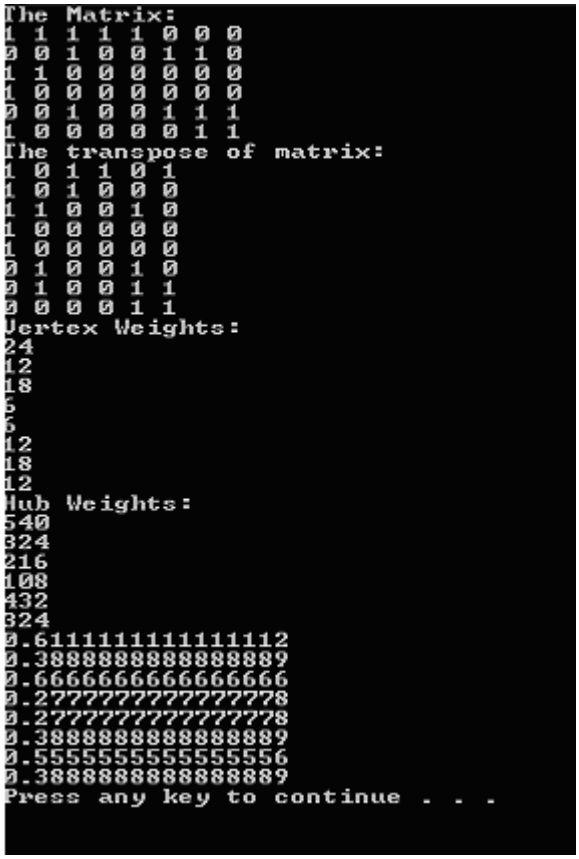


Figure 3 display the weights of example 1

B. Example 2

This example proposed to present the efficiency of our new approach concerning the reduction of the number of rules. In this proposed example, we have taken number of items 38 with 768 transactions. We have listed bellow some of the results from the example.

Support (%)	Confidence (%)	No. of frequent itemsets	Number of Association Rulesnerated
0.1	40	9	13
0.2	12	7	12
0.3	33	7	12
0.5	20	5	4
0.6	65	3	0
0.2	60	7	10
0.1	50	9	12

Table3: example 2 results based on weights

VI. CONCLUSION

This thesis discusses the problem of selecting interesting association rules throughout huge volumes of discovered rules. The major contributions of our paper are stated below. We propose to integrate user knowledge in association rule mining using ontologies. Our ORWM process assigns the weights to the attributes. Mining performed based on the ontological relational weights. By applying our new WARM (weighted Association Rule Mining) approach over a voluminous questionnaire database, we allowed the integration of domain expert knowledge in the postprocessing step in order to reduce the number of rules to several dozens or less.

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REFERENCES

[1] R. Agrawal, T. Imielinski, and A. Swami, "Mining Association Rules between Sets of Items in Large Databases," Proc. ACMSIGMOD, pp. 207-216, 1993.

[2] U.M. Fayyad, G. Piatetsky-Shapiro, P. Smyth, and R. Uthurusamy, Advances in Knowledge Discovery and Data Mining. AAAI/MIT Press, 1996.

[3] M.J. Zaki and M. Ogihara, "Theoretical Foundations of Association Rules," Proc. Workshop Research Issues in Data Mining and Knowledge Discovery (DMKD '98), pp. 1-8, June 1998.

[4] D. Burdick, M. Calimlim, J. Flannick, J. Gehrke, and T. Yiu, "Mafia: A Maximal Frequent Itemset Algorithm," IEEE Trans. Knowledge and Data Eng., vol. 17, no. 11, pp. 1490-1504, Nov. 2005.

[5] J. Li, "On Optimal Rule Discovery," IEEE Trans. Knowledge and Data Eng., vol. 18, no. 4, pp. 460-471, Apr. 2006.

[6] M.J. Zaki, "Generating Non-Redundant Association Rules," Proc. Int'l Conf. Knowledge Discovery and Data Mining, pp. 34-43, 2000.

[7] N. Pasquier, Y. Bastide, R. Taouil, and L. Lakhal, "Efficient Mining of Association Rules Using Closed Itemset Lattices," Information Systems, vol. 24, pp. 25-46, 1999.

[8] Toivonen, M. Klemettinen, P. Ronkainen, K. Hatonen, and H. Mannila, "Pruning and Grouping of Discovered Association Rules," Proc. ECML-95 Workshop Statistics, Machine Learning, and Knowledge Discovery in Databases, pp. 47-52, 1995.

[9] B. Baesens, S. Viaene, and J. Vanthienen, "Post-Processing of Association Rules," Proc. Workshop Post-Processing in Machine Learning and Data Mining: Interpretation, Visualization, Integration, and Related Topics with Sixth ACM SIGKDD, pp. 20-23, 2000. .J. Zaki and C.J. Hsiao, "Charm: An Efficient Algorithm for Closed Itemset Mining," Proc. Second SIAM Int'l Conf. Data Mining, pp. 34-43, 2002.

[10] T.R. Gruber, "A Translation Approach to Portable Ontology Specifications," Knowledge Acquisition, vol. 5, pp. 199-220, 1993.

[11] Implementing an online version of hyperlink-induced topic search (hits) algorithm Amith Kollam Chandranna, Department of Computer Science San José State University, project thesis.

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Review and Analysis of Voltage Collapse in Power System

Prof. Paramjeet Kaur, Manojkumar Jaiswal, Priyanka Jaiswal

Abstract- A Voltage Collapse is defined as the process by which voltage instability leads to a very low voltage profile in a significant part of the system**.**Voltage stability in power systems is influenced by generator field and armature current limiters, on-load tap changers and load dynamics. This paper analyses possible interactions between these system components by computer simulations of long-term power system dynamics.
The different modes of generator current limiter operation are analysed and it is shown that possible transitions between these modes can cause voltage instability. The importance of the armature current limiter behaviour is emphasized since this protection system causes the generator to lose all of its voltage support when trying to keep the armature current on a constant level. During a voltage decline in the transmission network, the on-load tap changers try to maintain a constant load voltage. This will cause a higher current demand in the transmission system which increases the voltage drop even more. It is shown how dynamic load characteristics can have a strong influence on the outcome of a disturbance. A load recovery in combination with on-load tap changers may cause an overshoot in power demand leading to a higher stress on the system compared to a constant power load.

The system is also sensitive to the static load dependence where a small variation in characteristics may cause a completely different outcome of a disturbance. The phenomena mentioned were studied in a small power system with special attention to the current behaviour. That voltage stability can be treated as a 'current problem' is best shown by the on-load tap changer behaviour and the armature current limiter actions. These components have a strong influence on the currents in the system. A clear indication that the system sooner or later will approach voltage instability is therefore an increasing current combined with a decreasing voltage. This current versus voltage relation is briefly studied through the Parameter ΔI/ΔU.

Index Terms- Armature current limiter, Field current limiter, load dynamics. Voltage collapse, Voltage instability

I. INTRODUCTION

This paper treats certain aspects of voltage stability in power systems. The approach has a practical point of view, where computer simulations and analysis are based on accurate models of real components. Two different models for on-load tap changer relays and a generator field and armature current limiter model have been implemented into the simulations. Also a dynamic load model based on field measurements has been included. With these models long-term dynamics of power systems have been analysed. Finally a qualitative study of the current limiter behaviour of generators is presented together with a study of the current-voltage trajectory during voltage instability. The project began with a preliminary study in October 1992. The usefulness of the power system simulation software MATLAB as a simulating tool for long-term models was investigated. It was concluded that the ability to develop user models in PSS/E was sufficient for the purpose of investigating voltage collapse. Two papers have been written during this project. In the first paper it is presented at the conference on "Bulk Power System Phenomena III, Voltage stability, Security and Control" in Davos, Switzerland in August 1994. The paper treats four implemented models: a generator current limiting model, two different on-load tap changer models and a dynamic load model. All of them are based on real components or field measurements. Their behaviour is exemplified by simple simulations. The significance of the current limiters, OLTC and the load dynamics is demonstrated. The second paper has been accepted for publication at Stockholm Power Tech, International Symposium on Electric Power Engineering June 1995. This paper analyses the behaviour of generator current limiters. It is shown in which manner different current limiting modes interact with the power system and may cause a voltage collapse. The variable ΔI / ΔU is introduced which gives information on the state of the system.

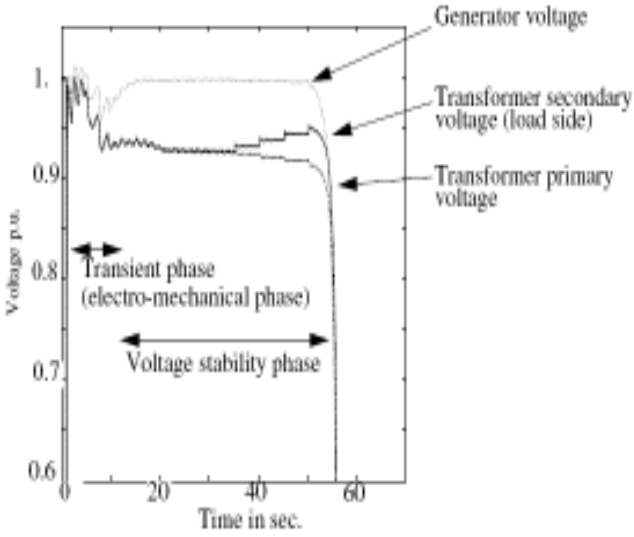

Fig. 1 Collapse Simulation example with a stable transient stability phase

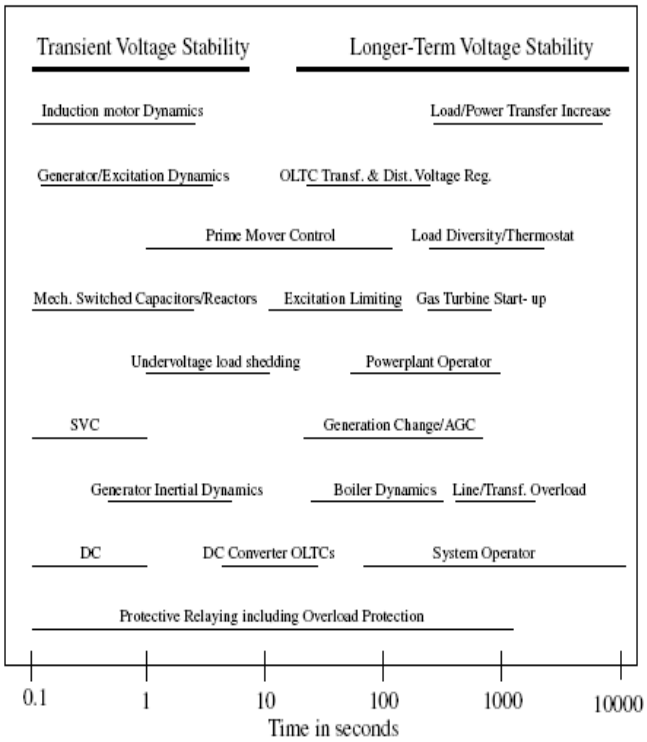

Fig. 2 Different Time Responses for Voltage Stability Phenomenon

II. LITERATURE REVIEW

Analysing real collapses involves two problems. Firstly, the lack of event recorders in the "right" places causes lack of information about the disturbance. Secondly, it is sometimes difficult to distinguish between voltage stability and transient stability. There might be other reciprocal actions which make the system more difficult to understand, such as human interaction, frequency deviation etc. We would like to present the following experiences gained from real collapses. They point out several important properties that are common in many different disturbances.

Table 1: Occurrence of disturbances world-wide

YEAR	OCCURRENCE OF DISTURBANCE
1970	New York State Pool disturbance
1977	Jacksonville, Florida system disturbance
1979	Zealand, Denmark system disturbance
1981	Longview, Washington area system disturbance
1981	Central Oregon system disturbance
1982	Belgium system disturbance
1982	Florida system disturbance
1987	Western French system disturbance
1982	Northern Belgium system disturbance
1983	Northern California system disturbance
1983	Swedish system disturbance
1983	Japanese system disturbance
1984	Northeast United States system disturbance
1986	England system disturbance
1986	Miles City HVDC links
1987	Tokyo system disturbance
1987	IIIinois and Indiana system disturbance
1987	Mississippi system disturbance
1989	South Carolina system disturbance
1990	Western France system disturbance
1990	Baltimore and Washington D.C. system disturbance
1996	Western System Co-ordination Council (WSCC) disturbance
1995	Sri Lanka Power System disturbance
1996	North Indian Grid disturbance
2003	North American Power system disturbance
2006	National Grid System of Pakistan disturbances

Proposal and implementation of new theories and their implementers –

These are the contingencies and network stresses which gives rise to the voltage instability. Post-analysis of several recent wide-area outages show it to be a contributing factor. Insufficient reactive power reserves or the loss of reactive power resources have been linked to most of these incidents. This problem has prompted significant research efforts towards reactive power management strategies targeted at mitigating voltage instability. Several reactive power dispatch methods incorporating voltage stability have been developed.

- Cheebo introduced a linear reactive power support algorithm that uses a voltage collapse proximity indicator to detect voltage instability.
- Ajjarapu, suggested a technique that maximizes the real power transfer with minimal shunt reactive power support by using an extended method of the continuation power flow
- Dong, proposed an optimized reactive reserve management strategy based on the solutions from an optimal power flow.

In the analysis, the available generator reserves serve as the measurement of voltage stability. Flexible AC transmission systems (FACTS) have also been studied and proposed as a partial solution to voltage collapse. FACTS devices can provide reactive compensation, shift the voltage-power angles, and change the apparent impedance across the transmission line. Such effects may improve voltage stability at strategic locations in the network. Canizares demonstrated that a Static Var Compensator (SVC) and Thyristor Controlled Series Capacitor could increase the loading limits in practical power system applications.

- Noroozian utilized the dynamic reactive power capability of a Static Synchronous Shunt Compensator and SVC to improve both the steady-state stability and the short-term voltage stability of a test power system.

Distributed energy (DE) resources have received greater attention in recent years due to utility restructuring and power quality concerns. Distributed resources assist in reducing power delivery problems by providing both voltage regulation and reactive compensation closer to loads.

Before distributed resources can take on this role and be integrated with greater frequency, it is important to fully understand its interaction with the power system. One particular issue is that distributed resources can mask the underlying

voltage instability as it improves the voltage profile. This situation reduces voltage security and increases power system vulnerability to voltage instability. Without proper coordination of reactive power compensation, distributed resources may actually exacerbate a problematic voltage condition.

- Katiraei, implemented droop control for reactive power control of multiple distributed generation units in a microgrid system.
- Piagi, utilized droop control as a solution to voltage regulation problems, reactive power oscillations, and large circulating currents that may occur due to high penetration levels of micro-sources in a microgrid.
- Marwali, proposed a droop control strategy for parallel operation of distributed generation systems in a stand-alone ac power supply.

III. RESULTS

There are several approaches to voltage stability problems. One approach might be to divide the power system into three parts: the transmission system, the distribution system which includes the electrical load demand and the generation system. These three subsystems interact with each other and voltage stability problems can originate in any of these sub-systems. For transmission systems, increased reactive power demand can cause a voltage stability problem.

In distribution networks, stalling asynchronous motors, air conditioning systems and electrical heating appliances are examples of dynamic loads that can give rise to voltage stability problems. Voltage problems can also be due to generators. A well known example is the field current limiter (over-excitation limiter). However, the armature current limiter affects the power system in an even more drastic way. The armature current limiter is quite often neglected in the analysis because it is not commonly used. However, there are reasons to include it as an over current protection system.

We analyze current limiter behaviour and its significance for system stability. Moreover carrying out simulation in MATLAB with respect to the physical parameters such as current, voltage, etc, bottlenecks of the system can be tracked.

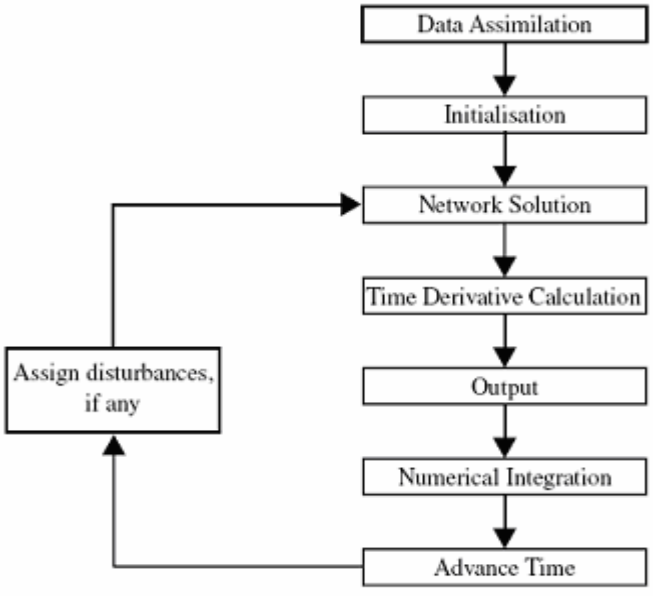

Fig. 3 Logic Flow of dynamic simulation of objective

IV. FUTURE SCOPE

In recent years, Voltage stability problems have been encountered by many power utilities that are forced to operate their generation and transmission network under increasingly stressed condition. As a result considerable research efforts have been devoted to voltage stability related issues. Methodology based on proximity indicators and P–V, Q–V curves have been developed for voltage stability assessment. Artificial intelligence based methods including neural network, decision trees and fuzzy logic have also been used for voltage instability studies.

Moreover, numerous simulation scenarios testify the viability of such an approach. By using suboptimal search methods, extension to large scale systems can be made possible within the computational time restriction. This is currently an issue under investigation and some promising results are available. So it is expected these approaches is shown to be computationally efficient which makes it attractive for real time applications.

V. CONCLUSION

An important problem regarding voltage collapse has been addressed accounting uncertainties in system parameters and control variables. A methodology has been developed for avoiding voltage instability with respect to probabilistic risk. Such approach is of great significance for modern power systems operating under stressed condition. PSS/E in improved form has been implemented to obtain optimal solution. A fly-back mechanism has also been used to get feasible solution.

All in all, as to the different circumstances of every system and every area, application of under-voltage load-shedding scheme should be established based on special conditions of the power systems, for voltage instability problem has close relationship with the power system of every area. With the rapid development of wide area measurement and communication technology, under-voltage load-shedding and other emergency control measures can be combined to prevent voltage collapse more efficiently.

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REFERENCES

[1] C. W. Taylor, "Power System Voltage Stability", McGraw-Hill ISBN 0- 07-063184-0.
[2] Y. Harmand et al., "Analysis of a Voltage Collapse-incident and proposal for a time-based hierarchical containment scheme", CIGRÉ 38/39-02.
[3] R., van den Damme, "The incident of August 4th 1982 of the Belgian Electricity System", Intercom, September 12.
[4] IEEE Committee Report, Voltage Stability of Power Systems: Concepts, Analytical Tools, and Industry Experience, IEEE/PES 90TH0358-2-PWR.
[5] H. Suzuki, Study group 37 discussion, CIGRÉ, Proceedings of the 34th Session, Vol. II, pp. 37-39.

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Seasonal Variations in the Population Density and Diversity of Soil Fauna in two Different Habitats of Central Travancore Area of South Kerala –India

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Abstract- The population density and diversity of soil fauna of two different habitats of Central Travancore area of South Kerala were studied. The population density of most of the soil animal groups was well represented in the grassland and agricultural soil during monsoon. The density of Orthoptera and Isoptera in soil was low. Diplopodans were richly found during the monsoon, which is the active feeding time of this group.

Post-monsoon temperature of soil favors the reproduction and multiplication of Collembolans. There was a rapid increase in the density of Collembolan during post monsoon. During post monsoon Coleopterans had low density. In summer most of the soil animals showed vertical migration. They go very deep into the soil to avoid extreme temperature rise of the top soil. So the population density of soil animal groups in both grasslands and agricultural soil was low during summer.

Comparatively grassland soils showed more population density of most of these animal groups when compared to agricultural land soil. The population density of different groups showed drastic variations in the number among different groups but no significant difference among same groups at different sites as revealed by Anova tests. This showed that even distribution of species in the soil and dominance and over dominance of certain species over the other. There were differences in the soil edaphic and chemical properties in two habitats.

Index Terms- density and diversity, habitat, seasonal variations, soil fauna, soil properties

I. INTRODUCTION

The organic matter of soil arises from the debris of green plants, animal's residues and excreta that are deposited on the surface and mixed to a variable extend with the mineral component (Russel, 1973). The dead organic matter is colonized by a variety of soil organisms most importantly microorganisms which derive energy for growth from the oxidative decomposition of complex organic molecules.

The soil faunas inhabiting the soil are active partners of plant tissues. When dead leaves fall on moist soils they are immediately attacked by mites which perforate and fragment the dead plant bodies, thus facilitating microbial entry and offering a layer surface area for microbial action. Most important groups involved in the turnover of organic matter are Arthropods and Annelids. Soil micro arthropods include the Isopods, Arachnids Insects and Myriapods. The more numerous are the mites and many of the insects present as adults and larvae. Millipedes feed on vegetation much of which in the form of living roots, bulbs and tubers. The turnover of organic matter in the soil depends on the density and diversity of inhabiting soil fauna. Hence an attempt has been taken to estimate the density and diversity of soil fauna of two different habitats of central Travancore area of South Kerala.

II. MATERIALS AND METHODS

A Diversity and Density

Soil animal groups of various orders were selected for this study. Soil samples were collected from eight different sites, of which four grassland and four agricultural land respectively. Samples were collected in three seasons viz monsoon (June-August), post monsoon (September- November) and summer (December – February). Moist surface soil samples were collected from these areas using a soil auger (25cm^2 area). The collected soil samples were transferred to polythene cover and then taken to the Berlesse funnel apparatus and the animals were extracted in beakers containing picric acid. After the extraction of animals, their number was counted and identified the different groups of animals present in the extraction bowl with the help of a dissection microscope. The population density (mean +SD in m^2) of each group was then calculated.

B. Soil properties

Soil temperature, soil pH and organic carbon content of the soil from where these animals were collected were analyzed. Temperature was measured using a soil thermometer. pH of the soil, soil moisture content and organic carbon content were estimated using the standard procedures of Trivedy and Goel (1987). The NPK value of the soil was determined. Total nitrogen content of the soil was analysed using Kjeldahl distillation method (Jackson, 1958). Phosphate content of the soil was determined by molybdate- stannous chloride method (Jackson, 1958). Potassium content was analysed by flame photometry method of ASA (1965). Exchangeable acid, exchangeable base, calcium and magnesium content were found out according to procedures of Jackson (1958).

C. Statistical Analysis

Mean and standard deviation was calculated for the animal density estimation. One way Anova test was conducted to find

out any significant difference in the soil properties at different sites of same community. A two way Anova test was conducted to find any significant difference in the population density of different animal groups at different collection sites and also between different groups.

III. Results and discussion

A. Population density and diversity

1) Grassland Community – Monsoon Season (June- August)

Eleven groups of animals were recorded from the grassland community during monsoon season. They were Acari, Diplopoda, Isopoda, Annelida, Collembola, Hymenoptera, Isoptera, Orthoptera, Coleoptera, Gastropoda and Pauropoda. Collembolans were the most abundant group where as Coleoptera and Orthoptera were least abundant (Table 1) .Two way Anova conducted revealed that there is significant difference in the population density of different groups of animals ($F = 60.4254$, $P < 0.05$) and no significant difference between the density of same group of animals at different sites ($F = 1.0668$, $P > 0.05$)

2) Grass land community- Post monsoon (September-November)

During post monsoon season almost all faunal groups were well represented with high population density (Table 2). Two way Anova conducted revealed that there is significant difference in the population density of different groups of animals ($F = 60.4254$, $P < 0.05$) and no significant difference between the density of same group of animals at different sites ($F = 1.0668$, $P > 0.05$)

3) Grassland Community- summer (December –February)

During summer season Orthoptera and Coleoptera were not at all represented in the sample in all sites. Here also Collembola predominates among the soil animals. Acari, Isopoda, Diplopoda and Annelida were moderately represented whereas Gastropods and Pauropods were least represented (Table 3). A two way Anova conducted showed that there is significant difference in the population density of different animal groups ($F = 65.232$, $P < 0.05$) whereas no significant difference was found in the density of same animal groups at different sites ($F = 0.8955$, $P > 0.05$).

4) Agricultural land Community -Monsoon (June – August)

Nine groups were identified from different sites of agricultural land community during monsoon. Collembola were the most abundant group followed by Acari and Isopoda. Isoptera and Coleoptera were not at all represented whereas Orthoptera were obtained from one site. Population density was observed for Gastropoda, Diplopoda, Pauropoda and Annelida (Table 4). A two way Anova conducted showed that there is significant difference in the density of different groups ($F = 40.465$, $P < 0.05$) and no significant difference in the density of same groups at different sites ($F = 1.419$, $P > 0.05$).

5) Agricultural land Community - Post Monsoon (September-November)

Only eight groups of soil animals were recorded from agricultural land community during post monsoon season. Isoptera, Coleoptera and Orthoptera were not at all represented in any of the study sites. Acari and Collembola were well represented. Diplopoda and Isopoda were moderately represented whereas Pauropoda, Gastropoda, Hymenoptera and Annelida were least represented (Table 5). Two way Anova conducted with this data showed a very significant difference in the population density of different animal groups ($F = 32.115$, $P<0.05$) and no significant difference between the population density of animal groups at different sites ($F = 0.148$, $P > 0.05$)

6) Agricultural land Community – summer (December – February)

Only seven animal groups were extracted from the agricultural land community during summer. Gastropoda, Coleoptera, Orthoptera and Isoptera were not at all represented. Collembola were well represented followed by Acari and Diplopoda. Isopoda and Hymenoptera were moderately represented whereas Annelida was least represented (Table -6). Two way Anova conducted with this data showed a very significant positive difference in the density of different animal groups ($F = 63.21$, $P < 0.05$) and no significant difference in the population density of same animal groups at different sites ($F = 1.9365$, $P>0.05$)

B. Soil Properties

Agricultural land Community

1) Soil Moisture (%) and Soil Temperature (^{0}C)

The moisture content was very high during monsoon followed by pre-monsoon and summer. During monsoon the moisture content rose up to 78 % (mean). In pre-monsoon it came down to 62% (mean) and in summer a mean value of 32% was obtained. The soil temperature was at an average of 22^0 C in monsoon, 24^0 C in Post monsoon and 32^0 C in summer (Table 7).

2) pH

The pH was between 5.9 and 6.2. This indicates that soil in the agricultural land community is slightly acidic (Table 7).

3) Organic Carbon (OC %)

The Organic Carbon content varies between 2.1 to 2.4 in different sites. This value indicates a moderate fertility to the soil (Table 7).

4) Exchangeable acid and Exchangeable base (EA% and EB %)

The EA % was 80 in all the study sites of agricultural land community whereas exchangeable base (EB %) was in the range of 8 and 9. This indicates that the soil has high tolerance to acidity and alkalinity (Table 7).

5) Sand, Clay (%)

The Sand content of agricultural land community ranges between 4 and 6% and the clay between 15 and 18%. This indicates a good porosity and moisture holding capacity of the soil (Table 7).

6) NPK Content (ppm)

The nitrogen (available nitrogen) content was between 2130 and 2930 parts per million (ppm) at different sites. The phosphate content varies from 9.1-9.8 ppm and potassium

content between 120-131 ppm. This indicates a moderate chemical nutrient content of the soil (Table 8).

7) Calcium and Magnesium content (ppm)

The calcium and magnesium content was very low in the soil of this community. The calcium was in the range of 810-910 ppm against the normal healthy range of 2000-2250 ppm. The magnesium content was also low in the range of 171-180 ppm against the healthy range of 700-800 ppm (Table 8).

Grassland Community

1) Soil moisture (%) and soil temperature (^{0}C)

The soil moisture was high during monsoon and low during post monsoon and summer. A drastic difference in the soil moisture % was not obtained during post monsoon and summer. The temperature was at an average of 20^{0}C in monsoon, 22^{0}C in post monsoon and 34^0 C in summer (Table 9).

2) pH

The pH of grassland community soil was more acidic than agricultural land soil. It ranges from 5.22 to 5.42 (Table 9).

3) Organic Carbon (OC %)

The OC% was very high in this soil. OC% was above 4 in all the sites ranged between 4.1 and 4.3. This is almost equal to the OC% of moist deciduous and savannah soil (Table 9).

4) Exchangeable acid (EA %) and Exchangeable base (EB %)

The EA ranges between 71 and 74% while EB between 11 and 12%. This value indicates that this soil has low acidic tolerance than alkalinity. Acidic tolerance is very important for the growth of higher angiosperms (Table 9).

5) Sand and Clay (%)

The sand % was very high ranging from 7and 8. The clay % was also high between 21 and 23% whereas silt was between 0.71-0.74 percent. The very high sand and clay% showed the absence of luxuriant vegetation and degradation of community into grassland (Table 9).

6) NPK Content (ppm)

The nitrogen and phosphorous content was very low in this soil. The nitrogen content was between. 1011 -1236 ppm and phosphate content between 4.1- 4.8ppm. The potassium content was very high between 310-373 ppm compared to agricultural land soil (Table 10).

7). Calcium and Magnesium Content (ppm)

Calcium and magnesium content was very high compared to agricultural land soil. The calcium content varies from 1110-1410 ppm whereas magnesium content varies from 232-281 ppm. The values of these two elements exceed the limit of healthy soil for agriculture purpose (Table 10).

The one way Anova conducted to find any significant difference in the values of soil pH at different sites of agricultural land and grass- land showed a very significant difference ($F=92.685$, $P< 0.05$) . The one way Anova conducted to find out any significant difference in the soil OC%, soil EA%, soil EB %, sand %, silt %, clay%, Nitrogen (ppm), Phosphorous (ppm), Potassium (ppm), Calcium (ppm) and Magnesium (ppm) between agricultural land and grassland showed a very high positive significant difference in the above properties between the two communities ($P< 0.05$ in all cases).

The population density of most of the soil animal groups was well represented in the grassland soil during monsoon. The low density of Orthoptera and Isoptera in soil was due to their adult life in air. Diplopodans were highly found during the monsoon, which is the active feeding time of this group. The young leaves of grasses are the prime food of Diplopodans. Post-monsoon temperature of soil favors the reproduction and multiplication of Collembolans (Sanal Kumar and Sujatha, 1996). This accounts for the rapid increase in the density of Collembolan during post monsoon. During post monsoon Coleopterans go very deep into the soil for egg laying. This is the reason for the low population density of this group during post monsoon.

In summer most of the soil animals show vertical migration. They go very deep into the soil to avoid extreme temperature rise of the top soil. This is the reason for the low population density of soil animal groups in both grasslands and agricultural soil.

Comparatively grassland soils showed more population density of most of these animal groups when compared to agricultural land soil. This may be due to the un disturbances of the grassland soil when compared to agricultural soil.

The population density of different groups showed drastic variations in the number among different groups but no significant difference among same groups at different sites as revealed by Anova tests. This showed that even distribution of species in the soil and dominance and over dominance of certain species over the other.

Grassland soil is more fertile than the agricultural soil as revealed by OC %, pH, EA% and EB% but the luxuriant vegetation is lacking in the soil due to the high content of calcium, magnesium and sand content. Increase in sand content and level of calcium and magnesium above optimal had retarded effect on plant growth. The increase in the nitrogen and phosphorous content of agricultural soil is due to the addition of chemical fertilizers to the soil during agricultural operations.

Table 1: Density and diversity of soil organisms at different sites in the grassland community during monsoon (Mean $\pm$ SD per m^2)

Species	Site I	Site II	Site III	Site IV
Acari	11 $\pm$ 1	10 $\pm$ 1.732	14 $\pm$1	13 $\pm$ 2.081
Diplopoda	18 $\pm$ 1	7 $\pm$ 09	10 +1.732	11$\pm$ 2
Isopoda	13 $\pm$ 2.081	8 $\pm$ 2.645	5 $\pm$ 1	10 $\pm$ 1
Annelida	9 $\pm$ 2.645	11$\pm$1	7 $\pm$ 1	12$\pm$1
Collembola	26 $\pm$ 2.081	24 $\pm$ 1	30$\pm$2.645	20$\pm$2.081
Hymenoptera	10 $\pm$1.732	8 $\pm$ 3.605	12 $\pm$ 2	14 $\pm$1.527
Isoptera	6 $\pm$ 2.645	4 $\pm$ 1.732	3 $\pm$ 2.645	7 $\pm$ 1.732

Orthoptera	1 ± 1	3 ± 1.732	0	0
Coleoptera	2 ± 1.732	0	1 ± 1.732	1 ± 0
Gastropoda	4 ± 1	6 ± 3.605	3 ± 1.732	5 ±2.645
Pauropoda	7 ± 3	4 ± 1	3 ± 1	5 ± 1.732

Table.2: Population density and diversity of soil organisms at different sites in the grassland community during post monsoon (Mean ± SD per m^2)

Species	Site I	Site II	Site III	Site IV
Acari	16 ± 2.516	14 ± 2.465	20 ± 1.732	17 ± 1
Diplopoda	12 ± 1	16 ± 1.527	19 ± 1	10 ± 1.732
Isopoda	9 ± 3.605	15 ± 1	12 ± 1	11 ± 2
Annelida	8 ± 3.214	13 ± 1.527	14 ± 2.645	17 ± 1
Collembola	35 ± 4.358	34 ± 3.605	32 ± 2.645	31 ± 1
Hymenoptera	4 ± 1	8 ± 2	7 ± 1	6 ± 1
Isoptera	7 ± 1.732	3 ± 1	4 ± 0	9 ± 1.732
Orthoptera	1 ± 0	0	3 ± 0	1 ± 1.732
Coleoptera	1 ±1	2 ± 1732	0	1 ±1
Gastropoda	3 ±1.732	2 ±2	3 ±1	6 ± 2.645
Pauropoda	4 ± 1	3 ± 2.645	5 ± 2.645	6 ± 1.732

Table 3: Population density and diversity of soil organisms at different sites in the grassland community during summer season (Mean ± SD per m^2)

Species	Site I	Site II	Site III	Site IV
Acari	10 ± 2	8 ± 1.732	12 ± 1	9 ± 1.732
Diplopoda	11 ± 1	9 ± 1. 732	10 ± 1	6 ± 1
Isopoda	7 ± 1	9 ± 2.645	10 ± 1	6 ± 1
Annelida	8 ± 1.732	4 ± 1	4 ± 0	3 ± 1
Collembola	22 ± 2.645	18 ± 1	19 ± 1	21 ± 2.645
Hymenoptera	16 ± 1.527	14 ± 1.732	17 ± 1	13 ± 0.577
Isoptera	7 ± 1.732	5 ± 1.732	4 ± 1.732	6 ± 1.732
Orthoptera	0	0	0	0
Coleoptera	0	0	0	0
Gastropoda	2 ± 2	5 ± 2.645	4 ±1.732	3 ± 2.645
Pauropoda	2 ± 1	4 ± 2	2 ± 1.732	1 ± 1

Table 4: Population density and diversity of different soil animals at different sites of agricultural land community during monsoon season (Mean ± SD per m^2)

Species	Site I	Site II	Site III	Site IV
Acari	11 ± 1	13 ± 1.527	9 ± 1	14 ± 1
Diplopoda	7 ± 1.732	5 ± 1. 732	3 ± 1	7 ± 1.732
Isopoda	6 ± 2	4 ± 1.732	7 ± 1	8 ± 2
Annelida	3 ± 1	2 ± 1	3± 1.732	4 ± 1
Collembola	18 ± 2.645	14 ± 2	13 ± 0	12 ± 1
Hymenoptera	6 ± 1	4 ± 1	5 ± 1.732	5 ± 2.645
Isoptera	0	0	0	0
Orthoptera	0	1 ± 1	0	2 ± 2
Coleoptera	0	0	0	0
Gastropoda	3 ± 1.732	4 ± 2	2 ±1.732	4 ± 1
Pauropoda	3 ± 2.645	3 ± 4.358	6 ± 1.732	4 ± 2

Table 5: Population density and diversity of different soil animals at different sites of agricultural land community during post monsoon season (Mean ± SD per m^2)

Species	Site I	Site II	Site III	Site IV
Acari	12 ± 2.645	15 ± 2	13 ± 2.081	10 ± 3
Diplopoda	8 ± 1.732	10 ± 2	13 ± 3.785	9 ± 2.645
Isopoda	8± 2.645	7 ± 1.732	9± 2	4 ± 2.645
Annelida	3 ± 1	5 ± 2.645	2± 1	7 ± 2
Collembola	12± 2.645	11 ± 2	10 ± 2.645	13 ± 3.055
Hymenoptera	6 ± 2	4 ± 1	0	5 ± 2
Isoptera	0	0	0	0
Orthoptera	0	0	0	0
Coleoptera	0	0	0	0
Gastropoda	0	2 ± 1.732	1 ±1	0
Pauropoda	3 ± 3.605	1 ± 1	2 ± 1.732	3 ± 1.732

Table 6: Population density and diversity of soil animal groups at different sites in the agricultural land community during summer (Mean ± SD per m^2)

Species	Site I	Site II	Site III	Site IV
Acari	7 ± 1.732	9 ± 1	6 ± 1	8± 3
Diplopoda	6 ± 1.732	5 ± 1	7 ± 2.645	6 ± 2.645
Isopoda	4± 2	3 ± 3	2± 1.732	4 ± 1
Annelida	2 ± 1	2 ± 2.645	3± 1	1 ± 1
Collembola	10± 1.732	13 ± 1.732	9 ± 2.645	12 ± 5.567
Hymenoptera	6 ± 1	8 ± 2.645	4± 1.732	7 ± 1
Isoptera	0	0	0	0
Orthoptera	0	0	0	0
Coleoptera	0	0	0	0
Gastropoda	0	0	0	0
Pauropoda	0	2 ± 1	1 ± 0.05	1 ± 0

Table 7: Mean values of edaphic factors of soil-agriculture field

SEASON	MOIST (%)	Tem(^{0}C)	PH	OC%	EA%	EB%	SAND%	CLAY%
MONSOON	78	32	5.9	2.1	80	8	4	15
POST MONSOON	62	24	5.9	2.3	80	9	5	16
SUMMER	32	32	6.2	2.4	80	8	6	18

Table 8: Chemical properties of soil- agricultural field (Mean value)

SEASON	N(ppm)	P(ppm)	K(ppm)	Ca(ppm)	Mg(ppm)
MONSOON	2130	9.8	120	810	171
POST MONSOON	2930	9.6	130	828	179
SUMMER	2840	9.8	131	910	180

Table 9: Mean values of edaphic factors of soil-grassland

SEASON	MOIST (%)	Tem(^{0}C)	PH	OC%	EA%	EB%	SAND%	CLAY%
MONSOON	68.75	20	5.22	4.1	71	11	7	21
POST MONSOON	46.5	22	5.31	4.1	72	11	8	22
SUMMER	45.5	34	5.42	4.3	74	12	7	23

Table 10: Chemical properties of soil- grass land (Mean value)

SEASON	N(ppm)	P(ppm)	K(ppm)	Ca(ppm)	Mg(ppm)
MONSOON	1011	4.1	310	1110	232
POST MONSOON	1121	4.6	360	1312	276
SUMMER	1236	4.8	373	1410	281

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REFERENCES

[1] ASA, Methods of Soil Analysis part I and II, Black CA *et. al*. (eds) Amer-soc. Agro Madison., 1965, pp.1512.
[2] M.I. Jackson, Soil Chemical Analysis. Prentice hall Engle wood cliffs, 1958, pp. 498.
[3] E.W.Russel, Soil conditions and plant-growth 10th Edn. Longman, London, 1973.
[4] M.G.Sanal Kumar and M.P. Sujatha, Population density and diversity of micro arthropods and annelids in the reed growing forest soil of Vazhachaal Reserve Forest South India. *J. Tro .Forestry*, 1996, (3) pp.11-19.
[5] R.K.Trivedy and P.K. Goel, Practical Methods in Ecology and Environmental Science, Environmental Publications, Karad, 1987, pp. 340.

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Multiple Body Scanners (Telemedicine)

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Abstract- Telemedicine is not medicine but to use computing and communications to delivery access to high-quality medical care regardless of locations. It reduces cost, time, and resources and it saves lives. Telemedicine is the use of electronic information and communication technology to provide and support healthcare when distance separates the participants. Furthermore, wireless technologies play significant roles in telemedicine, and therefore, it is called wireless telemedicine or mobile-heath. This paper provides a short survey on multiple Body Scanners (Telemedicine) and also introduces the future scope of Multi Body Scanner including literature survey of 4G and Telemedicine

Index Terms- electroencephalography (EEG), magneto-encephalography (MEG), electrocardiography (EKG)

I. INTRODUCTION

This article guides a stepwise walkthrough by Experts for writing a successful journal or a research paper starting from inception of ideas till their publications. Research papers are highly recognized in scholar fraternity and form a core part of PhD curriculum. Research scholars publish their research work in leading journals to complete their grades. In addition, the published research work also provides a big weight-age to get admissions in reputed varsity. Now, here we enlist the proven steps to publish the research paper in a journal.

Telemedicine means `medicine at a distance'. In other words, it is a technique, not a technology. It is an umbrella term for many separate applications of medical care, including diagnosis and clinical management, treatment and medical education, whenever they are carried out at a distance. Similarly, Tele-care involves the provision of nursing and community support to a patient at a distance. The fundamental basis is the transmission of clinical information from one location to another, almost always by electronic means. For example, Tele-radiology involves capturing a digital X-ray image and transmitting it to a different site for display. Tele-pathology requires a system which can capture an image from a microscope, transmit it and display the image at a remote site. Tele-consulting (e.g. Tele-psychiatry) involves video-conferencing equipment installed at both the local site and the remote site so that the doctor and patient can see and talk to each other. Medical imaging is the technique and process used to create images of the human body (or parts and function thereof) for clinical purposes (medical procedures seeking to reveal, diagnose or examine disease) or medical science (including the study of normal anatomy and physiology). Although imaging of removed organs and tissues can be performed for medical reasons, such procedures are not usually referred to as medical imaging, but rather are a part of pathology. Telemedicine applications are a valid method to improve the quality of the delivered sanitary assistance. Mobile telemedicine is in particular useful both in places where standard telephone service is not easily available, and when emergency care is required. In order to build a global architecture for providing remote Tele-consulting, collaborative diagnosis and emergency situations handling, many different technologies are required.

Measurement and recording techniques which are not primarily designed to produce images, such as electroencephalography (EEG), magneto-encephalography (MEG), electrocardiography (EKG) and others, but which produce data susceptible to be represented as maps (i.e. containing positional information), can be seen as forms of medical imaging. Up until 2010, 5 billion medical imaging studies had been conducted worldwide. Radiation exposure from medical imaging in 2006 made up about 50% of total ionizing radiation exposure in the United States.

Imaging technology comes under Multiple Scanners are:

Radiography- Two forms of radiographic images are in use in medical imaging; projection radiography and fluoroscopy, with the latter being useful for catheter guidance.

Magnetic Resonance Imaging (MRI)- A magnetic resonance imaging instrument (MRI scanner), or "nuclear magnetic resonance (NMR) imaging" scanner as it was originally known, uses powerful magnets to polarise and excite hydrogen nuclei (single proton) in water molecules in human tissue, producing a detectable signal which is spatially encoded, resulting in images of the body.

Fiduciary Markers - Fiduciary markers are used in a wide range of medical imaging applications. Images of the same subject produced with two different imaging systems may be correlated by placing a fiduciary marker in the area imaged by both systems.

Nuclear Medicine- Nuclear medicine encompasses both diagnostic imaging and treatment of disease, and may also be referred to as molecular medicine or molecular imaging & therapeutics.

Photo Acoustic Imaging – Photo-acoustic imaging is a recently developed hybrid biomedical imaging modality based on the photo-acoustic effect. It combines the advantages of optical absorption contrast with ultrasonic spatial resolution for deep imaging in (optical) diffusive or quasi-diffusive regime.

Breast Thermography - Digital infrared imaging thermography is based on the principle that metabolic activity and vascular

circulation in both pre-cancerous tissue and the area surrounding a developing breast cancer is almost always higher than in normal breast tissue.

Tomography - Tomography is the method of imaging a single plane, or slice, of an object resulting in a tomogram.

Ultrasound - Medical ultrasonography uses high frequency broadband sound waves in the megahertz range that are reflected by tissue to varying degrees to produce images.

II. LITERATURE SURVEY

Properties	1G	2G	2.5G	3G	4G
Starting time	1985	1992	1995	2001	2010-2012
Driven Techniq ue	Analogue signal Processsing	Digital signal Processi-ng	Packe-t switc-hing	Intelligent signal Processsing	Intelligent s/w Auto configuration
Representative Standard	AMPS, TACS, NMT	GSM, TDMA	GPRS, I-Mode, HSCSD, EDGE	IMT-2000 (UMTS, WCDMA, CDMA 2000)	OFDM, UWB
Radio Frequency (HZ)	400M-800M	800M-1900M	800M-1900M	2G	3G-5G
Bandwidth (bps)	2.4K-30K	9.6K-14.4K	171K-384K	2M-5M	10M-20M
Multi-address Techniq ue	FDMA	TDMA, CDMA	TDMA, CDMA	CDMA	FDMA, TDMA, CDMA
Cellular Coverage	Large area	Medium area	Medium area	Small area	Mini area
Core Networks	Telecom networks	Telecom networks	Telecom networks	Telecom networks, Some IP networks	All-IP networks
Service Type	Voice Mono-service Person-to-person	Voice, SMS Mono-media Person-to-person	Data service	Voice, Data Some Multimedia Person-to-machin	Multimedia Machine-to-machine
				e	

Fourth generation mobile communications systems that are characterised by high - speed data rates at 20 to 100 M bps, suitable for high - resolution movies and television, virtual . Initial deployments are anticipated in 2006-2010 . According to 4G Mobile Forum, by 2008 over $400 billion would be invested in 4G mobile projects. In India, communication Minister Mr. Dayanidhi Maran, has announced a national centre of excellence to work in 4G arena.

Description of 4G technology used in different ways in different fields:

2001: Features in Future: 4G Visions From a Technical Perspective.

Presented by: Jun-Zhao Sun, Jaakko Sauvola, and Douglas Howie MediaTeam, Machine Vision and Media Processing Unit, Infotech Oulu University of Oulu, Finland

This paper studies the visions of 4G from a technical perspective. After a brief review on the development history and status of mobile communications and related 4G perspectives, we present an overall 4G feature.

2004: 4G mobile communications: Towards Open Wireless Architecture

Presented by: Willi W.Lu, Bernhard H. Walke, Xuemin shen

First steps toward the fourth generation (4G) or beyond 3G (B3G) have been taken to support advanced and wideband multimedia services.

2005 (March): 4G Neighborhood Area Networks

Presented by: R.R. Miller AT&T Company

Completing a practical broadband access network alternative comparable to cable or DSL for residence, remote/small business, and public service environments requires the realization of multi-tier diffuse-field wireless networks that functionally-parallel and interwork with their wired multi-tier counterparts.so Neighborhood area networks or NAN are used,NANs are smaller than MANs and larger than LANs.

2005: Multi-Code Multi-Carrier CDMA Systems for 4G Wireless Communications

Presented by: Jin Woo Lee and Okechukwu C. Ugweje (Department of Electrical and Computer Engineering) University of Akron, Akron and Christian Madubata (Department of Electrical Engineering) Tuskegee University, Tuskegee

A new system combining Multi-Code CDMA and Multicarrier CDMA denoted as Multi-Code Multi-Carrier CDMX (MCMC4DMA) is analyzed in this paper.

2006: A Cooperative Localization Scheme for 4G Wireless Communications

Presented by: Ramjee Prasad Aalborg University, Denmark

In this paper we propose an innovative geolocation scheme that combines long and short range location infomlation, respectively,retrieved by mean of a hybrid time of arrival/angle of arrival (TOA/AOA) technique in the cellular segment and a TOA technique in the short· range one, in order to enhance the

location estimation accuracy with respect to the actual stand-alone hybrid cellular solutions.

2007: EDA for RF and Analog Front-ends in the 4G Era: Challenges and Solutions

Presented by: Delia Rodr´ıguez de Llera Gonz´alez_, Ana Rusu_, Mohammed Ismail, Royal Institute of Technology (KTH/ICT/ECS), Stockholm, Sweden

The convergence trends, enabled by the advances in fabrication technology, have driven the Software Defined Radio (SDR) more and more into the RF and analog front-end.

2010: Bluetooth Coexistence with 4G Broadband Wireless Networks.

Presented by: Xue Yang, Hsin-Yuo Liu, Xingang Guo, Intel Labs Intel Corporation

In this paper, we discuss a simple time domain coexistence solution that has low complexity and is easy to implement.

2011 (June): Interoperability of Wireless Mesh and Wi –Fi network using FPGA for 4G Solutions.

Presented by: A.Prasina, M.Thangaraja, Anna University, Tamilnadu India

Interoperability and compatibility of emerging trends with existing systems is a prime factor for 4G solutions.

2011 (July): Likelihood-Ratio Approaches to Automatic Modulation Classification.

Presented by: Jefferson L. Xu, Wei Su,and Mengchu Zhou

This survey paper focuses on the automatic modulation classification methods based on likelihood functions, studies various classification solutions derived from likelihood ratio test, and discusses the detailed characteristics associated with all major algorithms.

The above was literature survey of 4G technology. In my thesis i m going to work on an Application of 4G i.e "Life-saving: Telemedicine".

Telemedicine has been defined as the use of telecommunications to provide medical information and services. It may be as simple as two health professionals discussing a case over the telephone or as sophisticated as using satellite technology to broadcast a consultation between providers at facilities in two countries using video-conferencing equipment or robotic technology. WHO defines telemedicine as 'The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities'.

Description of TELEMEDICINE USING 4G

Telemedicine in the Eastern Cape using VoIP combined with a Store and Forward Approach

Presented by: M Chetty, W Tucker, E Blake Collaborative Visual Computing Laboratory, Dept of Computer Science, UCT Private Bag Rondebosch, 7701, South Africa

This paper describes how we determined the requirements and design for the application and why we chose Voice over Internet Protocol (VoIP) combined with a store and forward approach to achieve our telemedicine goals.

2007 Wireless Telemedicine and M-Heath

Presented by: Yang Xiao**,** Department of Computer Science, University of Alabama and Fei Hu, Computer Engineering Department, Rochester Institute of Technology

This paper provides a short survey on wireless telemedicine and mobile-heath, and introduces wireless technologies for wireless telemedicine.

2010 Telemedicine and anesthesia

Presented by: Veena Chatrath, Joginder Pal Attri , Raman Chatrath, Associate Professor, 1Assistant Professor, Department of Anaesthesia, Govt Medical College,, 2Senior Consultant Anaesthesiologist, Department of Anaesthesia and Critical Care, KD Hospital, Circular Road, Amritsar, Punjab, India

The majority of doctors practice in urban and semi-urban areas, whereas the major proportion of population lives in rural areas. This calls for the innovative methods for utilization of science and technology for the benefit of our society. There are few reports in the literature which support the use of telemedicine technology for pre-operative assessment, intra-operative consultation, monitoring and post-operative follow-up, which is discussed in this article.

III. FUTURE SCOPE AND FINDINGS

The 19th century poet Emily Dickinson was reclusive to the point that she would allow a doctor to examine her only from a distance of several feet as she walked past an open door. If she were alive today, it's likely that she would benefit from advances in medical imaging that could accommodate her standoffishness while still diagnosing the Bright's disease that ended her life at age 55. One example of our technologically enabled future is a bathroom mirror with a retinal scanner behind the glass that looks for retinopathy or collects vital signs. In the case of Dickinson, that mirror could have noticed a gradual increase in the puffiness of her face, a symptom of Bright's disease, and alerted her physician. This technology also could be a viable way to improve care for patients who are too busy to schedule routine doctor visits. For atrophobics – whose fear of doctors has them putting off regular checkups – advances in medical imaging enable a wide variety of noninvasive diagnostic options? For health care providers and their patients, these and other advances in medical technology make health care increasingly personal in terms of managing chronic diseases, predicting catastrophic ones and enabling patients to live out their final months or years in the comfort of their homes. These advances also allow health care to become a routine part of daily life.

Some Examples:

Bathroom fixtures with embedded devices that can detect potential problems such as a toilet that analyzes urine to identify kidney infections or the progression of chronic conditions such as diabetes and hypertension. Another example is a bathroom scale that detects sudden changes in weight or body fat. These

devices could automatically upload data to the patient's physician and schedule appointments based on the physician's predetermined criteria.

Connected diagnostic devices such as retinal scanners could be coupled with patients' existing consumer electronics' products, such as digital cameras, to provide additional diagnostic and treatment options and make information available to proper medical personnel.

Sensors in the home could measure how a person is walking to determine if he or she may be a candidate for a medical episode, such as a seizure. This is another example of how health care can be preventative and move deeper into the home without significant tradeoffs in quality of care.

Remote surgery, where a world-renowned specialist operates on a hologram that's used to control a surgical robot thousands of miles away. This approach spreads the best care around the world, allowing patients to be treated by world-renowned specialists without requiring them to travel thousands of miles.

Advanced technologies are transforming the very nature of healthcare. Virtual reality, robotics and telemedicine have revolutionized how we practice medicine. It creates new ways of visualizing information, but sometimes the technology is too difficult to use. The current view is that the Future is here … it is the Information Age. New technologies that are emerging from Information Age discoveries are changing our basic approach in all areas of medicine. Here are some examples.

The holographic electronic medical record (or HoloMER) is a new approach to medical record keeping that uses a full 3-D body scan instead of written text as the medical record, which is carried on an Electronic Information Carrier (EIC) or "electronic dog tag". The person's own total body scan will have all the 'properties', such as electrocardiogram, vital signs, biochemical data and other information, embedded in the image, such that the image will substitute for the person in "information space" – in essence an information surrogate for the person. (Does this mean that the person will "exist" in the information world – will they have a 'tele-existence' that can be transmitted anywhere?).

The holomer is critical to moving healthcare into the information age. Why is this important? Healthcare is the only science that does not have a "computer representation" of its 'product' (in a scientific sense, the patient is the 'product' which is worked upon). Therefore healthcare cannot take advantage of the billions of dollars in hardware and software in virtual prototyping, virtual testing and evaluation, etc. that all other industries use.

But even more important is to begin thinking of the tools that are used as types of information. For example: A robot is not a machine, it is an information system with arms … A CT scanner is not a digital imaging device, it is an information system with eyes … An operating room is not a space with equipment, it is an information system with ..(You fill in the description). This permits healthcare to be totally integrated into the information space. A computer does not discriminate between data that represents an object (e.g. patient) or a process (e.g. work flow, quality assessment, etc), and therefore all parts of medicine can be completely integrated.

For the discipline of surgery, the surgical console is the interface between the real and information world – virtual reality meets real reality .From the console, the surgeon can perform open surgery, minimally invasive surgery, remote telesurgery, surgical pre-planning, surgical procedure rehearsal, intra-operative image guided surgery and surgical simulation. All these actions are possible from the single point of the surgical console. The first tele-surgical procedure upon a patient was performed by Prof Jacques Marescaux in September, 1991: He sat at his surgical console in New York City and performed a laparoscopic cholecystectomy on his patient who was in Strassbourg, France, over 4000 km away. Today, Dr. Mehran Anvari of McMaster University in Toronto Canada routinely operates upon patients in North Bay Canada, 300 km away.

Another technology transforming medicine is the hand-held portable ultrasound (SonoSite 180, Bothell, WA). Taking the original ultrasound device, Dr. Larry Crum of the University of Washington added high-intensity focused ultrasound (HIFU), which focuses two beams of ultrasound to a single point – where the beams meet, harmonic vibration releases thermal energy which can either vaporize or coagulate tissue. In an experiment on a pig, Dr. Crum demonstrated that by perforating the femoral artery, he was able to detect the site of bleeding with the Doppler ultrasound, place the targeting cross-hairs on the bleeding point, and when he pressed the HIFU button, the bleeding stopped. Does this sound like magic? The Star Trek Tricorder? It is no longer science fiction, it is scientific fact. Steven Spielberg (the famous film maker) once said "There is no such thing as science fiction, only scientific eventuality".

Today military medics are using hand-held computers with entire medical references and which can download the information from a soldier's "electronic dog tag" into the computer right on the battlefield. Now the medic "knows everything, about medicine and the patient". In addition, once the wounded soldier is placed upon the Life Support for Trauma and Transport (LSTAT), which is a portable intensive care unit (ICU), the surgeon back in the Mobile Advanced Support Hospital (MASH) can receive by telemedicine the vital signs, and even change the respirator settings, control the flow of the intra-venous fluids and medications .The LSTAT has been used ever since 2000 in the conflict in Bosnia and Kosovo. From the time of wounding when the soldier is placed on the LSTAT, to the helicopter evacuation, to the ambulance transfer to the MASH, to the emergency triage, to the operating room and finally in the post-operative ICU, the casualty is continuously monitored and the medical record is automatically recorded. In the Afghanistan and Iraq Wars, the LSTAT was recalled for servicing; however the medics would not send them back because they were so valuable.

Virtual reality, simulation and the new paradigm of objective assessment is completely changing medical education. Gone are the days of oral examinations or reports from the Chief of Surgery on how the surgeons believe the resident performed in

the operating room. Surgical simulators are reaching new levels of visual fidelity, with organs that look, react and even "feel" real. One of the most sophisticated systems is the Endoscopic Sinus Surgery Simulator (ES3). This system has multiple levels of training, from the abstract (which is like a video game) to the intermediate level which shows the same objects but overlaid on the realistic anatomy, to the expert level where a procedure must be performed realistically. The student's performance is recorded, errors are counted, and the student is given an objective score of their performance. New devices such as the Blue Dragon (Blake Hannaford and Jacob Rosen, University of Washington, Seattle WA) and the Imperial College Surgical Assessment Device (Prof Sir Ara Darzi, Imperial College, London, England) actually record the hand motions so a quantitative assessment of time, path length (economy of motion), dwell time (indecision) and other parameters can be accurately measured and reported.

The most profound change is that the simulators can now be used to set criterion which the students must meet before operating upon patients. The expert (or experienced) surgeons perform on the simulator; their score is the benchmark which the student must achieve before being allowed to operate. Students do not train for a given period of time (eg, 10 trials on the simulator, or for 2 days); instead they must train until they reach the same performance (criterion-based or proficiency-based) as the experts. Some take only a few trials, while others take much longer – however no student operates upon a patient until they perform as well as an expert. The figure of merit is performance, not time – it is moving from a chronology-based (train for a given length of time) to a criterion-based training that insures that the student is as well trained as an expert before operating upon patients. This approach was first validated by Seymour, Gallagher and Satava at Yale University in 2002.

Robots, as indicated above, are becoming more important for surgery. Initially they were introduced for dexterity enhancement and precision. A new generation of robots are emerging that can replace the function of members of the operating team. Dr. Michael Treat (Columbia University, New York City, NY) has developed Penelope – a robot to replace a scrub nurse. Using robotics, automatic target recognition, voice activation, intelligent decision support and other common methods from other industries, Dr. Treat is able to use the robot to hand and pick-up and hand off surgical instruments during a surgical procedure .When robots are used in other industries, there are no people to change the instruments or provide supplies, there are other sub-robots called tool changers and parts dispensers that work with the main robot (this concept is called "robotic cell"). The United States military has a new program called "trauma pod" in which it is envisioned that they will build an "operating room without people" .The scrub nurse is replaced with a tool changer, the circulation nurse replaced with a supply dispenser, and the surgeon is just outside the operating room using the tele-operated surgical console will perform the procedure – the only person in the operating room is the patient. The overall idea is as follows: The patient will be anesthetized on the LSTAT in the position for surgery. A total body scan will be performed. The patient will move to a 'sterilization area' to be cleaned before entering the totally sterile operating room with all the robots. While the surgeon waits for the patient to be sterilized, he will rehearse the surgical procedure on the surgical console, using the total body scan just taken of the patient – plan the procedure, even "edit" the procedure, until it is exactly correct. Then when the patient comes into the operating room, the LSTAT will give all the information to the robot and the surgeon can begin operating. Every time a tool is changed or supply is used, 3 things happen: 1) the patient is billed, 2) the instrument or supply is restocked in the operating room, and 3) the central supply office orders a new replacement – all within 50 milliseconds and with 99.99% accuracy. This is the epitome of efficiency, using robotics, just in time inventory and supply chain management processes. In addition, it greatly reduces personnel, since a scrub nurse and circulation nurse are no longer needed in the operating room, and they can be freed up to perform other important nursing tasks. About 60% of operating room cost in for personnel, by replacing the nurses about 80% savings could be realized. Since many comparisons are made between surgeons and fighter pilots, note that pilots are now becoming replaced by unmanned autonomous vehicle (UAV) for the military .Some or all of the surgeon's responsibilities can be replaced with autonomous systems.

The above are examples of what can be done today – what is available with current technology. What about technologies now in the laboratory – the 'over the horizon' technologies? These are the technologies that cause a total disruption of the way of doing medicine. Remember, "The Future is not what it used to be" (Yogi Berra, Baseball Coach New York Yankees). The Information Age is NOT the Future – it is the Present. Therefore, something else must point to the future of medicine. Two interesting books give clues to what the Future may bring. The first is Innovator's Dilemma by Clayton Christensen, in which he coined the term "disruptive technologies" to describe any new technology which completely revolutionizes a field of science. Many of today's technologies are just that – disruptive. The other innovator is Alvin Toffler, who initially described the Information Age in his 1976 book "The Third Wave". He describes the Agricultural Age, the Industrial Age and the Information Age. Then there is a very sharp and rapid introduction of the technology – the "revolution". Finally, there occurs a time when there is consumer acceptance and the technology is adopted by everyone – and any new technology changes are 'evolutionary', not revolutionary – that is to say that improvements are made on existing technologies, not the introduction of a new technology. When this 'plateau' of innovation occurs, it is time to look at the new technologies which are emerging from laboratories, for where the next revolution must come. The universal acceptance of computers, mobile cellular phones, the Internet and other technologies signals the end of the Information Age and the beginning of a new era. Until a better name is used, I propose the term BioIntelligence Age, to emphasize the central importance of the new discoveries in biology (genetics, molecular engineering, biomimetic systems and others) and the fact that the result of the new technologies is to turn the world from dumb to intelligent. Inanimate objects, which previously were inert and passive, are now embedded with microchips, nanotechnology and other

technologies to change them to 'smart' and active. Today's automobile has more that 50 minicomputers which do everything from sensing the air in the tires to releasing the airbag to navigation – the automobile is no longer a dumb machine that a human drives, but a highly interactive transportation system which interacts with the human driver.

To understand the importance of the BioIntelligence Age, an analysis of the three basic sciences reveals that, until recently, all research and discoveries were made in one of the three disciplines: biological science (including genetics), physical science (including engineering) and information sciences (including computers). However new disciplines are emerging at the intersection of two and three sciences (Figure 30): Between biology and information science there are genomics, bioinformatics; between biology and physical science there are biosensors, biomimetic materials; and between physical and information sciences there are intelligent robotics, micro-electro machine systems (MEMS). The proof of this trend is in academia, corporations and laboratories where new departments and divisions are arising, which are combinations of two or more disciplines. The BioIntelligence Age therefore belongs to inter-disciplinary research and clinical practice. This new 'intelligent world' can be typified by radio-frequency identification tags (RFID) (Figure 32). This concept was first proposed by Prof Shankar Sastry of University of California, Berkeley in 1996 under the concept of "smart dust". He gave the example in agriculture. A farmer plows the field and spreads seeds, pesticide, fertilizer and billions of tiny smart computers the size of a pin-head – the RFIDs. Some are sensors, some are transmitters. As the plants grow, the RFIDs are incorporated into the plant and store information about the plant. When the harvester machine comes, the plants "talk" directly to the harvester – pick me, my vegetable is ready – determining those which have become ripe as measured by the microsensors. As the vegetable is sent along the supply chain from farm to shipping to warehouse to grocery store, the information is continuously tracked. Then, when a person goes to the grocery, using a hand-held computer like a personal digital assistant (PDA) or cell phone, the vegetable 'talks' to the computer, telling how many calories, how long on the shelf, the price and so forth. Then when the person leaves the store, all the contents in the shopping basket broadcast their information and are automatically checked out. Today a number of companies, such as Gillette (razors) and Wal-Mart (retail sales) are actually experimenting with this technology.

The evidence that interdisciplinary research is the leading science today is by the fact that virtually all the government funding agencies in the United States (Figure 33) are funding at least $200million per year in interdisciplinary research, with nanotechnology research nearly reaching $1 billion per year. Some interesting results of this new type of research are the following.

A number of microsensors and other MEMS technologies are being embedded into insects to act as living sensors. Bumble bees with micro-sensors for anthrax and a small transmitter (Figure 35) have been used to identify simulated biologic agents during military exercises and transmit the information back to the soldiers so they can avoid the biologic agent. Cockroaches have had tiny probes placed in their brain to record their activity as they run (cockroaches are the most efficient motion machines on earth). Some students have actually reverse engineered a cockroach by connecting the wires to a joystick (instead of a signal recorder) and began driving the cockroach around the laboratory .The world's smallest intelligent robot has been developed at Sandia national lab, with a two full computers and 6 different sensors, smaller than the size of a coin .The Israeli company Given Technologies has miniaturized a camera and transmitter and placed it into a capsule that can be swallowed; an image is taken 2 times a minute and send to a belt-worn video cassette recorder. After the camera passes, the video tape is given to the gastroenterologist to review – instead of doing an endoscopic procedure.

One of the most striking successes in multi-disciplinary research is the implantation of tiny electrodes in the brains of monkeys, then recording the signals from the brain as the monkey performs tasks. The monkeys have been trained to use a joystick with a computer to place a green circle upon a red circle – when they succeed, a robotic arm feeds them. Once the signals are decoded by the researchers, they disconnect the wire from the brain to the signal recorder and connect it directly to the robotic arm. It takes the monkeys about 2 weeks to learn that they do not have to move their hands or joystick to have the robot arm feed them – they have learned to just think and make the robot are feed them. Thoughts into action!

There is progress in making prostheses intelligent and in artificial organs. Dr. Jay Vacanti of Massachusetts General Hospital in Boston, MA is growing artificial organs. Computational mathematicians have designed a microvascular branching pattern of blood vessels (Figure 45), which is exported to a stereolithography machine to print out a 3 dimensional vascular system in bio-resorbable material with impregnated angiogenesis factor and vascular endothelial growth factors. This scaffold is placed in a bioreactor with vascular endothelial stem cells, and within two weeks a living blood vessel system is grown, which is perfused with blood and actually supports the growth of hepatic stem cells into a small portion of functioning liver. The next step is to begin implanting these artificial livers into mice to determine their functionality and longevity.

Nexia Technologies of Montreal, Canada has discovered the genetic sequence in the Orb Spider which codes for the production of the protein in spider silk – the strongest known natural fiber. They have transfected goats with this genetic material, and now have a herd of goats that produce the silk in their milk, which is harvested in very large quantities. This may be the beginning of replacing factories with genetically engineered herds of animals or fields of plants.

Femtosecond lasers have the properties of drilling holes in the cell membrane without damaging the cell; then laser 'tweezers' can be used to manipulate the organelles, such as mitochondria, Golgi apparatus, and perhaps within the nucleus to manipulate DNA directly. If this is successful, the future may be one of surgeons 'operating upon' DNA itself. This is referred to as

biosurgery – changing the biology of tissues to return to normal, instead of using pharmacologic agents or even major surgery for diseases such as cancer, infection, etc.

There are exciting discoveries in hibernation and resuscitation research. Prof Brian Barnes of the University of Alaska, Fairbanks has discovered that hibernating artic ground squirrels do not hibernate because of the cold weather – they hibernate because they turn-off their cells. About two hours before they go into hibernation, the metabolic rate drops to less than 2% of normal, and oxygen consumption nearly stops .It has been discovered that there is some molecule (yet to be identified) which arises in the hypothalamus, that binds to the mitochondria in the cells and blocks the oxidation process. While this is very preliminary research, it may well lead to the understanding of how to create drugs to induce suspended animation.

These discoveries raise some very serious moral and ethical issues. These technologies are neutral – they are neither good nor bad. It is up to physicians and all healthcare providers to breathe the moral and ethical life into the technology and then apply them for their patients with empathy and sympathy. The future holds an enormous challenge for those in healthcare. The technology is accelerating logarithmically, and business is following close behind to take advantage of these new discoveries; however the social and healthcare responses to these technologies have been very slow. Here are some examples of the moral and ethical dilemmas that are raised by these rapidly developing technologies.

Human Cloning: Shortly after the announcement of the first successful creation of a human clone embryo, the first three human clones were born. The immediate response of the world community was to ban human cloning – except for three countries, which are actively supporting human cloning: China, Korea and Italy. Is it moral to clone humans? Do we need more people by cloning, when the world is already overpopulated?

Genetic Engineering: In 2003, the first genetically engineered child was born – the family engineered to have a girl instead of a boy. Nexia Technologies, Inc have taken genes from a spider and implanted them into a goat – trans-species engineering. The pit viper and hummingbird can see in the infra-red and ultra-violet part of the spectrum, and the genes responsible have been identified. Should a parent be able to choose to give their children these genes and therefore the ability to see in the dark – an advantage over all other children?

Longevity: Using a number of different approaches, such as anti-telomerase to keep telomeres from shortening or blocking of apoptosis factor, a few of strains of mice have been engineered that have life spans that are 2-3 times normal life span. The longest living human was recorded to live 123 years. If these techniques can be transferred to humans and double or triple our life spans, what will it mean to live 200 or 250 years? Does a person still 'retire' at age 55, with 150 years of retirement? Will they have multiple careers? How much faster will the population grow if people die much slower? Is there really a need to live that long?

Intelligent Robots: Ray Kurzweil and Hans Moravec have speculated upon the importance of computers becoming intelligent. The human brain contains 4x1019 neuronal connections; the fastest supercomputer is now computing at 4.5x1015 cps – about 1000 times slower than the human brain However, if Moore's Law (loosely interpreted as computer power doubles every 18 months) continues as expected, then it is calculated that computers (and perhaps robots) will computer faster than humans in about 20 years. Will these computers be "intelligent"? Will humans be able to communicate with them? Will the computers remember we made them? Will they care? Will they even need humans any more?

Replacement Organs: As seen above, there are replacement parts in the form of intelligent prostheses or synthetically grown organs for nearly every part of the body. Some of these replacements will make the person 'super human', or prolong their life span dramatically. Who should be able to get these replacement parts – anyone who asks for one, even if they are healthy? Should a replacement part be given to a person at the end of their life? If 95% of a person's tissues and organs are replaced with prostheses or artificial organs, is that person still "human"?

The technologies are now providing promises that humans only could dream about in the past. Technology innovation is accelerating faster that the moral and ethical issues can be resolved. It is critical to begin deliberate discussions about these issues now, because it will take decades to resolve many of these dilemmas. And these questions beg what is probably the most profound challenge of all: For the first time ever, there walks upon this planet, a species so powerful that it can determine its own evolution at its own time and choosing – homo sapiens. What shall we decide to evolve humans into?

IV. CONCLUSION

With all of the technological advances in health care technology, it's easy to forget what they're really all about: the patient. But whether it's a retinal scanner in a bathroom mirror or a home ultrasound machine, it's the patient who is the greatest beneficiary. For latrophobics such as Emily Dickinson, new, noninvasive techniques that are increasingly available in the comfort of one's home can make all the difference in diagnosing and treating diseases before they become debilitating or life-threatening. These advances enable health care to become more personal and, for lack of a better term, user-friendly, with patients interacting with physicians through videoconferences from their homes or nearby clinics. They also help make health care more effective by providing ways to identify diseases and other conditions before they become untreatable. At the same time, these advances also allow health care to fade into the background and become a part of daily life: being scanned each morning while brushing one's teeth instead of only during an annual checkup. That's particularly valuable for patients with chronic or end-stage diseases because it may keep them from having to move into a hospice. In that sense, health care revolves around the patient, as it should. Someday soon, technology will be able to manage our chronic diseases, predict our catastrophic

diseases and allow us to live out the last days of our lives comfortably.

REFERENCES

[1] http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&arnumber=1019448&isnumber=21925
[2] www.columbiamissourian.com/stories/2007/05/12/improving-care-rural-diabetics
[3] www.financialexpress.com/news/everyone-must-have-access-to-healthcare-facilities-Devi-Prasad-Shetty/42099/
[4] www.abc.net.au/foreign/stories/s785987.htm
[5] www.usc.edu/uscnews/stories/13442.html
[6] www.nighthawkrad.net
[7] www.telepresenceworld.com/ind-medical.phpwww.proavmagazine.com/industry-news.asp?sectionID=0&articleID=596571
[8] www.cnoga.com
[9] www.prostatecancer.org/education/novelthr/Chinn_TransrectalHIFU.html
[10] http://munews.missouri.edu/news-releases/2008/0818-duan-autism-research.php.
[11] www.google.com

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Fixed Point Theorems for Weakly Compatible Mappings in Fuzzy Metric Spaces

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Abstract- This paper presents some fixed point theorems for six occasionally weakly compatible maps in fuzzy metric spaces.

Index Terms- key words, occasionally weakly compatible mappings, fuzzy metric space

I. INTRODUCTION

The concept of Fuzzy sets was introduced initially by Zadeh in 1965. Since then, to use this concept in topology and analysis many authors have expansively developed the theory of fuzzy sets. Both George and Veermani (1994) modified the notion of fuzzy metric spaces with the help of continuous t-norms. Many researchers have obtained common fixed point theorems for mappings satisfying different types of commutativity conditions. Vasuki (1999) proved fixed point theorems for R-weakly commutating mappings. Pant (1998) introduced the new concept reciprocally continuous mappings and established some common fixed point theorems. Balasubramaniam et al (2002) have shown that Rhoades open problem on the existence of contractive definition which generates a fixed point but does not force the mappings to be continuous at the fixed point, posses an affirmative answer. Pant and Jha (2004) obtained some analogous results proved by Balasubramaniam et al (2002). Recently many authors have also studied the fixed point theory in fuzzy metric spaces. This paper presents some common fixed point theorems for more general commutative condition i.e. occasionally weakly compatible mappings in fuzzy metric space.

II. PRELIMINARY NOTES

Definition 2.1 A fuzzy set A in X is a function with domain X and values in [0, 1].

Definition 2.2 A binary operation $*$: [0, 1] × [0, 1] → [0, 1] is a continuous t-norms if $*$ is satisfying conditions:

(i) $*$ is an commutative and associative;

(ii) $*$ is continuous;

(iii) a $*$ 1 = a for all a ∈ [0, 1];

(iv) a $*$ b ≤ c $*$ d whenever a ≤ c and b ≤ d, and a, b, c, d ∈ [0, 1].

Definition 2.3 *A* 3-tuple (X, M, $*$) is said to be a fuzzy metric space if X is an arbitrary set, $*$ is a continuous t-norm and M is a fuzzy set of $X^2 \times (0,\infty)$ satisfying the following conditions, for all $x, y, z \in X$, $s, t > 0$,

(f1) M(x, y, t) > 0;

(f2) M(x, y, t) = 1 if and only if $x = y$

(f3) M(x, y, t) = M(y, x, t);

(f4) M(x, y, t) $*$ M(y, z, s) ≤ M($x, z, t+s$);

(f5) M($x, y, \cdot$): (0,∞) → (0, 1] is continuous.

Then M is called a fuzzy metric on X. Then M(x, y, t) denotes the degree of nearness between x and y with respect to t.

Example 2.4 Let (X, d) be a metric space. Define a $*$ b = a b { or a $*$ b = min(a, b)} for all $x, y \in$ X and $t > 0$,

$$M(x, y, t) = \frac{t}{t + d(x, y)}$$

Then (X, M, $*$) is a fuzzy metric space and the fuzzy metric M induced by the metric d is often referred to as the standard fuzzy metric.

Definition 2.5 Let (X, M, $*$) be a fuzzy metric space. Then

(a) a sequence { x_n } in X is said to converges to x in X if for each $\varepsilon > 0$ and each $t > 0$, there exists $n_0 \in$ N such that M(x_n, x, t) > 1 − ε for all n≥ n_0.

(b) a sequence { x_n } in X is said to be Cauchy if for each $\varepsilon > 0$ and each t >0, there exists $n_0 \in$ N such that M(x_n, x_m, t) > 1 − ε for all n, m ≥ n_0.

(c) A fuzzy metric space in which every Cauchy sequence is convergent is said to be complete.

Definition 2.6 A pair of self-mappings (f, g) of a fuzzy metric space (X, M, $*$) is said to be

(i) Weakly commuting if

M(fgx, gfx, t) ≥ M(fx, gx, t) for all $x \in$ X and t >0.

(ii) R-weakly commuting if there exists some R > 0 such that

M(fgx, gfx, t) ≥ M(fx, gx, t /R) for all $x \in$ X and $t > 0$.

Definition 2.7 Two self mappings f and g of a fuzzy metric space (X, M, $*$) are called compatible if $\lim_{n\to\infty}$ M(fgx_n, gfx_n, t) = 1 whenever { x_n } is a sequence in X such that $\lim_{n\to\infty} fx_n$ = $\lim_{n\to\infty} gx_n = x$ for some x in X.

Definition 2.8 Two self maps f and g of a fuzzy metric space (X, M, $*$) are called reciprocally continuous on X if $\lim_{n\to\infty} fgx_n$

= fx and $\lim_{n\to\infty} gfx_n = gx$ whenever $\{x_n\}$ is a sequence in X such that $\lim_{n\to\infty} fx_n = \lim_{n\to\infty} gx_n = x$ for some x in X.

Lemma 2.9 Let (X, M, $*$) be a fuzzy metric space. If there exists $q \in (0,1)$ such that M(x, y, qt) ≥ M(x, y, t) for all $x, y \in$ X and $t > 0$, then $x = y$.

Definition 2.10 Let X be a set f, g self maps of X. A point x in X is called a Coincidence point of f and g if $fx = gx$. We shall call $w = fx = gx$ a point of coincidence of f and g .

Definition 2.11 A pair of maps S and T is called weakly compatible pair if they commute at coincidence points.

The concept occasionally weakly compatible is introduced by Thagafi and Shahzad (2008). It is stated as follows.

Definition 2.12 Two self maps f and g of a set X are occasionally weakly compatible (owc) iff there is a point x in X which is a coincidence point of f and g at which f and g commute.

Thagafi and Shahzad (2008) shows that occasionally weakly is weakly compatible but converse is not true.

Example 2.13 Let R be the usual metric space. Define S, T : R → R by $Sx = 2x$ and $Tx = x^2$ for all $x \in$ R. Then $Sx = Tx$ for x = 0, 2 but ST0 = TS0, and ST2 ≠ TS2.

S and T are occasionally weakly compatible self maps but not weakly compatible.

Lemma 2.14 Let X be a set, f , g owc self maps of X. If f and g have a unique point of coincidence, $w = fx = gx$, then w is the unique common fixed point of f and g .

III. Main Results

Theorem 3.1 Let (X, M, $*$) be a complete fuzzy metric space and let A, B, S, T, P and Q be self-mappings of X. Let the pairs $\{P, ST\}$ and $\{Q, AB\}$ be owc. If there exists $q \in (0,1)$ such that

$$M(Px, Qy, qt) \geq \phi\begin{bmatrix} \min\{M(STx, ABy, t), M(STx, Px, t)\} * \\ \min\{M(Qy, ABy, t), M(Px, ABy, t), M(Qy, STx, t)\} \end{bmatrix} ..(1)$$

for all $x, y \in$ X and ϕ : [0, 1] → [0, 1] such that $\phi(t) > t$ for all $0 < t < 1$,then there exists a unique common fixed point of A, B, S, T, P and Q .

Proof: Let the pairs {P, ST} and {Q, AB} be owc, so there are points $x, y \in$ X such that $Px = STx$ and $Qy = ABy$. We claim that $Px = Qy$. If not, by inequality (1)

$$M(Px, Qy, qt) \geq \phi\begin{bmatrix} \min\{M(STx, ABy, t), M(STx, Px, t)\} * \\ \min\{M(Qy, ABy, t), M(Px, ABy, t), M(Qy, STx, t)\} \end{bmatrix} ..(1)$$

$$= \phi\begin{bmatrix} \{\min M(Px, Qy, t), M(Px, Px, t)\} * \\ \min\{M(Qy, Qy, t), M(Px, Qy, t), M(Qy, Px, t)\} \end{bmatrix}$$

$$= \phi[M(Px, Qy, t)] > [M(Px, Qy, t)]$$

Therefore $Px = Qy$, i.e. $Px = STx$ and $Qy = ABy$. Suppose that there is another point z such that $Pz = STz$ then by (1) we have $Pz = STz = Qy = ABy$, so $Px = Pz$ and $w = Px = STx$ is the unique point of coincidence of P and ST . By Lemma 2.14 w is the only common fixed point of P and ST . Similarly there is a unique point $z \in$ X such that $z = Qz = ABz$.

Assume that $w \neq z$. We have

$$M(w, z, qt) = M(Pw, Qz, qt)$$

$$\geq \phi\begin{bmatrix} \{\min M(STw, ABz, t), M(STw, Pz, t)\} * \\ \min\{M(Qz, ABz, t), M(Pw, ABz, t), M(Qz, STw, t)\} \end{bmatrix}$$

$$= \phi\begin{bmatrix} \min\{M(w, z, t), M(w, z, t)\} * \\ \{M(z, z, t), M(w, z, t), M(z, w, t)\} \end{bmatrix}$$

$$= \phi[M(w, z, t)] > M(w, z, t)$$

Therefore we have $z = w$ by Lemma 2.14 and z is a common fixed point of A, B, S, T, P and Q . The uniqueness of the fixed point holds from (1).

Theorem 3.2 Let (X, M, $*$) be a complete fuzzy metric space and let A, B, S, T, P and Q be self-mappings of X. Let the pairs $\{P, ST\}$ and $\{Q, AB\}$ be owc. If there exists q ∈ (0, 1) such that

$$M(Px, Qy, qt) \geq \begin{bmatrix} \min\{M(STx, ABy, t), M(STx, Px, t), M(Qy, ABy, t)\} * \\ \min\{(Px, ABy, t), M(Qy, STx, t)\} \end{bmatrix} ....(2)$$

for all $x, y \in$ X and for all t > 0, then there exists a unique point $w \in$ X such that $Pw = STw = w$ and a unique point $z \in$ X such that $Qz = ABz = z$. Moreover, $z = w$, so that there is a unique common fixed point of A, B, S, T, P and Q .

Proof: Let the pairs $\{P, ST\}$ and $\{Q, AB\}$ be owc, so there are points $x, y \in$ X such that $Px = STx$ and $Qy = ABy$. We claim that $Px = Qy$ .. If not, by inequality (2)

$$M(Px, Qy, qt) \geq$$
$$\begin{bmatrix} \min\{M(STx, ABy, t), M(STx, Px, t), M(Qy, ABy, t)\} * \\ \min\{M(Px, ABy, t), M(Qy, STx, t)\} \end{bmatrix}$$
$$= \begin{bmatrix} \min\{M(Px, Qy, t), M(Px, Px, t), M(Qy, Qy, t)\} * \\ \min\{M(Px, Qy, t), M(Qy, Px, t)\} \end{bmatrix}$$
$$= M(Px, Qy, t),$$

Therefore $Px = Qy$, i.e. $Px = STx = Qy = ABy$. Suppose that there is another point z such that $Pz = STz$ then by (2) we have $Pz = STz = Qy = ABy$, so $Px = Pz$ and $w = Px = STx$ is the unique point of coincidence of P and ST. By Lemma 2.14 w is the only common fixed point of P and ST. Similarly there is a unique point $z \in$ X such that $z = Qz = ABz$.

Assume that $w \neq z$. We have

$$M(w, z, qt) = M(Pw, Qz, qt)$$
$$\geq \begin{bmatrix} \min\{M(STx, ABz, t), M(STx, Pz, t), M(Qz, ABz, t)\} * \\ \min\{M(Px, ABz, t), M(Qz, STw, t)\} \end{bmatrix}$$
$$= \begin{bmatrix} \min\{M(w, z, t), M(w, z, t), M(z, z, t)\} * \\ \min\{M(w, z, t), M(z, w, t)\} \end{bmatrix}$$
$$= M(w, z, t)$$

Theorem 3.3 Let (X, M, $*$) be a complete fuzzy metric space and let A, B, S, T, P and Q be self-mappings of X. Let the pairs $\{P, ST\}$ and $\{Q, AB\}$ be owc. If there exists q $\in$ (0, 1)

$$M(Px, Qy, qt) \geq$$

such that $$\phi\begin{Bmatrix} M(STx, ABy, t), M(STx, Qy, t), \\ M(Qy, ABy, t), M(Px, ABy, t) \end{Bmatrix} \quad \text{.....(3)}$$

for all $x, y \in$ X and $\phi: [0,1]^4 \to$ [0, 1] such that ϕ (t, t, 1, t,) > t for all 0 < t < 1, then there exists a unique common fixed point of A, B, S, T, P and Q.

Proof: Let the pairs {P, ST} and {Q, AB} are owc, there are points point $x, y \in$ X such that $Px = STx$ and $Qy = ABy$. We claim that $Px = Qy$. By inequality (3) we have

$$M(Px, Qy, qt) \geq$$
$$\phi\begin{Bmatrix} M(STx, ABy, t), M(STx, Qy, t), \\ M(Qy, ABy, t), M(Px, ABy, t) \end{Bmatrix}$$
$$= \phi\{M(Px, Qy, t), M(Px, Qy, t), M(Qy, Qy, t), M(Px, Qy, t)\}$$
$$= \phi\{M(Px, Qy, t), M(Px, Qy, t), 1, M(Px, Qy, t)\}$$
$$> M(PX, Qy, t).$$

a contradiction, therefore $Px = Qy$, i.e. $Px = STx = Qy = ABy$. Suppose that there is $*$ another point z such that $Pz = STz$ then by (3) we have $Pz = STz = Qy = ABy$, so $Px = Pz$ and $w = Px = ABx$ is the unique point of coincidence of P and AB. By Lemma 2.14 w is a unique common fixed point of P and ST. Similarly there is a unique point $z \in$ X such that $z = Qz = ABz$. Thus z is a common fixed point of A, B, S, T, P and Q. The uniqueness of the fixed point holds from (3).

$$= M(w, z, qt) = M(Pw, Qw, qt)$$
$$\geq \phi\begin{Bmatrix} M(STw, ABz, t), M(STw, Qz, t) \\ M(Qz, ABz, t), M(Pw, ABz, t) \end{Bmatrix}$$
$$= \phi\{M(w, z, t), M(w, z, t) M(z, z, t), M(w, z, t)\}$$
$$> M(w, z, t),$$

References

[1] Aage C.T., Salunke J. N.(2010) "On Fixed Point Theorems in Fuzzy Metric Spaces", Int. J. open Problems Compt. Math., Vol.3, No.2,123-131.

[2] Al-Thagafi A.and Shahzad N.(2008) "Generalized I-Nonexpansive Self maps and Invariant Approximations", Acta Mathematica Sinica, English Series , Vol. 24, No.5, 867-876.

[3] Balasubramaniam P., Muralisankar S., Pant R.P.(2002) "Common fixed points of four mappings in a fuzzy metric space", J. Fuzzy Math. 10(2), 379-384.

[4] Cho Y.J., Pathak H.K., Kang S.M., Jung J.S.(1998) "Common fixed points of compatible maps of type (A) on fuzzy metric spaces", Fuzzy Sets and Systems 93, 99-111.

[5] George A., Veeramani P.(1994)"On some results in fuzzy metric spaces", Fuzzy Sets and Systems, 64, 395-399.

[6] Hadzic O.(1984) "Common fixed point theorems for families of mapping in complete metric space", Math. Japon. 29, 127-134.

[7] Imdad Mohd. and Ali Javid (2006) "Some common fixed point theorems in fuzzy metric spaces", Mathematical Communications 11, 153-163 .

[8] Jungck G. and Rhoades B.E.(2006), "Fixed Point Theorems for Occasionally Weakly compatible Mappings", Fixed Point Theory, Volume 7, No. 2, 287-296.

[9] Jungck G. and Rhoades B.E.(2008), "Fixed Point Theorems for Occasionally Weakly compatible Mappings", Erratum, Fixed Point Theory, Volume 9, No. 1, 383-384.

[10] Kramosil O., and Michalek J.(1975) "Fuzzy metric and statistical metric spaces", Kybernetika, 11, 326-334.

[11] Kutukcu S. (2007) "A fixed point theorem for contraction type mappings in Menger Spaces", Am. J. Appl. Sci. 4(6), 371-373.

[12] Kutukcu S., Sharma S. and Tokgoz H.(2007), "A Fixed Point Theorem in Fuzzy Metric Spaces", Int. Journal of Math. Analysis, Vol. 1, no. 18, 861 - 872.

[13] Mishra S.N.(1991) "Common fixed points of compatible mappings in PM-spaces", Math. Japon. 36 , 283-289.

[14] Pant R.P.(1998) "Common fixed points of four mappings", Bull. Cal. Math.Soc. 90, 281-286.

[15] Pant R.P.(1998) "Common fixed point theorems for contractive maps", J. Math. Anal. Appl. 226 , 251-258.

[16] Pant R.P., Jha K.(2004) "A remark on common fixed points of four mappings in a fuzzy metric space", J. Fuzzy Math. 12(2) , 433-437.

[17] Pathak H. K., and Singh Prachi (2007) "Common Fixed Point Theorem for Weakly Compatible Mapping", International Mathematical Forum, 2, no. 57, 2831 -2839.

[18] Rhoades B.E.(1988) "Contractive definitions and continuity", Contemporary Math. 72,233-245.

[19] Schweizer B. and Sklar A.(1960) "Statistical metric spaces", Pacific J. Math.10, 313-334.

[20] Vasuki R.(1999) "Common fixed points for R-weakly commuting maps in fuzzy metric spaces", Indian J. Pure Appl. Math. 30, 419-423.

[21] Zadeh L.A (1965) "Fuzzy sets", Inform and Control 8, 338-353.

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Channel Aware Routing in MANET'S with Secure Hash Algorithm

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Abstract- A Mobile Ad-hoc Network (MANET) is a collection of autonomous nodes or terminals which communicate with each other by forming a multi-hop radio network and maintaining connectivity in a decentralized manner. Nodes in ad-hoc networks play both the roles of routers and terminals. Moreover, the routing path in ad-hoc networks is dynamic; it is not fixed as in wired networks. Therefore, some security mechanisms used in wired networks cannot simply be applied to protocols in ad-hoc networks. After analyzing various types of attacks against ad-hoc networks, a secure scheme for the famous routing protocol, CA- AOMDV (Channel Aware ad hoc multipath distance vector routing) is proposed. To guarantee the integrity in ad-hoc networks, Secure Hash Algorithm-1 (SHA-1) is used. Furthermore, NS2 (Network Simulator) software is used to simulate this scheme and performance analysis are made.

Index Terms- mobile ad hoc networks, channel aware routing, security, SHA1

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I. INTRODUCTION

In a multi-hop mobile ad-hoc network, mobile nodes cooperate to form a network without using any infrastructure such as access points and base stations. Instead, the mobile nodes forward packets for each other's allowing communication among nodes outside wireless transmission range. Examples of applications for ad-hoc networks range from military operation and emergency disaster relief to community networking and interaction among meeting attendees or students during a lecture. In this ad-hoc networking applications, security is necessary to guard the network from various types of attacks. In ad-hoc networks, adverse nodes can freely join the network, listen to and/or interfere with network traffic, and Compromise network nodes leads to various network failures. Since routing protocols are fundamental tools of network-based computation, at tacks on unsecured routing protocols can disrupt network performance and reliability.

II. REVIEW OF AOMDV AND CA-AOMDV

Transmissions via unreliable wireless connections can result in large packet losses. Thus, it makes sense to consider routing protocols which adapt to channel variations. We use a channel-aware routing protocol which extends the Ad hoc On- Demand Multipath Distance Vector (AOMDV) routing protocol. We call it CA-AOMDV. AOMDV is, itself, an extension of the Ad hoc On-Demand Distance Vector (AODV) routing protocol. In this section, we review the details of these two predecessor protocols that are useful to our discussion in this paper. AOMDV the key distinguishing feature of AOMDV over AODV is that it provides multiple paths to nd. These paths are loop free and mutually link-disjoint. AOMDV uses the notion of advertised hop-count to maintain multiple paths with the same destination sequence number. In both AODV and AOMDV, receipt of a RREQ initiates a node route table entry in preparation for receipt of a returning RREP.

In AODV, the routing table entry contains the fields:
<destination IP address, destination sequence number, next-hop IP address,
hop-count,
entry expiration time>,

where entry expiration time gives the time after which, if a corresponding RREP has not been received, the entry is discarded. In AOMDV, the routing table entry is slightly modified to allow for maintenance of multiple entries and multiple loop- free paths. First, advertized hop-count replaces hop- count and advertized hop-count is the maximum over all paths from the current node to nd, so only one value is advertized from that node for a given destination sequence number. Second, next-hop IP address is replaced by a list of all next-hop nodes and corresponding hop-counts of the saved paths to nd from that node, as follows:
<destination IP address, destination sequence number, advertized hop-count, route list:
{(next hop IP 1, hop-count 1),
(next hop IP 2, hop-count 2), . . . },
entry expiration time>.

To obtain link-disjoint paths in AOMDV, nd can reply to multiple copies of a given RREQ, as long as they arrive via different neighbors.

AOMDV ROUTING TABLE	CA-AOMDV ROUTING TABLE
Destination IP address	Destination IP address
Destination sequence number	Destination sequence number
Advertised hop count	Advertised hop count
Path list { (next hop IP1,hopcount 1), (next hop IP2,hop	Dmin Path list { (next hop IP1,hopcount 1,d1),

count 2)….}	(next hop IP2,hop count 2, d2)…..}
Expiration time	Expiration time
	Dormant time

AOMDVand CA-AOMDV routing table structure

III. ROUTE DISCOVERY IN CA-AOMDV

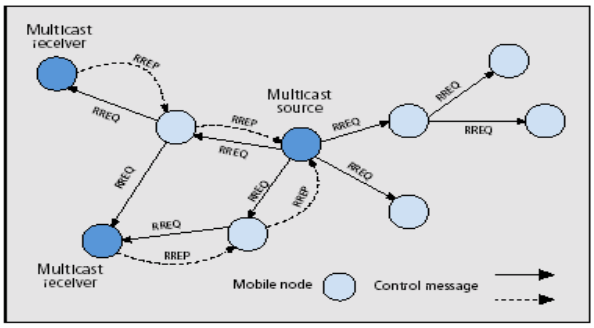
Route discovery in CA-AOMDV is an enhanced version of route discovery in AOMDV, incorporating channel properties for choosing more reliable paths. we defined the ANFD for one link of a path, according to the mobile-to-mobile channel model. CA-AOMDV uses the ANFD as a measure of link lifetime. The duration, D, of a path is defined as the minimum ANFD over all of its links,

$$\mathcal{D} \triangleq \min_{1 \le h \le \mathcal{H}} \text{ANFD}_h,$$

Where h is link number, and H is number of links/hops in the path. Before forwarding a RREQ to its neighbors, a node inserts its current speed into the RREQ header so that its neighbors can calculate the link ANFD using (1). The path duration, D, is also recorded in the RREQ, updated, as necessary, at each intermediate node. Thus, all information required for calculating the ANFD is available via the RREQs, minimizing added complexity. Similarly, to the way the longest hop path is advertised for each node in AOMDV to allow for the worst case at each node, in CA-AOMDV the minimum D over all paths between a given node, ni, and nd, is used as part of the cost function in path selection. That is,

$$\mathcal{D}_{\min}^{i,d} \triangleq \min_{\zeta \in \text{path\_list}_i^d} \mathcal{D}_\zeta,$$

where path list di is the list of all saved paths between nodes ni and nd. The route discovery update algorithm in CA-AOMDV is a slight modification of that of AOMDV. If a RREQ or RREP for nd at ni, from a neighbor node, nj, has a higher destination sequence number or shorter hop- count than the existing route for nd at ni, the route update criterion in CA-AOMDV is the same as that in AOMDV. However, if the RREQ or RREP has a destination sequence number and hop-count equal to the existing route at ni but with a greater Di;d min, the list of paths to nd in ni's routing table is updated. So, in CA-AOMDV, path selection is based on Di;d min as well as destination sequence number and advertised hop-count. The routing table structures for each path entry in AOMDV and CA- AOMDV are shown in Table 1. The handoff dormant time field in the routing table for CA-AOMDV is the amount of time for which the path should be made dormant due to channel fading. It is set to the maximum value of the AFDs over all links in the path. This use of handoff dormant time is described in more detail in the next section.



Route discovery in CA-AOMDV

IV. ROUTE MAINTENANCE

When a source node broadcasts an RREQ for a multicast group, it often receives more than one reply. The source node keeps the received route with the greatest sequence number and shortest hop count to the nearest member of the multicast tree for a specified period of time, and disregards other routes. At the end of this period, it enables the selected next hop in its multicast route table, and unicasts an activation message (MACT) to this selected next hop. The next hop, on receiving this message, enables the entry for the source node in its multicast routing table. If this node is a member of the multicast tree, it does not propagate the message any further. However, if this node is not a member of the multicast tree, it would have received one or more RREPs from its neighbors. It keeps the best next hop for its route to the multicast group, unicasts MACT to that next hop and enables the corresponding entry in its multicast route table. This process continues until the node that originated the chosen RREP (member of tree) is reached. The activation message ensures that the multicast tree does not have multiple paths to any tree node.

V. STANDARD SECURITY SERVICES

The following are the standard security services.

1. Data Confidentiality: It is the property in which the information embedded in network traffic is prevented from unauthorized disclosure. Since one of the main reasons that an attacker an successfully attack network nodes and protocols is the leak of sensitive information such as passwords and configuration data, data confidentiality is a very important property of network security.

2. Data Integrity: It is the property in which the originality of the information transmitted over the network is ensured. It is often combined with data origin authentication since data integrity alone cannot help receivers decide whether the received data are forged or have been tampered with.

3. Authentication: It is the property in which the identity of the connected entity (node) can be confirmed during connection phase (i.e., peer entity authentication), and the source of a message transmitted during the data transfer phase can be verified (i.e., data origin authentication).

A. Security in CA-AOMDV

Integrity plays an important role in ad-hoc networks. To overcome man-in-the-middle attack in mobile-ad hoc networks, SHA-1 algorithm is used. Normally, hop count field is mutable in nature. To protect this hop count value, hash values are found

by using SHA- 1 algorithm for those fields. Here, the packets are sent along with the hashed values of hop count field. Now, the malicious nodes, which forward the false routing information, can be effectively defended. This algorithm takes input as source address, destination address and hop count with a maximum length of less than 264 bits and produces output as a 160-bits message digest. The input is processed in 512-bits blocks. This algorithm includes the following steps.

1. Padding: The purpose of message padding is to make the total length of a padded message congruent to 448 modulo 512 (length = 448 mod 512). The number of padding bits should he between 1 and 512. Padding consists of a single 1- bit followed by the necessary number of 0-bits.

2. Appending Length: The 64-bit binary representation of the original length of the message is appended to the end of the message.

3. Initialize the SHA-1 buffer: The 160-bit buffer is represented by five four-word buffers (A, B, C, D, E) used to store the middle or finally results of the message digests for SHA-I functions and they are initialized to the following values in hexadecimal. Low-order bytes are put

Word A: 67 45 23 01
Word B: EF CD AB 89
Word C: 98
BA DC EF
Word D: 10
32 54 16
Wnrd E: C3 D2 El FO
.
..

4. Process message in 16-word blocks: The heart of the algorithm is a module that consists of four rounds of processing 20 steps each. The four rounds have a similar structure, but each uses a different primitive logical function.

These logical functions are defined as follows:

Initialize hash value : a:=A,b:=B,c:=C,d=:D,e=:E Main loop:
for I from 0 to 79 if 0 _ i _ 19 then
f := (b and c) or((not b) and d)
k := 0x5A827999 else if 20 _ i _ 39
f := b xor c xor d k:=0x6ED9EBA1
else if 40 _ i _ 59
f := (b and c) or (b and d) or (c and d)
k := 0x8F1BBCDC
else if 60 _ i _ 79
f := b xor c xor d
k := 0xCA62C1D6

The output of the fourth round is added to the input of the first round, and then the addition is modulo 232 to produce the ABCDE value that calculate next 5l2- bits block.

5. Output: After all 512-bits blocks have been processed, the output of the last block is the 160- bits message digest. These m e s s a g e d i g e s t v a l u e s a r e s e n t a l o n g w i t h t h e packets .

So, the packets which are sent by malicious nodes are suppressed. Thus, the integrity is ensured.

B. Secured CA-AOMDV Route Discovery algorithm

1. Sender Generates RREQ packet;
2. Sender signs all non-mutable fields (except hop count and hash chain fields) with its private key; Apply Hash to a seed to generate hash chain field; if (intermediate node can reply)

{Clear destination only tag; Include second signature in the signature extension;
}
Append signature extension to RREQ packet;

3. Broadcast RREQ to all neighbor nodes;
4. Intermediate node receives RREQ packet;
5. Node Verifies signature with public key of source (from RREQ packet);

If (valid packet)
then
update routing information of
source in any (establishment of reverse path);

6. if (destination I.P == node I.P)

{
Generate RREP;
Sign all the signs all non-mutable fields
(except hop count and hash chain fields)
with its private key;
Apply Hash to a seed to generate hash chain field;
Append signature extension to RREP
packet;
Unicast RREP to the neighbor which is in the reverse path for the source node;
}
else if (Node has valid route for destination &&
!(Destination only tag))
{
Generate RREP;
Copy the signature and other necessary
field of source to the signature extension; Sign all the signs all non-mutable fields (except hop count and hash chain fields) with its private key;
Apply Hash to a seed to generate hash chain field;
Append signature extension to RREP
packet;
Unicast RREP to the neighbor which is in the reverse path for the source node;
}
else

VI. SIMULATION

For simulation, we used network simulator ns-2.34, implementing the mobile-to=-mobile channel with Doppler frequency. This model has considered an area of 750m X 750m with a set of mobile nodes placed randomly and broadcast range is 150m.The simulation was carried out for different number of nodes using Network simulator (NS2).

A. Simulation Results

Here, we consider 25 mobile nodes with Channel aware routing protocol with the following parameters.

Table 2. Simulation Parameters.

Routing Protocol	CA-AOMDV
No. of nodes	20
Traffic type	CBR

Channel capacity	2 Mbps
Simulator	NS2
CBR packet size	512 bytes

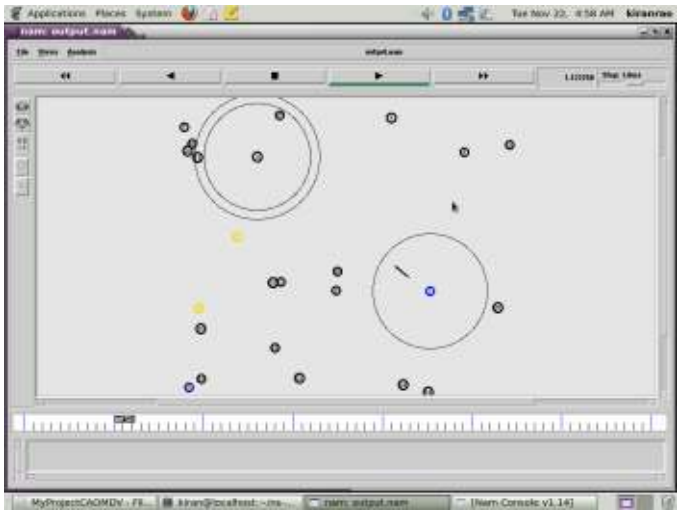


Figure1

Figure 1 shows data transmission between source and destination node without malicious nodes

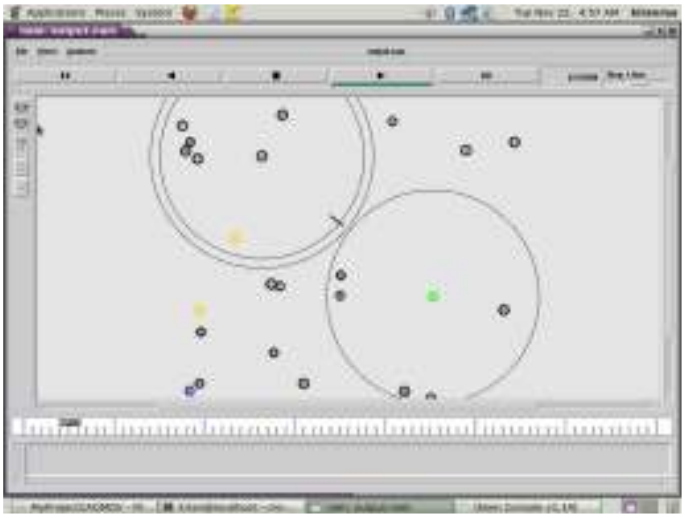
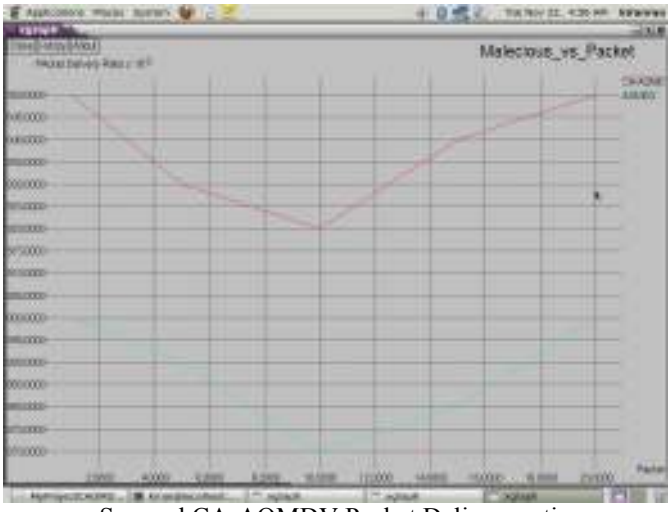


Figure 2

Figure2 shows data transmission with malicious nodes



Secured CA-AOMDV Packet Delivery ratio

VII. CONCLUSION AND FUTURE WORK

The purpose of this paper is to find an efficient and secure communication in wireless ad- hoc networks. Here, SHA-1 algorithm is applied in CA-AOMDV protocol to achieve secure routing in MANET. CA-AOMDV is used to generate stable link between source and destination. There are still many problems such as tunneling attacks, selectively drop packets; etc are still persist in these ad-hoc networks.

REFERENCES

[1] Xiaoqin Chen, Haley M. Jones, and Dhammika Jayalath, "Channel-Aware Routing in MANETs with Route Handoff" IEEE Transactions on Mobile computing, VOL. 10. NO. 1, JANUARY 2011.
[2] Mr.P.VISU,Mr.W.T.CHEMBIAN, Mr.S.KOTEESWARAN"Security in Multicast Mobile Ad-hoc Networks" IEEE 2009.
[3] S.Biswas and R.Morris, "ExOR: opportunistic MultiHop Routing for wireless Networks", vol. 35,no. 4, pp. 133-144 Aug.2005
[4] Dai Zibin and Zhou Ning, "FPGA Implementation of SHA-1 Algorithm", IEEE 2003, pp 1321-1324 .
[5] Junaid Arshad and Mohammad Ajmal Azad, "Performance Evaluation of Secure on- DemandRouting Protocols for Mobile Adhoc Networks", IEEE Network, 2006, pp 971- 975.
[6] A.S. Akki, "Statistical Properties of Mobile-to-Mobile Land Communication Channel," IEEE Trans. Vehicular Technology, vol. 43, no.4, pp. 826-831, Nov. 1994.
[7] N. Priyantha, A. Miu, H. Balakrishnan, and S.Teller, "The Cricket Compass for Context-Aware Mobile Applications," Proc. ACMMobiCom, pp. 1-14, July 2001.
[8] T. Goff, N. Abu-Ghazaleh, D. Phatak, and R.Kahvecioglu, "Preemptive Routing in AdHoc Networks," Proc. Ann. Int'l Conf. MobileComputing and Networks (ICMCN), pp.43-52, July 2001.
[9] [The Network Simulator - ns-2, http://www.isi.edu/nsnam/ns, 2008.
[10] C.S. Patel, G.L. Stuber, and T.G. Pratt, "Simulation of Rayleigh-Faded Mobile-to-Mobile Communication Channels," IEEE Trans. Comm., vol. 53, no. 11, pp. 1876-1884, Nov. 2005.

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A New Impulse Noise Detection and Filtering Algorithm

Geeta Hanji, M.V.Latte

Abstract- A new impulse detection and filtering algorithm is proposed for restoration of images that are highly corrupted by impulse noise. It is based on the average absolute value of four convolutions obtained by one-dimensional Laplacian operators. The proposed algorithm can effectively remove the impulse noise with a wide range of noise density and produce better results in terms of the qualitative and quantitative measures of the images even at noise density as high as 90%. Extensive simulations show that the proposed algorithm provides better performance than many of the existing switching median filters in terms of noise suppression and detail preservation.

Index Terms- image processing, impulse noise, noise suppression, detail preservation

I. INTRODUCTION

During image acquisition or transmission, digital images could be contaminated by impulse noise. Two common types of impulses are the salt-and-pepper noise and the random-valued noise [1, 2]. For image corrupted by salt-and-pepper impulse noise, the noisy pixels can take only the maximum and the minimum value in the dynamic range. For 8-bit pixel, the maximum value is 255 and the minimum value is 0. In the literature, a large number of algorithms have been proposed to remove impulse noise while preserving image details [1–9]. One of the most popular and robust nonlinear filter is the standard median filter (SMF) [1], which exploits the rank-order information of pixel intensities within a filtering window and replaces the center pixel with the median value. Conventional median filtering approaches apply the median operation to each pixel without considering whether it is uncorrupted or corrupted, thus the impulse noise is removed at the expense of blurred and distorted features. Improved filtering algorithms employ an impulse-noise detector to determine which pixels should be filtered, hence only those pixels identified as "corrupted" would undergo the filtering process, while those identified as "uncorrupted" would remain intact. The adaptive median filter (AMF) [2] ensures that most of the impulse noise can be detected even at a high noise level provided that the window size is large enough. But, it increased the computation complexity especially at high density impulse noise. The convolution-based impulse detector and switching median filter (CD-SMF) algorithm [3] distinguishes whether the interest pixel is noise or not depending on a threshold determined by computer simulations. [4] processes the corrupted image by first detecting the impulse noise and uses a fixed 3×3 window size to handle the corrupted pixel for removal of impulse noises. It is found that CD-SMF and A new Impulse Detection and Filtering method for removal of Wide Range Impulse Noises, IDFRWRIN[5] ,will exhibit serious image blurring for high density impulse noise [3, 5, 6]. In this paper, we propose new impulse noise detection and filtering algorithm that can effectively remove a wide range impulse noise while preserving image details. The proposed algorithm is shown to achieve excellent performance across a wide range of noise densities varying from 10% to 90%. The organization of the rest of this paper is as follows. In the next section, new impulse noise detection and filtering algorithm is described in detail. In Section 3, some experimental results are presented with discussion. The concluding remarks are given in Section 4.

II. THE PROPOSED IMPULSE NOISE DETECTION AND FILTERING ALGORITHM

In this paper, noise is assumed to be salt and pepper impulse noise. Pixels are randomly corrupted by two fixed extreme values, 0 and 255 (for 8-bit monochrome images) generated with the same probability [6]. There are three steps (steps (a)–(c)) in our proposed algorithm for impulse detection and filtering. After classifying corrupted and uncorrupted pixels (see steps (a) and (b)), we replace the corrupted pixel by the suitable value of the sorted sequence of its neighborhood values (see step(c)). We repeat steps (a)–(c) for S iterations to get the convergent recovery image.

Step (a): The input image Xij is first convolved with a set of convolution kernels. Here, four one-dimension Laplacian operators shown in Fig. 1 are used, each of which is sensitive to edges in a different orientation [3]. Then, the average absolute value of these four convolutions (denoted as r_{ij}) is used for impulse detection, which can be represented as:

$$r_{ij} = \mathrm{Avg}\left\{\left|X_{ij} \otimes K_t\right| \,\middle|\, t = 1, 2, 3, 4\right\} \quad (1)$$

where K_t is the t_{th} kernel and $\otimes$ denotes a convolution operation. We compare r_{ij} with a threshold T to determine whether a pixel is corrupted,

$$\alpha_{ij} = \begin{cases} 1, & r_{ij} > T \\ 0, & r_{ij} \leqslant T \end{cases} \quad (2)$$

If $\alpha_{ij}=1$, then the pixel Xij is marked as noise candidate; otherwise the pixel Xij is noise-free. A reasonable threshold T can be determined as follows: Consider an example of a 3×3 window (i.e., W =3 X 3), in which four thresholds μ_k , k = 0, 1, 2, 3, are needed. The median of the absolute deviations from the median (MAD), MAD=median $\{|x_{i-s,\, j-t} - x_{i,j}| \mid (s,t) \in W\}$ is a robust estimate of dispersion [12].

Specifically the thresholds are described as

$T = s \cdot MAD + \mu_k;\ 0 \leq k \leq 3$ (3)

$[\mu_0, \mu_1, \mu_2, \mu_3] = [40, 25, 10, 5]$ (4)

Here parameter s (> 0) varies for different images degraded with different noise ratios, & is also observed empirically that good results could be obtained using $0 \leq s \leq 0.6$, in suppressing impulse noise for various images. Hence due to the robustness of

the algorithm, the determination of the thresholds is simplified to the adjustment of parameter s.

Step (b): If the interesting pixel Xij is marked as noise candidate, we use a fixed 3×3 window W shown in (2) for further processing:

$$W = \begin{bmatrix} a_0 & a_5 & a_3 \\ a_6 & a_1 & a_7 \\ a_4 & a_8 & a_2 \end{bmatrix} = \begin{bmatrix} X_{i-1,j-1} & X_{ij-1} & X_{i,j+1} \\ X_{i-1,j} & X_{ij} & X_{i+1,j} \\ X_{i-1,j+1} & X_{ij+1} & X_{i+1,j+1} \end{bmatrix}$$

By sorting all the elements a0, a1, a2, a3, a4,a5,a6,a7 and a8 in ascending order, we get a sorted sequence: b0, b1, b2, b3, b4,b5,b6,b7 & b8, where b0 <b1 < b2 < b3 < b4 < b5 < b6 <b7 < b8. If Xij satisfies the following cases, the pixel will be considered a noise-free pixel and retain its value:

Case 1: $a_0 < Xij < a_8$

Case 2: $Xij = b_8 \neq 255$

Case 3: $Xij = b_0 \neq 0$

1. Case 1 indicates that Xij is not an extreme value.
2. Case 2 indicates that Xij is not a salt impulse noise.
3. Case 3 indicates that Xij is not a pepper impulse noise.
4. If Xij does not satisfy Cases 1–3, the pixel will be regarded as a noisy pixel.

So, Xij is replaced by the mean of noise free pixels.

III. EXPERIMENTAL RESULTS

In this experiment, The performance is tested with different gray scale images such as Lena, Girl, and Baboon with size 256×256. In the simulation, images are corrupted by "salt" (with value 255) and "pepper" (with value 0) noise with equal probability. The noise levels are widely varied from 10% to 90% with increments of 10%, and the restoration performance are quantitatively measured in terns of PSNR in dB and computation time in seconds. A comparison of these performance measures with various algorithms including SMF, AMF, CD-SMF and A new Impulse Detection and Filtering method for Removal of Wide Range Impulse Noises (IDFRWRIN) [4] are presented in Tables 1–2. It is observed that the proposed algorithm can provide better performance in terms of image quality and computation time. For every noise level, our algorithm achieves better PSNR than SMF, AMF, CD-SMF and & IDFRWRIN. Though the computation time of SMF and AMF is shorter than our algorithm, but their PSNR performance is not good. Extensive simulations show that our algorithm converges with S = 2 iteration for noise density below 30%, with S=4 iterations for noise density from 40% to 70%, and with S = 5 iterations for density higher than 80%. Fig. 1 shows the original test images. Figs. 2–3 show the subjective visual qualities of the filtered images using various algorithms for the image "Lena" corrupted by 50% and 80% impulse noise. It can be seen that for different noise density the SMF suppress the impulses but introduce the obvious blur effect. Our algorithm can achieve better PSNR visual quality while preserving image detail very well for a wide range of noise density. Figs. 4 and 5 show the restoration results for the Girl image corrupted by 50% & 80% noise, respectively. These results also reveal that the. proposed algorithm exhibits better visual quality.

IV. CONCLUSION

In this paper, a new algorithm for impulse detection and filtering is proposed. The proposed algorithm can not only achieve better image quality, but also have shorter computation time. Extensive simulations reveal that the proposed algorithm provides better performance than many of the existing switching median filters in terms of noise suppression and detail preservation. The proposed algorithm shows stable performance across a wide range of noise densities varying from 10% to 90%, and is suitable for real-time implementation since it uses a fixed 3×3 window for filtering processing.

Figure1. The original image Lena and Girl

Figure 2. Image restoration results: (a) Lena image corrupted with 50% impulse noise (b) SMF (c) AMF (d) CD-SMF (e) IDFRWRIN (f) Proposed

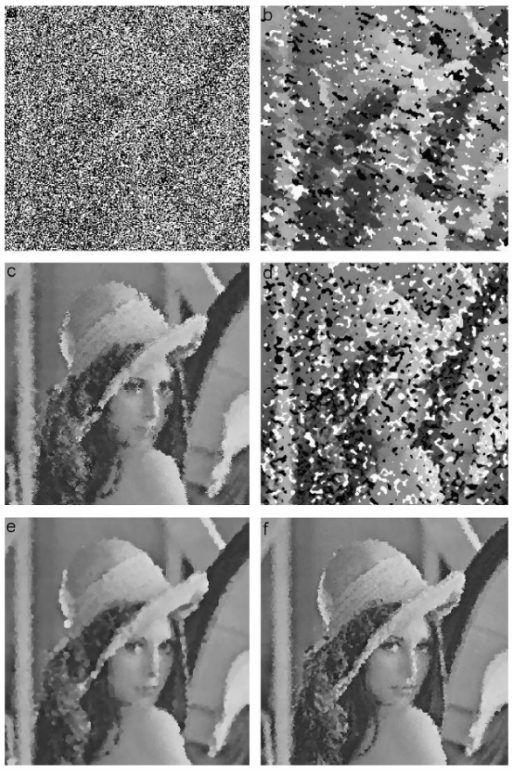

Figure 3.Image restoration results:(a)Lena image corrupted with 80% impulse noise(b) SMF(c) AMF (d) CD-SMF (e)IDFRWRIN (f) Proposed

TABLE (1): PSNR (DB) AND COMPUTATION TIME (SEC) FOR VARIOUS ALGORITHMS FOR LENA IMAGE

NOISE DENSITY	ALGORITHM									
	SMF		AMF		CD-SMF		IDFRWRIN		PROPOSED	
	PSNR	TIME	PSNR	TIME	PSNR	TIME	PSNR	TIME	PSNR	TIME
10%	29.93	0.61	35.57	0.639	32.94	0.938	39.09	0.764	40.2	0.762
20%	28.36	0.625	32.94	0.639	30.97	0.823	34.32	0.734	36.32	0.732
30%	26.42	0.625	30.72	0.639	29.62	0.823	32	0.734	33.4	0.721
40%	23.99	0.625	28.94	0.657	27.83	0.828	30.27	0.734	32.27	0.714
50%	21.7	0.625	27.37	0.671	26	0.938	28.54	0.735	30.54	0.714
60%	19.47	0.64	26.17	0.718	22.55	0.796	27.33	0.75	29.63	0.71
70%	15.98	0.609	24.18	0.859	17.39	0.843	26	0.765	28	0.735
80%	13.04	0.609	22.39	1.531	12.37	0.86	24.53	0.764	26.53	0.734
90%	8.94	0.609	20.17	10.6	8.46	0.764	22.2	0.765	24.2	0.745

TABLE 2: PSNR (DB) AND COMPUTATION TIME (SEC) FOR VARIOUS ALGORITHMS FOR GIRL IMAGE

NOISE DENSITY	ALGORITHM

	SMF		AMF		CD-SMF		IDFRWRIN		PROPOSED	
	PSNR	TIME	PSNR	TIME	PSNR	TIME	PSNR	TIME	PSNR	TIME
10%	31.89	0.609	37.33	0.639	35.34	0.823	42.11	0.735	44.12	0.713
20%	31.05	0.65	35.57	0.656	33.07	0.86	37.33	0.734	39.03	0.714
30%	28.73	0.61	33.65	0.640	31.14	0.938	34.90	0.75	36.12	0.72
40%	26.73	0.69	31.79	0.656	29.20	0.86	32.80	0.75	34.71	0.714
50%	23.98	0.625	30.34	0.688	27.26	0.823	32.81	0.75	34.86	0.723
60%	20.32	0.609	28.49	0.75	22.95	0.823	31.50	0.75	33.25	0.723
70%	16.67	0.625	27.02	0.875	16.05	0.836	29.80	0.75	31.81	0.723
80%	12.66	0.625	24.57	3.03	11.52	0.796	28.73	0.75	30.45	0.723
90%	8.29	0.610	23.12	11.2	7.34	0.836	29.84	0.74	31.65	0.72

REFERENCES

[1] J. Wang, "Fundamentals of erbium-doped fiber amplifiers arrays (Periodical style—Submitted for publication)," *IEEE J. Quantum Electron.*, submitted for publication.

[2] Wakeham.K.J. "Introduction to chassis design revision 1.0" Undergraduate diss., Memorial University of Newfoundland and Labrador. 2009

[3] Beleandez, T. Neipp, C. And Belea, N.A, "Numerical and experimental analysis of a cantilever beam: A laboratory project to introduce geometric Nonlinearity in mechanics of materials". International journal of engng. Ed. vol.19 No 6 pp 885-892. 2003

[4] Karaoglu, C. and Kuralay, N.S., "Stress analysis of truck chassis with riveted joints", Elsevier science Publishers B.V Amsterdam, the Netherlands Vol.38 pp 1115-1130. 2000

[5] Ye.N and Moan T 2007, "Static and Fatigue analysis of three types of Aluminum Box-Stiffener/web Frame connections, International Journal of Fatigue 29 pp1426- 1433

[6] Crouse W.H and Anglin D.L, Automotive Mechanics, Tata McGraw Hill Education Pvt.Ltd. pp. 658-711 2007

[7] National Code of Practice, Heavy Vehicle Modifications Section H Chassis Frame.

[8] National Code of Practice, Heavy Vehicle Modifications Section J Body Mounting.

[9] Meiyalagan, M Anbarasu, M and Dr.Sukumar.S, "Investigation on cold formed C Section Long Column with Intermediate Stiffener and corner lips under axial compression" International Journal of applied engineering research, Dindigul, Vol.No.1 pp 28-41. 2010

[10] Young B, "Tests and design of fixed ended cold formed steel plain angle columns, Journal of structural engineering © ASCE / 19311940, 2004

[11] Martin H.Sadd (2004), "Elasticity Theory, Applications and Numerics" Elsevier, a division of Reed Elsevier India Private Limited.

[12] Timoshenko S and Goodier J.N, "Theory of Elasticity" Mc-Graw Hill Book Company, Inc.

[13] Reimpell J., Stoll H., Betzler J.W., "The Automotive chassis: Engineering Principles" Second Edition. Butterworth Heinemann, A division of Reed Educational and Professional Publishing Ltd.

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Undecryptable Encryption against Network and Forensic Attack

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Abstract- Cryptography plays a vital role in data security. It is necessary where the integrity and confidentiality of information is needed. But use of cryptography is not sufficient for the protection of the sensitive information. There are number of cases encounter where the attacker breach the security and obtain the secret key in use or the secure information even though the strong protection against attack such as brute force, cold boot etc. has been provided. Some systems are only use for the storage purpose. Such systems are the recording devices such as CCTV, video recorders and network equipments. They just keep the information for further use in secure manner. These systems never process this stored information and even not understood it. These devices require the more protection as they either transfer the data physically or through network. Symmetric cryptography is useful when there is a huge amount of data to encrypt but provide the more access then needed. Asymmetric encryption does not provide more access but not suitable for large volume of data. So a solution is required where device is allowed to encrypt the data symmetrically, but is not able to decrypt it neither by itself nor by attacker.

Index Terms- Data remanance, Image storing, Cryptography, Data Security, Computer security

I. INTRODUCTION

Cryptography is the science of protecting the channel between two communicating parties. It becomes one of the most important contributors to privacy and data security in an increasingly interconnected world. The use of cryptography As cryptography may be used to hide data that may high light on the chain of events that constitutes an incident or crime, it also represents a challenge for digital forensics investigators.

Only protection to communication channel using cryptography is not sufficient. Endpoints of channels is now become the major security challenges. Cryptography defends against various attacks; still the endpoints have become the weakest link in the security chain. Hackers do not need decrypt data in transit, just need to implant the malicious program on machine to harvest all the secrets that it processes. Some attack make it difficult to identify the third party or remote party so it is increasingly important to secure the machine right in front of you. Information is always at risk. Attacker can follow any possible way to get the data either by using the rootkit to monitor the device or stolen physical device.

Various cases have occurred, where the devices contain sensitive information has stolen and disposed drive incorrectly. To defend the device from the attack, it is require that device has only useful data available to it. Information that no longer needed should be purge out properly. The data which is available in the device should be in encrypted form so that unauthenticated user will not be able to access it. Generally devices keep data available for the further processing on it. User accesses data and modify its requirement. Some devices are only used for the storage purpose. Device store data and transfer it to another device. Another device processes this data. There are a wide range of devices that would fit into this category, including sensors on scientific equipment, monitors on vehicles, and CCTV equipment. These devices do not require processing the data that it captures, but should store the data in secure manner.

Symmetric encryption is used to encrypt the bulk of a data. If the data is encrypted on a device using the symmetric encryption then it is possible to decrypt the data on the same device. It is possible that device that having the key and data can be stolen or hacked during the encryption process. As a result, attacker can compromise the device and manipulate the data. Asymmetric encryption can be used to solve this problem, but it is infeasible to encrypt large amount of data with it. Where cryptography is used to protect the content, hackers have invariably found the keys and publicly disclosed them.

The purpose of this paper is to provide a method that gives the high degree of protection to the information. It allows the device to securely encrypt the data but not allow decrypting it on the same device. It keeps the information in system which is strictly necessary. While all important information should be encrypted. Information that is no longer needed should be properly erased.

This technique is applicable where device need not to decrypt the data such as

1. Military tank where recording device is used to capture the image of battle ground and store information in hidden form. Data will open up in base camp only.
2. CCTV cameras in mails, offices etc.
3. Network equipment which are use to transmit sensitive data
4. And video recorder in Black box.

II. REVIEW OF LITERATURE AND SIMILAR WORK

1. Data remanence in DRAM

Data remanence is the residual representation of data that remains even after attempts have been made to remove or erase the data.

Most security experts assume that a computer's memory is erased almost immediately when it loses power or that whatever data remains is difficult to retrieve without specialized equipment. It is shown that these assumptions are incorrect. Ordinary DRAMs typically lose their contents gradually over a period of seconds, even at standard operating temperatures and even if the chips are removed from the motherboard, and data will persist for minutes or even hours if the chips are kept at low temperatures. Residual data can be recovered using simple, nondestructive techniques that require only momentary physical access to the machine. Previous researchers have suggested that data in DRAM might survive reboots, and that this fact might have security implications.

2. Full Disk Encryption

To protect the data that remains in disk (such Cryptographic keys in DRAM) are need to be store in encrypted form. Now a day's device uses full disk encryption. According to the 2006 Security Breaches Matrix, a large number of the data leaks were caused due to stolen/missing laptops. Mobile devices will be stolen or lost, but one way to easily mitigate the harm is to use Full Disk Encryption (FDE) on all mobile devices. So, why don't we encrypt all our HDDs? Cost and performance impact are the usual arguments. Analysis shows that the access time increases by 56%-85% after FDE. As HDDs fills up the fragmentation increases and so will the file access time. With FDE, the swap file (system's virtual memory) gets encrypted as well. This will impact the system's performance noticeably when the virtual memory is being used more often.

Encryption key & password management blues follow. What happens when the user forgets his/her new FDE password? How to manage the encryption key backup files? Who has possession of the backups of the encryption keys? What about when the users quit and do not hand over the password / encryption keys? Who can access the system and its encrypted files? How frequently does the password need to be changed? How to prevent the user from writing the passwords down? Using hardware token (RSA Token, smartcard etc) can alleviate many of the password management issues. But these hardware tokens are costly.

There are number of strong algorithm and techniques are available for data encryption. In most cases, a user will need to modify information continuously hence they need to have access to it on their machines. However, some devices are purely used for storage, and processing done later, by a different device in a different location. The device recording the data does not need to be able to decrypt what it is storing. . There are several popular disk encryption systems, including BitLocker, TrueCrypt, and File Vault, and many similar products are also vulnerable.

3. Attacks

Cryptographic keys held in memory can be recovered by the effect of attacks that exploit DRAM remanence. They pose a particular threat to devices such as laptop which uses disk encryption products, since an adversary who steals a laptop while an encrypted disk is mounted could employ attacks to access the contents, even though if the computer is screen-locked or suspended. While principal focus is disk encryption, any sensitive data present in memory when an attacker gains physical access to the system could be subject to attack. Many other security systems are probably vulnerable.

Imaging Residual Memory

No special equipment is required by imaging residual memory contents. When the system is start booting, the memory controller begins refreshing the DRAM, reading and rewriting each bit value. At this point, the values are fixed, decay halts, and programs running on the system can read any data present using normal memory-access instructions.

Memory-Imaging Tools

To boot a system and extract the contents of its memory, Memory-imaging tools use several different attack vectors. Use tiny special-purpose programs that, when booted from either a warm or cold reset state, produce accurate dumps of memory contents to some external medium. These programs use only trivial amounts of RAM, and their memory offsets used can be adjusted to some extent to ensure that data structures of interest are unaffected.

USB Device

Most PCs can boot from an external USB device such as a USB hard drive or flash device. There are numbers of plug-in that can be booted from an external USB device or a regular hard disk. It saves the contents of system RAM into a designated data partition on this device.

Simple Reboots

The simplest attack is to reboot the machine and configure the BIOS to boot the imaging tool. A warm boot, invoked with the operating system's restart procedure, will normally ensure that the memory has no chance to decay, though software will have an opportunity to wipe sensitive data prior to shutdown.

Transferring DRAM Modules

Removing the memory modules can also allow the attacker to image memory in address regions where standards BIOSes load their own code during boot. The attacker could remove the primary memory module from the target machine and place it into the secondary DIMM slot (in the same machine or another machine), effectively remapping the data to be imaged into a different part of the address space.

Countermeasures

Memory imaging attacks are difficult to defend against because cryptographic keys that are in active use need to be stored somewhere. Countermeasures focus on
discarding or obscuring encryption keys before an adversary might gain physical access, preventing memory dumping software from being executed on the machine, physically protecting DRAM chips, and possibly making the contents of memory decay more readily.

- Discard encryption key.
- Key should be generated by password used for accessing the machine.
- Scrubbing memory.
- Clear memory at boot time.
- Clear during start up (before loading of OS)
- Limiting booting from network or removable media.
- Physical protection such as locking DRAM

4. Cold Boot Attack

In cryptography, a cold boot attack (or to a lesser extent, a platform reset attack) is a type of side channel attack in which an attacker with physical access to a computer is able to retrieve encryption keys from a running operating system after using a cold reboot to restart the machine from a completely "off" state. The attack relies on the data remanence property of DRAM and SRAM to retrieve memory contents which remain readable in the seconds to minutes after power has been removed.

To execute the attack, the machine is cold-booted. Cold-booted refers to when the power is cycled “off” and then “on” without letting the computer shut down cleanly, or, if available, the “reset” button on the computer is pressed. A light-weight operating system is then immediately booted (e.g. from a USB flash drive), and the contents of pre-boot memory dumped to a file. Alternatively, the memory modulesare removed from the original system and quickly placed in another machine under the attacker's control, which is then booted to access the memory. Further analysis can then be performed against the information that was retrieved from memory to find the sensitive keys contained in it (automated tools are now available to perform this task).

The attack has been demonstrated to be effective against full disk encryption schemes of various vendors and operating systems, even where a Trusted Platform Module (TPM) secure cryptoprocessor is used.[2] This is because the problem is fundamentally a hardware (insecure memory) and not a software issue. While the focus of current research is on disk encryption, any sensitive data held in memory are vulnerable to the attack.

The time window for an attack can be extended to hours by cooling the memory modules. Furthermore, as the bits disappear in memory over time, they can be reconstructed, as they fade away in a predictable manner. In the case of disk encryption applications that can be configured to allow the operating system to boot without a pre-boot PIN being entered or a hardware key being present (e.g. BitLocker in a simple configuration that uses a TPM without a two-factor authentication PIN or USB key), the time frame for the attack is not limited at all.

5. Walsh Code

There are number of forensic identification and key extraction techniques that can recover the keys use for data hiding process. So, there is a need of method which generates a unique key which is hard to detect. Walsh code is one which can be used as key. It is difficult to detect the Walsh code as two codes are purely orthogonal.

Also known as "Walsh-Hadamard code," it is an algorithm that generates statistically unique sets of numbers for use in encryption and cellular communications.

Walsh Code Algorithm

(a', b') = (a+b, a-b)

A new technique is proposed for optical encryption and multiplexing of binary characters and images used for personal identification information. Different binary images can first be encrypted using orthogonal code and then multiplexed together in the spatial domain. The resulting encrypted single image provides security as well as makes efficient use of storage and/or transmission capacity. The image can finally be decrypted and the individual input images can be decoded employing the same orthogonal code set. Because of the orthogonal nature of the code used, the encryption and decryption processes do not deteriorate the quality of the images employed. Also, the proposed technique involves a very simple architecture, as it does not require any mathematical transformation.

Walsh Transform

This is a special type of orthogonal transformation formed by rearranging the rows of Hadamard matrix that performs an orthogonal, symmetric, evolutional & linear operation on 2^m real numbers.

The Walsh transform Wm is a 2^m *x* 2^m matrix, known as the *Walsh matrix*, which is a specific square matrix, the entries of which are *+1* or *−1*, and the property that the dot product of any two distinct rows (or columns) is zero.

The Hadamard matrices of dimension 2^k for $k \in N$ are given by the recursive formula:

$$H_2^0 = [1] \qquad H_2^k = \begin{bmatrix} H_2^{k-1} & H_2^{k-1} \\ H_2^{k-1} & -H_2^{k-1} \end{bmatrix}$$

For example,

$$H_2^0 = [\mathbf{1}] \qquad H_2^1 = \begin{bmatrix} \mathbf{1} & \mathbf{1} \\ \mathbf{1} & \mathbf{-1} \end{bmatrix}$$

Binary representation is,

$$H_2^0 = [\mathbf{1}] \qquad H_2^1 = \begin{bmatrix} \mathbf{0} & \mathbf{0} \\ \mathbf{0} & \mathbf{1} \end{bmatrix}$$

Now, the Walsh matrix is obtained in such a way that the number of sign changes in a row is in increasing order. So,

$$H_2^0 = [\mathbf{1}] \qquad W_2 = \begin{bmatrix} \mathbf{1} & \mathbf{1} \\ \mathbf{1} & \mathbf{-1} \end{bmatrix}$$

$$W_4 = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{bmatrix} \quad \text{and so on.}$$

This whole matrix is used as key in case of image This whole matrix is used as key in case of image Encryption and decryption. This matrix is multiply with the image matrix to obtain the cipher image.

Another way to obtain The Walsh-Hadamard code is to generate Generator matrix G of dimension K $\times 2^n$. Where $g_i \in \{0,1\}^n$ is the vector corresponding to the binary representation of *i*. In other words,g_0, g_1, … g_{2n-1} is the list of *all* vectors of $\{0,1\}^n$ in some lexicographic order.

G= $\begin{bmatrix} \uparrow & \uparrow & & \uparrow \\ g_0 & g_1 & \cdots & g_{2n-1} \\ \downarrow & \downarrow & & \downarrow \end{bmatrix}$

The Generator matrix for the Walsh–Hadamard code of dimension 3 is

G= $\begin{bmatrix} 0 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 & 0 & 1 \end{bmatrix}$

As is possible for any linear code generated by a generator matrix, we encode a message $x \in \{0,1\}^n$, viewed as a row vector, by computing its codeword $z \in \{0,1\}2^n$ using the vector-matrix product in the vector space over the finite field F_2:

Z= x.G

This code word used as key for encryption purpose.

Walsh function generation using basis vectors:

The Walsh sequences of order N form a K-dimensional vector space over GF(2) , i.e., all the N- tuple Walsh sequences can be spanned by a set of linearly independent basis vectors.There exists a K× N generation matrix G such that $W_j = X_jG$, j = 0, 1, …. $2^K = N$.

W=XG,
G is K×N generation matrix
$N=2^K$ $X=(x_1,x_2,\ldots\ldots x_k)$

For Example
N=8 K=3
G= 01100110 $X_5 = (101)$
00111100
00001111
$W_5 = (01101001)$

The Walsh codes now have variable lengths that range from 4 to a total of 256.The one effect with utilizing variable length Walsh codes is that if a shorter Walsh code is being used, then it precludes the use of the longer Walsh codes that are derived from it. For instance, if Walsh code 2 is used, then it precludes the use of all the Walsh codes in the code tree that were derived from it.

III. PROPOSED WORK

To solve the stated problem, assuming two separated device. One for recording purpose called Recording device and another for processing called Master device. Recording and Master Device will perform some initial communication. Recording device perform some initial operation in secure area. In this initial operation Recording device divide the memory into blocks and generate the secret key and the initialization vector. Store the secrete key and initialization vector in encrypted form in one of the block. This encryption will do with the help of another key either sends by Master device or generated by itself. To fill the remaining blocks, XOR operation on initialization vector will carry out called Mask and store into a block .This operation will repeat for each block. Recording device will generate another secrete key to encrypt the data. Second secrete key will also store in one of the block in encrypted form. Encrypted data will then XOR with the mask and store back to the same block of used Mask. After completing this initial operation all the key have been cleared from the system. Even the attacker get all the key material during encryption, is able to obtain the current block only. Without the keys form initial pass, they cannot decrypt anything.

Recording device send this encrypted information to Master Device where decryption will carry out. During decryption Master device will decrypt the blocks that contain the keys and initialization vector. Next step will to remove the mask. To remove the mask, encrypt the Initialization vector using the obtained secrete key and XOR with the content of the block which gives the cipher text. This cipher text is the decrypted using the second secret key which was used during the encryption process, will gives the original data.

IV. CONCLUSION

If the devices use the full disk encryption still there is threat to the confidential information. With full disk encryption, it is required that attacker will not be able to obtain the data remain in disk. Even if attacker compromises the device at the time of encryption, information remains secure.

REFERENCES

[1] Thomas Martin 2011,"UNDECRYPTABLE SYMMETRIC ENCRYPTION" IEEE GCC Conference and Exhibition (GCC),, Dubai, United Arab Emirates February 19-22, 2011

[2] A.Jones, G. Dardick, G. Davies, I. Sutherland, C. Valli, "The 2009 Analysis of Information Remaining on Disks Offered for Sale on the Second Hand market" Journal of International Commercial Law and Technology, North America, Jul. 2009.

[3] C. Maartmann-Moe, S. E. Thorkildsen, and A. Arnes, "The persistence of memory: Forensic identification and extraction of cryptographic keys" Digital Investigation, 6(1):S132–S140, 2009.

[4] J. A. Halderman, S. D. Schoen, N. Heninger, W.Clarkson, W. Paul, J. A. Calandrino, A. J. Feldman, J. Appelbaum, and E. W. Felten, "Lest We Remember: Cold Boot Attacks on Encryption Keys" Proc. 17th USENIX Security Symposium (Sec '08), San Jose, CA, July 2008

[5] FERGUSON, N. AES-CBC + Elephant diffuser: A disk encryption algorithm for Windows Vista. Aug. 2006.

[6] SKOROBOGATOV, S. Low-temperature data remanence in static RAM. University of Cambridge Computer Laboratory Technical Report No. 536, June 2002.

[7] GUTMANN, P. Data remanence in semiconductor devices. In Proc. 10th USENIX Security Symposium (Aug. 2001)

[8] R. Cramer, V. Shoup, "Design and Analysis of Practical Public-Key Encryption Schemes Secure against Adaptive Chosen Ciphertext Attack" SIAM Journal on Computing Vol 33 2001.

[9] Yuen, C. 1972. Remarks on the Ordering of Walsh Functions. IEEE Transactions on Computers. C-21: 1452.

[10] "Image Encryption & Authentication using Orthogonal Transformation on Residual Number System".

[11] http://slashdot.org/story/06/10/20/2250246/Why-Not-Use-Full-Disk-Encryption-on-Laptops

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Disposable PLASTICS, "A Boon or a Curse?"

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Abstract- In today's world we are living in an age where disposables have become a way of life. In this "use and throw" society, plastics have become a part of our day to-day lifestyle, and affect everyone. Plastics have several drawbacks, and also contain toxins that can trigger the development of cancerous diseases. The hospital today is on the brink of a progressing ecological catastrophe. Excessive use of chemicals of various kinds, burning of PVC plastic, use of bio-chemicals and disinfectants, irresponsible playing around with waste treatment technologies, have all led to the breakdown of ecological, thermal and oxygen balance. Proper Plastic Waste Management not only reduces quantum & volume of Waste generated but also changes the quality of waste. Generation of plastics waste which constitutes a major part of municipal solid waste creates a lot of environmental pollution, which in turn affects ecosystem and human health. This article focused much on hospital and municipal plastic waste, an eco-friendly concept to protect the environment.

Index Terms- Hospital plastic equipment used Environmental problems, Remedial measure, *and PVC* (Poly Vinyl Chloride) syringe

I. INTRODUCTION

Generation of plastic waste is an ongoing process arising from use of plastic products. Every year, around 500 billion plastic bags are used worldwide. So that over one million bags are being used every minute and they're damaging our environment. India's plastics consumption is one of the highest in the world. The plastic consumption in India, as per estimate in 2008 by CPCB was 8 MT/annum, out of which about 5.7 MT of i.e. 15,722 tons of plastic waste is generated plastics are converted into waste annually per day. Therefore the per capita generation of plastic waste has been estimated as 5.7 Kg/annum. It has been reported that 60% of total plastic waste generated is recycled and 40% is littered and remains uncollected. Therefore, approximately, 6289 tons per day (TPD) i.e. 40% of plastics are neither collected, nor recycled and find their way into drains. Use of plastic in hospitals and is constantly increasing by an astounding proportion of approximate initially 6% per annum and presently it is growing at the rate of 15 % per annum. Large amount of plastic wastes are generated in health care facilities and municipal solid waste in the form of packaging materials, disposable syringes, catheters, OT gowns and kits and day to day activities of the patients. Cafeterias, in campuses also serve beverages and food in plastic containers. Plastics owe their name to their most important property, the ability to be shaped to almost any form to produce articles of practical value. Plastics can be stiff and hard or flexible and soft. Because of their light weight, low cost, and desirable properties, their use has rapidly increased and they have replaced other materials such as rubber, metal and glass. They are used in millions of items, including cars, bullet proof vests, toys, hospital equipments and containers. Health care areas have also had an over-whelming onslaught of plastic disposable goods. Plastics constitute a major chunk of waste generated in the health care facilities, both large and small. This causes immense problems in managing hospital waste. We shall deal with some of the issues related to plastic use in hospitals and highlight the problems and dangers in health care facilities. Plastic waste can be easily managed at the point of generation. If this is not done, then the magnitude of cost in treating plastic waste multiplies several times because management and treatment of plastic waste is expensive and difficult, but not impossible. In USA a study on "Finding Prescription for Medical Waste 1990" narrates that plastics comprise 25% of total waste generated in hospital. As compared with Municipal Solid Waste (MSW), hospital waste contains a larger percentage of plastic. In the Indian scenario the plastic content in Hospital Waste is four times higher than that in Municipal Solid Waste. There are around 3.30 lakhs tones of bio-medical waste annually in India. It has been seen that the economic status of the patient and the hospitals is directly proportionate to the generation of disposable plastic waste. Hence the volume of plastic waste in sophisticated, multi-specialty private hospitals like Apollo, Escorts is considerably higher as compared to that in district government hospitals. However, there is a marked shift towards the use of plastic, "use and throw" disposables. In India the market for medical disposables has grown from 2350 million USD in 1979 to 4000 million in 1986. (Alok R. Ray & Dr Bhommick, AIIMS, New Delhi). Plastic usage in Indian Healthcare industry is growing approximate by 15% per annum. Various market segments like medical and dental surgical equipments, implants and medical plastics disposable industry is on an expansion mode.

Strange! All these peoples are drinking bottled water to protect their bodies and their health, and then they're throwing their bottles out of the car window. It's like they haven't completed the loop in their rationale here. Plastic packing is slowly becoming the norm in India too and we happy to carry away water, juice, biscuits, chips, muruku, pulses, pickles, curd and ready-to-eat dishes, in plastic containers. It is not too late for us in India to go back to our old ways of carrying our own cloth bags for shopping, taking stainless steel tiffin and bottles carriers for take-out food, and safe water respectively. We need to encourage and demand more eco-friendly packaging; glass bottles instead of plastic, less packing instead of more, and reusable instead of throwaway.

II. OBJECTIVES OF SUSTAINABLE PLASTIC WASTE POLICIES

The objective of a policy in addressing an issue is very important, since targeting the right objective is crucial in alleviating the problem. A policy objective should not only aim to address immediate concerns, but also provide a long-term solution to the problems. This would help to analyze whether the objectives of the existing policies on plastic waste management in India contribute to sustainable waste management.

The following reflects the main principles for sustainable waste management.

1. Prevention of plastic waste generation at source as the first priority.
2. Reuse and recycling should be practiced to the extent possible.
3. Treatment of plastic waste prior to disposal.
4. Disposal is the least preferred option.

Fig 1: "Linkage between waste prevention and waste minimization"

III. PLASTIC IN THE HOSPITAL AND ENVIRONMENT

The use of plastics in hospitals began in 1960s when enamel urine bottles and disposable plastics replaced bedpans. The concept of disposable hospital equipments started in health care facilities because of its cheaper cost and easy availability. It thus found its way into the day to day use of health care facilities. Plastic originates as a by-product of the petroleum industry. When this plastic is used in manufacture of equipments, it generates poisonous gases specially dioxins and furans. Similarly, when plastic waste is burnt it again produces dioxins, furans, sulphur dioxide, carbon dioxide etc. These poisonous gases not only affect green house but also increased impotency in our country in last one decade due to Hormonal in-balance. Dioxin, Furan, Sulphur dioxide, Carbon dioxide, etc. gasses also increased congenital abnormality in new born like cleft pallets, harelip etc. Plastics, though convenient and cheap, it causes damage to the environment and health when disposed off and increase the volume of waste making it difficult to collect, transport and treat. This indirect increase in cost is not considered when disposables are used. Hospital waste generation can be controlled if plastic usage is reduced. Hospital Waste Management plan in the area of plastic usage is influenced by the following factors:

1. Waste production is related to the choice of material used especially reusable traditional hospital equipment v/s disposable plastic hospital equipment.
2. Proper segregation of waste at source will reduce waste treatment costs.
3. Waste may also be reduced through decreased plastic packaging material in hospital supplies.
4. PVC plastic items may be substituted with reusable crockery and cutlery as far as possible.

So Plastics form a major constituent of Hospital Waste. On one end of the spectrum plastic attracts the attention of the planner of plastic waste management in hospitals and municipal streams, on the other end it attracts the rag pickers who often get injuries from sharps while rag picking from solid waste.

A. Pollution Concerns

The basic reasons that make plastics a source of pollution are the following.

1. Plastics are non-biodegradable.
2. Plastics prevent or reduce the seepage of water into the soil.
3. These clog/block the domestic pipelines and sewage lines.
4. Direct burning of plastics lead to the emission of toxic fumes and gases, which in turn affects human life.
5. Emission of CO2 during burning of waste plastics adds the causes which raise Earth's temperature.
6. Incorporation and dumping of synthetic colouring dyes (azo dyes) to manufacture plastics pose a threatening health hazard to workers and consumers,
7. Continuous accumulation and dumping of plastics, in due course of time reduces cultivable land. Accumulated plastics invite additional wastes and these dumps are aesthetically disturbing and potential health hazards.

B. Hospital Acquired Infection

Plastic equipment used for patient care is discarded after single use. Thus we believe that inter patient transmission of infection via equipment is restricted. Hospital workload gets reduced with use of disposable plastic equipment. If, despite the usage of disposable plastic equipment the rate of hospital acquired Infection remains unchanged it is easy to shift the blame on the quality of disposable plastic equipment procured by the patient. It is commonly believed that "use and throw" equipment reduces chances of Hospital acquired Infection because it is used only once. WHO survey conducted in 1988 across 14 countries showed that the prevalence rate of Hospital acquired Infection of different hospitals varied from 3-21%with a mean of 8.4% and this prevalence rate is increasing exhovirant. The result of the survey reported that the Hospital acquired Infection is a considerable problem, even in hospitals with means and interest in control of Hospital Acquired Infection. This is largely due to poor hospital waste management and reuse of disposable which may be accidental or intentional as in the case of drug abusers. However, in effect, the rates of Hospital acquired Infection have

increased because these plastic disposables increase the quantum and volume of Hospital Waste, which cannot be properly managed. It is this unmanaged hospital waste which is also largely responsible for the increase in the rate of hospital Acquired Infection.

Most of the time disposable equipment is discarded without disfiguring and thus gets recycled by rag pickers and hospital staff. Often, newspapers & television report the recycling rackets flourishing in the country. The disposables are recycled and repacked under standard company brand s. Also, spurious IV fluids are packed in these pouches and sold in the market to unsuspecting buyers. This is big business in India with annual turn over's of several crores of rupees. In addition to the problem of recycling of hospital disposables, sharp injuries sustained by rag pickers also lead to spread of infections like Hep. B, Hep. C and AIDS etc. In view of these facts and the alarming fallout from plastic disposables, the use of plastics should be minimized forthwith, before the problem gets out of hand.

Figure 2: "Dangerous disposal"

*Needles, syringes and medicine vials dumped along the Kurichi Tank in the Coimbatore. Source: The Hindu, Wednesday, Feb 21, 2007

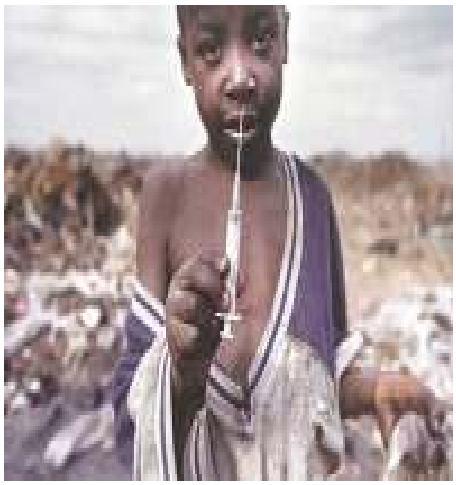


Figure 3: "A rag-picker in danger"

*Many times improperly disposed of used needles, and medical wastes in dumpsters, trash or along the road

IV. ROLE OF RAG-PICKERS IN PLASTIC WASTE

At the site of most hospital dumpsters, child rag pickers are paid Rs 12-15/day by the contractor who reclaims the hospital waste. This waste is segregated into various categories like pouches, IV bottles, drips sets, glass, syringes etc. and sold at much higher price to the recycling Mafia. Sometimes the rag picker himself sells these directly to the contractor at low rates of Rs. 4 –10/kg of mixed plastics. This in turn is sold at much higher rates as seen in the fact sheet (1) "Recycled" in this case merely means "collected", not reprocessed or converted as the some useful products. On the other hand, researchers throughout the world are working towards inventing new products from living resources that are biodegradable. There are several such types and grades of biodegradable plastics coming up in the market. But the cost of these products is exorbitant. Emerging social concerns and growing environmental awareness throughout the world have triggered the search for new materials and processes that enhance the environmental quality of products. Companies throughout the world have or are initiating the design and engineering of new products with holistic environmental evaluations beginning with the acquisition of raw materials, continuing through product use/ reuse, and ending with disposal.

Fact Sheet 1

Item	**How it is disposed**	**Rag pickers price**	**Buying price**	**Selling Price**
Syringes	Dumpsters	Rs. 4-10/kg	Rs.15-16/kg	Rs.22/ kg
IVbottle	Dumpsters	Rs. 4-10/kg	Rs.15-16/kg	Rs.22/ kg
IV tubes	Dumpsters	Rs. 4-10/kg	Rs.15-16/kg	Rs.22/ kg

V. USE OF PLASTIC IN HEALTH CARE INDUSTRIES

The rapid increase in population and urbanization the hospital bed patient is also increased in India has led to an increase in plastic usage and its waste generation. Every year a huge quantity of plastics in India finds its way from hospital and municipal waste to the landfill sites of major cities, where in the remote areas from health care centers they can be usually found scattered among the vegetation. They seem to be harmless but in reality they are silent killers.

(PVC) Poly Vinyl Chloride is a thermoplastic, 40% of which is composed of additives which confer the property of flexibility and transparency to the plastic. A commonly used additive in PVC is DHEP (Diethyl Hexyl Phthalate), along with lead and cadmium. A study has revealed that storage of cyclosporine in dextrose solution in PVC bags has been shown to cause leaching of significant amounts DHEP. Lead is neurotoxin, Cadmium is nepherotoxic and DHEP is carcinogenic. **At the time of graduation every doctor takes the pledge "DOES NO HARM". However, despite the pledge the doctors do more**

harm than good to the patient by supporting the usage of PVC. Plastic is light in weight, balloons up from hospital waste and floats carrying with it hospital infections to surrounding colonies. Thus the health of people living near health care facilities is always at stake. This plastic chokes the sewer lines causing increased rates of infection. Plastics and needles are also consumed by stray cattle grazing on hospital dumpsters. Many of them die due to intestinal obstruction and internal hemorrhage. The BMW rules of India, 1998 have ignored the issue of plastics altogether. No policies have been laid down to regulate the use of plastics in different types of medical equipments. We have still not formulated a policy, which lays down standards for the quality of plastic permissible in the manufacturing of hospital equipment. Over 1.5 million pounds of plastic bottles were recycled in 2000, representing a four-fold increase in the amount of plastics recycled in the previous decade. Nonetheless, the capacity to recycle bottles appreciably exceeds their supply by about 40 per cent, so local governments and environmental groups need to encourage greater participation in this practice among consumers. Profitable operations are currently in place for recycling PET from bottle sources and converting it into products such as fibers. PS is another potentially recyclable polymer. The initiative to popularize a simple technology using waste plastics to lay roads has received a shot in the arm with the Central Pollution Control Board (CPCB) approving it for wider application. In Tamil Nadu, the District Rural Development Agency (DRDA) had laid 1,200km of plastic roads bin 28 districts.

The crusade against "stopping use of PVC" is going on for more than 5-10 years and has gained international momentum. Plastics used in hospital equipment are patented, licensed and widely used in many developed countries like Canada, U.S.A. and U.K. However, international trend in use of plastic disposables in hospitals is shifting downwards due to hazards of plastics. Pollution level in the capital city of India, Delhi is already 410 SPM (suspended particulate matter) which is five times more than the pollution standard laid by WHO. It is to be noted that even 210 SPM level is considered critical. Hence we must minimize use of PVC plastics whose burning releases toxic gases and particulates into the atmosphere. If at all necessary we must use biodegradable polymer materials.

A. Health Hazard

Thermal decomposition of plastics is a source of dioxins. They are significantly toxic and termed as environmental "repeat offenders". They belong to the special group of dangerous chemicals known as persistent organic pollutants (POPs). Once dioxins have entered the body, they are there to stay due to their uncanny ability to dissolve in fats and due to their rock-solid chemical stability. Their half-life in the tissue of an organism is, on an average, seven years – half of DDT that had been banned for welfare. The best way to get rid of toxic effects of dioxins is to incinerate the plastic waste at temperatures as high as 850oC to 1000oC. Brief exposure to dioxins which 90% through fatty food results in skin lesion and impairment of liver functions and longer exposure may disturb the immune system, nervous system, endocrine system, and reproductive system. Several studies conducted so far indicate that incidences of some form of cancer may have been caused by dioxins. Based on human epidemiological data, dioxin was categorized by International Agency for Research on Cancer (IARC) as a known human carcinogen. Unless an alternative cost effective solution to replace the non-biodegradable plastic is made available to society, it is impossible to completely stop production or prevent people from using plastics, as well as, to prevent their hazardous effects

VI. RESPONSIBILITY OF MUNICIPAL AUTHORITIES TOWARDS PLASTIC WASTE MANAGEMENMT

The municipal authority shall be responsible for setting up, operationalisation and co-ordination of the waste management system and for performing the associated functions. Which are as follows?

5. To ensure safe collection, storage, segregation, transportation, processing and disposal of plastic waste.
6. To ensure that no damage is caused to the environment during this process.
7. To ensure that open burning of plastic waste is not permitted.
8. To ensure that the setting up of collection centres for plastic waste involving manufacturers and its channelization to recyclers.
9. To determine the minimum price for carry bags depending upon their quality and size which covers their material and waste management costs in order to encourage their re-use so as to minimize plastic waste generation.

A. Responsibility of Manufactures and Recyclers

10. Recycling of plastic shall be carried out in accordance with the Indian standard: 14534:1998 titled as guidelines for recycling of plastics, as amended from time to time.
11. Each recycled carry bags shall bear a label or a mark" recycled" as shown below.

Fig 4: "Different Label or a mark"

PET- Polyethylene Terephthalate,
HDPE- High density polyethylene, V-Vinyl (PVC),
LDPE- Low density polythethylene, PP- polypropylene, PS- polystyrene and other means all other resins and multi-materials like ABS (Acrylonitrile butadiene),
PPO - (Polyphenylene oxide),
PC - (Polycarbonate),
PBT - (Polybutylene terephalate)

B. Civic Responsibility towards Environment Protection

Biodegradability and recyclability have become important considerations in the design of new products. Many green organizations have been presenting governments to ban the use of non-biodegradable plastics. In some states viz. HP, Rajasthan etc., it has already been banned. It required people co-operation to support the law so total plastic in the municipal waste and hospital waste is finished. We must remember that there are limits to growth. It is for us to accept these facts and to think wisely to find an alternative to replace non degradable plastics, control the use of these materials in packaging and find more ways of utilizing the discarded plastics to save the future generation from being massacred through our thoughtless and negligent use and disposal of plastic. A small step to "stop use of PVC plastics", can lead to changes that will make the world environment a clean, green and safe place to live in.

VII. RECYCLING OF PLASTIC AND HOSPITAL WASTE- COST BENEFIT ANALYSIS

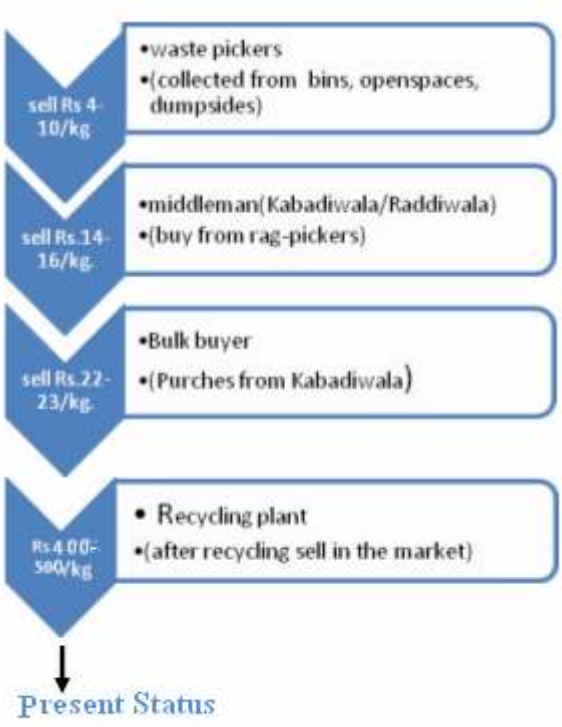
As the plastic waste reaches the top of the pyramid, it has acquired a fairly high value after passing through the various actors in the informal sector. The plastic acquires a fairly high value before it is fed into the recycling chain. The above fact sheet (1) provides only an approximate idea of the money involved in the trade. Although the statistics are not very recent, they are valid even today with minor differences. The value of the plastic waste within the trade increases by a minimum of 350%.The starting point for the cost benefit analysis of government policies is the assumed objective policy should result in an improvement in the overall welfare or well-being of society.69% of total plastic used in health care industries in packing material which is in huge quantity i.e. bring recycled, projection and presumption have future recovery rate for packing plastic material.

To Summaries benefit of recycling and comparison of cost and benefit we have to make analysis for each material uses three sets of assumption:

12. An initial rate of recycling based on benefit esti mates that include savings in landfill costs (soc ial cost estimate rather than a market rate) but i gnore external costs associated with emissions, leachate and the direct consumer benefits.
13. A low benefit estimate that uses the low assum ptions.
14. A high benefit estimate that uses the high assumptions.

To assess this cost benefit analysis measures total costs and benefits wherever they fall in Society and compares one with another improving policies for which the total benefits exceed the total costs.

Fig.5 "Present and future status hierarchy"



A. Basic Relationships

Profit (π) = Revenue (R) - Cost (C)
Revenue(R) = Selling price (SP) x Quantity (Q)

Cost (C) = [Variable cost (VC) x Quantity (Q)]
+ Fixed Cost (FC)]

Remember,
Quantity produced = quantity sold
By substitutions,
$\pi = (SP \times Q) - [(VC \times Q) + (FC)]$
$\pi = SP*Q - VC*Q - FC$
$\pi = (SP-VC)*Q - FC$

B. Eco- efficiency

Eco- efficiency is recognized as "one of the primary way in which business can contribute to the concept of sustainable development."

$$Eco\ efficiency = \frac{Product\ of\ service\ value}{Environmental\ influence}$$

$$Return\ on\ Environment = \frac{Life\ cycle\ cost/selling\ price}{Life\ cycle\ environmental\ impact}$$

So Eco-efficiency = Benefit-Cost/eco cost

Eco-efficiency	=	1,	Affordable Sustainable
		0-1,	Affordable Not sustainable
		0,	Not affordable Not sustainable

Fig. 6 "Hidden Profit"

C. Analysis of PVC and Rubber syringe in hospital waste:

PVC Syringe	Rubber Syringe
Cost:-	**Cost:-**
PVC syringe around Rs.10/each	Glass Syringe around Rs.15/each
Use and throw	Boiled and reuse
Loss/(No Benefits):-	**Benefits/(No loss):-**
Harmful for health and Environment	Sustainable development
Not economic	Economic

VIII. CONCLUSION

"There are two things certain in life when you are using plastic, one is Boone and the other is curse", accurately sums up the plastic waste scenario in urban India. Plastic waste is a pressing issue in the country today. The environmental issues regarding plastic waste arise predominantly due to the throwaway culture that Plastics propagate, and also the lack of an efficient waste management system. A large number of Indians have turned away from traditional modes of consumption, and are moving towards more wasteful patterns of resource use. The increasing purchasing power and consumerism of the burgeoning Indian middle class is moving India into the vicious use-and-throw cycle. It is likely that better segregation of waste would have a quick and dramatic impact on lowering the total hazardous waste. In particular, there would be a huge benefit arising from better procedures for dealing with plastic waste, when this plastic is burn it produces gas like dioxins and furan which are very federal cases which change human life causing impotency, nepherotoxic, neurotoxin, By preventing this we are saving lots of life and environment greenhouse cases reduces. Crusade against use of plastics in health care facilities and human life to save the earth from future pollution. We had taken the earth from our ancestors as a green peace without pollution and think for us what we are giving back to our children's. However finding solutions to these problems and to translate the goals into reality calls for an active involvement from the stakeholders, particularly the Government along with a clear policy agenda, and also by the people will only help to ensure sustainable use of plastics in the country. Following steps are helpful for sustainable development.

15. Remedied to minimize pollution.
16. Installation of RDF plants to prepare pellets for cement industries as a fuel. Temperature of plant is 8500 C and high of stake is 30 m, so no pollution is generated.
17. Use of biopolymers for bio plastic.
18. Poly hydroxyl butyrate.
19. Proper plastic waste management.
20. Preparation of eco-bricks at landfill site which are widely used for construction of boundary wall.
21. Prefer rubber catheter tubes and glass syringe as for as possible for personal use in good sterilization procedure.

REFERENCES

[12] Alok R. Ray & Dr Bhommick, (1986), In India the market for medical disposables has grown from 2350 million USD in 1979 to 4000 million, AIIMS, New Delhi.

[1] Boustead, I. et.al.,(1995), "Theory and Definitions in ecobalances"Recycling and recovery of plastic,

[2] Molgaard. C. (1995) Environmental Impacts by Disposal of plastic from Municipal solid waste, Resource conservation and recycling, 15 (1), 51.

[3] Ravi Agrawal, (2000). *Plastic used in hospitals*, Toxic link, New Dehli.

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Residential Solar Cooker

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Abstract- Energy has become the utmost necessity of our life. It is required from dawn to dusk to fuel the world. Energy is scattered everywhere around the Earth. Man has always desired to capture it and use it for mankind. One of the most important sources of energy is solar energy. Several methods of capturing solar energy and its usage are practised. The intensity of solar rays is immense and ways are still being discovered to harness the full potential of the rays. Focussing the rays to a point will cause generation of heat. Transferring the energy towards cooking is one such method. Usually a solar cooker is a device that is placed in the open ground under direct sunlight. This causes inconvenience to the users. Recent developments are in progress to make it possible to cook under shelter harnessing energy from the solar rays.

There is extensive potential in the solar rays yet to be harnessed. The existing methods, apart from being inefficient in transferring energy, it fails to store the heat effectively. Introduction of Phase Change Materials (PCM) has done the trick of harnessing sun's energy to cook. By doing so the heat energy storing efficiency is increased and thereby effectively increases the process of cooking. With prices of LPG elevating, using this method proves to be cost effective and energy conserving. Unlike induction stoves, the residential solar cooker uses energy from the solar rays and is cost effective. In the absence of sunlight, the PCM setup still increases the efficiency of heating the utensils.

Index Terms- Sheltered solar cooking, Phase Change Material (PCM), Effective heating, Less fuel consumption, User friendly, Cost effective cooking, Eco friendly.

I. INTRODUCTION

The present day systems to cook food using solar rays promise heating at the expense of our convenience. This idea deals with this problem to make the energy harnessing a more user friendly process. The usage of solar cookers is not more widely used because of its major disadvantages. The most prominent problem arising in this method is the seasonal changes.

The intensity of the solar rays is unpredictable and often plays truant during rainy and winter seasons. The harnessed energy is transferred and poorly stored. This reduces the overall efficiency of the device. The time required to cook the food is increased because of lacking in heat storage.

To overcome these major problems, a new design has been devised to heat efficiently using the sunny days and as well as the other dusky situations. This device not only transfers energy efficiently and stores it for continuous usage. The PCM material layered around the vessel stores heat effectively and heats up the vessel. This helps in reducing the fuel consumption to a greater extent during non-sunny days. The harnessed energy is not liberated thus assuring fast heating process.

II. EXISTING SYSTEMS

A. Box Cookers

Box cookers are the most common type made for personal use. They consist of an enclosed inner box covered with clear glass or plastic, a reflector, and insulation. There is a wide variety of patterns and plans that can be adapted to work with available materials. While they do not heat quickly, they provide slow, even cooking. Box cookers are very easy and safe to use, and fairly easy to construct.

B. Panel Cookers

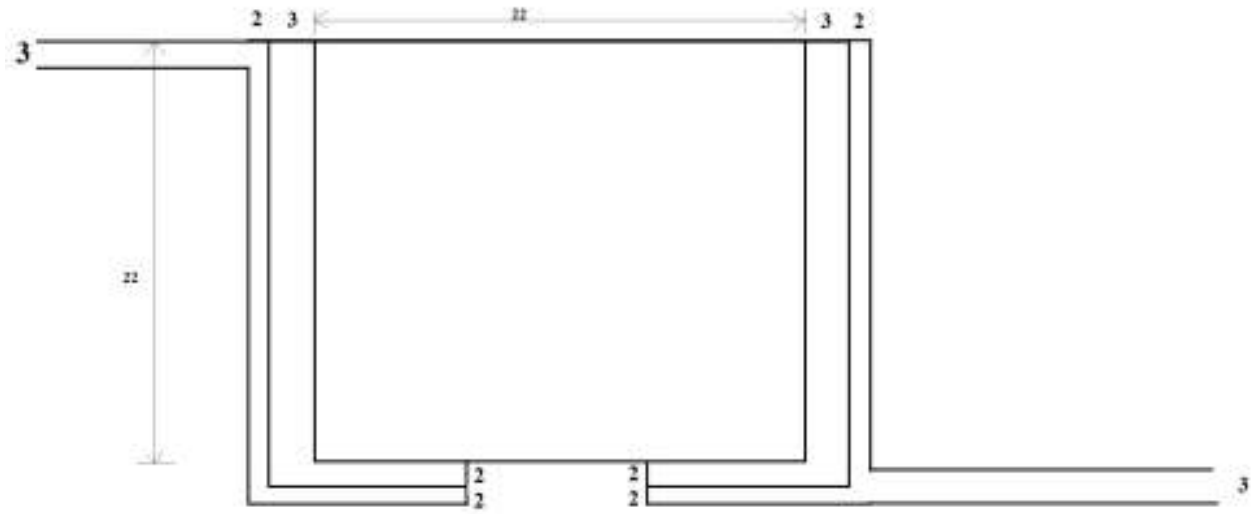
Panel cookers are flat reflective panels which focus the sunlight on a cooking vessel without the inner box common in box cookers. Panel cookers are the easiest and least costly to make, requiring just four reflective panels and a cooking vessel, but they are unstable in high winds and do not retain as much heat when the sun is hidden behind clouds.

C. Parabolic Cookers

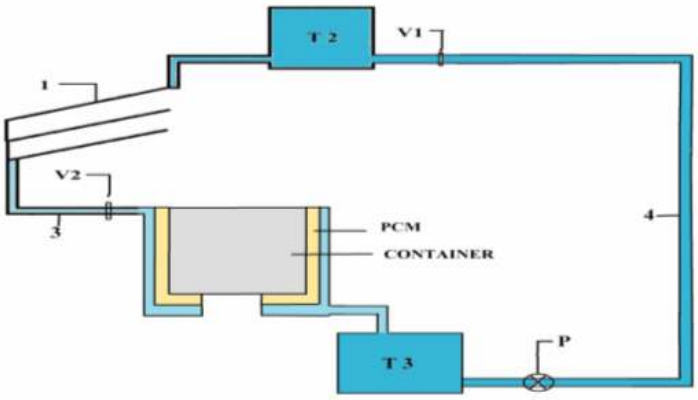
Parabolic cookers reach higher temperatures and cook more quickly than solar box cookers, but are harder to make and use. Parabolic cookers require more precision to focus the sunlight on the cooking vessel. If the sunlight is not focused exactly on the cooking vessel, the food will not cook. When the parabolic oven is used, the temperature must be watched so the vessel does not overheat, burning the food. The risk of burns and eye injury is greater with homemade parabolic designs. While they provide excellent results when used correctly, they are not easy to build at home and require great care to use.

III. DESCRIPTION

The system consists of two tanks T2 and T3 where T2 is storage tank and T3 is tank which collects water outlet from cooker .Flat plate collector (1) uses solar energy and transfer heat to water. The container is surrounded by PCM and water. It is considered that an 8 litre cooker is enough to cook for a family of four.



The dimensions of the container was designed as a cylinder with a diameter of 22cm, a height of 22cm.The surface of the container is copper coated for better heat transmission. The container is surrounded by a layer of PCM of thickness 3cm. There is provision for placing the container over a burner as per the usual domestic gas stove used. The component material were selected as,



Insulated pipeline:	SIB with PVC
Cooking vessel (inner):	Copper coated
Ordinary pipeline:	Mild steel
Cooking vessel (outer):	Cera glue alp coated stainless steel.

A ¼1/4hp motor is used to circulate the water facilitating heat transfer. Valves V1 and V2 are to control the flow rate and adjust the cooking temperature respectively. The PCM material used is Paraffin wax whose latent heat is 180K J/Kg K, melting point is 1300F. The thermal conductivity of the material is 0.21 W/m K.

IV. WORKING

Water is pumped into the tank T2 by means of motor. The Valve V1 is generally kept open slightly, so that the fluid flow will be laminar. The laminar flow is maintained so that the water will attain temperature of 90^{o}C (approx.) {Note: This temperature is attained only in summer days in Tropical region}. The water from storage tank T2 is passed through the inlet of flat plate collector. Since flat plate collector absorbs Sun's radiation and converts light energy into heat energy, the heated water is allowed to pass through the pipeline (3). The hot water is circulated through outer cooking vessel.

Since the outer cooking vessel contains PCM, the latent heat of condensation of water is absorbed by the PCM, thus gets heated it. Thus latent heat of fusion of PCM is obtained from the latent heat of condensation of water. Since latent heat of PCM is transferred to the cooking vessel which is copper coated since copper is having good thermal conductivity, the food can be cooked easily. Foods can be cooked more effectively if it is covered with an insulating lid while cooking.

Thus the circulated water comes out of outlet pipeline and is collected in the tank T3. Generally the hot water in the tank T3 is pumped to tank T2 by means of the motor. The hot water is again circulated and this process continues till cooking ends. This circulation increases the efficiency of system.

V. CALCULATIONS

A. Calculation for output heat from flat plate collector:

The total output heat is calculated by

$$Q_{Out} = m_{water} * C_{p,\,water} * (T_{out,\,water} - T_{in,\,water})$$

Calculation for fluid flow:

Steady flow is maintained by using valve V1.

c = constant
dc/dt = 0
Re = $(\rho_w * c * d_p)/ \mu$ = Inertia force / Viscous force

Since laminar flow is maintained,

Re < 2000
$\mu = \tau / (dc/dy)$
$Q_{discharge} = A_p * c$
$Q_{discharge} = \pi * (d_{p2}/4) * c$

But $Q_{discharge} = V_{tank} / t_{tank}$

$t_{tank} = V_{tank} / Q_{discharge}$

Calculation for PCM:

$Q_{water} = m_{water} * C_{p, water} * dT_{water}$
$Q_{water} = m_{water} * C_{p, water} * (T_{pcm} - T_{out, water})$
$m_{t, water} = V_{t,water} * \rho_w / 3600$
$V_{t,water} = C_{v2} * A_p$
$Nu = h_{water} * D_h / k_{water}$
k_{copper} = 401 W/m K.
dc/dt = 0

$Re = (\rho_w * c * d_p)/ \mu$ = Inertia force / Viscous force

Since laminar flow is maintained,

Re < 2000
$\mu = \tau / (dc/dy)$
$Q_{discharge} = A_p * c$
$Q_{discharge} = \pi * (d_{p2}/4) * c$

But $Q_{discharge} = V_{tank} / t_{tank}$
$t_{tank} = V_{tank} / Q_{discharge}$

Motor:

Motor used = ¼ hp=0.1864 W
Let us assume that we are using this for 4 hours per day.
No. of hours usage per month= 120 hours
Power consumed per day=0.1864*4=0.7456W
Power consumed per month=0.7456 □= 23W
Cost consumed per unit = Rs.5/-
Total cost consumed per month = Rs.115/-

Induction Stove:

Induction stove power usage= 250*10=2.5KW
Let us assume that we are using 2 hours per day.
No. of hours usage = 60 hours.
Power consumed per day= 5KW
Power consumed per month = 150KW
Total cost per month = Rs.750/-

Cost efficiency = cost of induction stove for power consumption/ cost of motor for power consumption
= 750/115
= 6.5

VI. RESULTS

Considering the above assumptions made, it is inferred that we are reducing the cost to 6.5 times than that of induction stove. We can save about Rs.10000/- per year.

VII. CONCLUSION

Nowadays cooking has become the major source for global warming. If we consider a home using LPG stove it produces a lot of polluted air. By using the above stated technique, we can save LPG by a considerable amount, thereby reducing the heat rejected to atmosphere. This in turn reduces the global warming effect.

Thus this device can be used extensively in the domestic as well as industrial applications to immediate effect. Further proper designing of the vessel can make it more efficient in usage and for multi-purpose tasking.

REFERENCES

[1] Fluid Mechanics by S.M.Yahya
[2] http://www.pcmenergy.com/
[3] http://en.wikipedia.org/wiki/Phase-change_material
[4] www.solarcookers.org
[5] http://solarcooking.org/sbcdes.htm
[6] http://en.wikipedia.org/wiki/Solar_cooker
[7] Solar Engineering by Tiwari.

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