International Journal of computational Engineering research (IJCER)

IJCER | June 2013| VOL 3 ISSUE 6

Editorial Board

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Version IV

A Dwt-Svd Based Watermarking Techniques for Digital Images

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ABSTRACT:

Robustness geometric against distortion is one of the crucial important issues in watermarking. In this paper, a new discrete wavelet transform- singular value decomposition (DWT-SVD) image watermarking algorithm that is robust against affine transformation and ordinary image processing is presented. We use DWT transform to obtain four different frequency subbands. Watermarking is embedded in high frequency subbands by singular value decomposition (SVD). This is unlike traditional viewpoint that assumes watermarking should be embedded in low or middle frequency to have good robustness. Peak signal to Noise Ratio(PSNR) and Normal Cross Correlation are computed to measure image quality and template matching. In addition, the competency of the proposed scheme is verified under common image processing operations and a comparative study is made against our previous technique [6].

KEYWORDS:*DWT-SVD, Digital images, Robust watermarking*

I. INTRODUCTION

The growth of high speed computer networks and that of Internet has explored means of new business, entertainment, scientific, and social opportunities in the form of electronic publishing and advertising. It also deals with product ordering, transaction processing, digital repositories, real time information delivery and web newspapers, libraries, and magazines, network audio and video etc.The new opportunities can be broadly labeled as 'electronic commerce'. The improvement of technology result in cost effectiveness of selling software, high quality art work in the form of digital images and video sequences by transmission over World Wide Web (www). Digital media offer several distinct advantages over analog media: the quality of digital audio, images and video signals are higher than that of their analog counter- parts. Editing is easy because one can access the exact discrete locations that should be changed. Copying is simple as it has no fidelity. The copy of a digital media is identical to the original. The ease by which digital information can be duplicated and distributed has led to the need for effective copyright protection tools. As a result various software products have been recently introduced in attempt to address these growing concerns. It should be possible to hide data (information) within digital images, audio images and video files. The information is hidden in the sense that it is perceptually and statistically undetectable. One way to protect multimedia data against illegal recording and retransmission is to embed a signal, called ownership digital signature or copyright label called watermark, which completely characterizes the person who applies it and therefore, marks it as being his intellectual property. Watermarking is the technique of embedding a secret imperceptible signal directly into the original data in such a way that always remains present.

Geometric attacks such as scaling, rotation and translation are very easy to apply and may lead many watermark detectors to total failure due to loss of synchronization between the embedded and the correlating watermarking. Several watermarking methods resistant to geometric attacks have been presented in literature [1,2]. In recently, a transform called Singular Value Decomposition (SVD) is used with Discrete Wavelet Transform (DWT) was explored for watermarking [3,4,5].

II. BACKGROUND AND THEORY

Methods and techniques adopted by the watermarking schemes including DWT, Singular value decomposition(SVD) and watermark construction process adopted in our previous watermarking algorithm is as explained. .

determined by the application is reached .LH,HL and HH are the finest scale wavelet coefficients. Since human eyes(HVS) are much more sensitive to the low-frequency part (the LL subband), the watermark can be embedded in the other three subbands to maintain better image quality. In the proposed algorithm, watermark is embedded into the host image by modifying the coefficients of high-frequency bands i.e.HH subband.

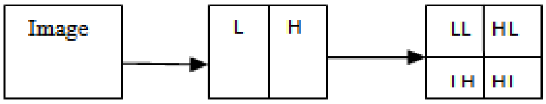

Figure 1:DWT decomposition of an image

Singular value decomposition (SVD)

Singular value decomposition is a mathematical tool used to decompose a matrix into two orthogonal matrices and one diagonal matrix consisting of the singular values of the matrix. From the point of image processing an image can be considered as a 2D matrix. Therefore, consider an image A to be an m × m matrix; the SVD of A can be given by

$A = USV^T$, where U and V are orthogonal matrices, and

$S = \text{diag}(\lambda)$, is a diagonal matrix of singular values $\lambda_i = 1, 2, \ldots m$ arranged in decreasing order. The columns of V are the right singular vectors, whereas the columns of U are left singular vectors of the image A. In case of SVD based watermarking, SVD of the cover image is taken and then singular values of the matrix are modified by introducing the watermark. SVD approach has found use in watermarking field because of the fact that singular values obtained after decomposition of the image matrix are very stable and do not change on introduction of small perturbations. Moreover, singular values represent intrinsic algebraic image.

Overview of Previous method [6]

This section briefly describes the watermarking generating algorithm of our previous work [6].The watermark is generated from the content information of host image. It includes the following steps:

- The original image P of size MxM ,is partitioned into non overlapping blocks of size 2x2.
- Perform 1-level DWT on the original image and acquire the LL1 component, which is of size M/2xM/2. Let this matrix be A.
- A reduced size (M/2xN/2) image B is obtained from original image.
- Compute one feature value from each block using equation (1).

$$B(x,y) = \{ \sum_{i=1}^{2} \sum_{j=1}^{2} P(x*2+I, y*2+j) \}/4, \qquad (1)$$

Where $0 \le x \le M/2$ *and* $0 \le y \le N/2$.

- Find the difference between A and B. Let it be C.
- A binary sequence named W can be obtained by applying the following constraint.
- W (x,y) ={0 if C(x,y) is even and 1 otherwise}
- Disorder the matrix W with the help of Arnold Transform, the resultant is the required watermark pattern to be embedded into the host image. In this method, watermark is generated from original image. This watermark is embedded in the HH subband of the original image. This embedded watermark is extracted in detection phase and is compared with the derived watermark to decide authenticity.

Proposed Algorithm

In this section we have discussed a scheme for embedding watermark. We have used DWT and SVD for developing an algorithm. Let A be the cover image and W be the watermark. The cover image and watermark are gray scale images of size MxN and M/2xM/2.The main idea of our proposed method is as follows.

Watermark Embedding

1. One-level Haar DWT is used to decompose the cover image A into four subbands

   (i.e., LL, LH, HL, and HH).
2. SVD applied to LH and HL subbands, i.e.

$$A^k = U^k S^k V^{kT}, \qquad k = 1, 2$$

where k represents one of the subbands.

3. The watermark is divided into two parts:

$W=W^1 + W^2$,

Where W^k denotes half of the watermark.

4. The singular values are modified in HL and HH subbands with half of the watermark image and then SVD is applied to them, respectively,i.e.

$S^k + \alpha W^k = U_w{}^k S_w{}^k V_w{}^k$ where α denotes the scale factor.

The scale factor is used to control the strength of the watermark to be inserted.

5. Two sets of modified DWT coefficients are obtained, i.e.,

$A^{*k} = U^k S_w{}^k V^{kT}$, k = 1, 2

6. The watermarked image A_w is obtained by performing the inverse DWT using two sets of modified DWT coefficients and two sets of non-modified DWT coefficients.

Watermark Extraction

1. One-level Haar DWT is used to decompose the watermarked (possibly distorted) image $A_w{}^*$ into four subbands: LL, LH, HL, and HH.

2. Apply SVD to the HH and HL subbands, i.e

$A_w{}^{*k} = U^{*k} S_W{}^{*k} V^{*kT}$, k = 1, 2

3. Computation of

$D^{*k} = U_w{}^k S_w{}^{*k} V_w{}^{*kT}$, k = 1, 2

4. Half of the watermark image from each subband is extracted, i.e.

$W^{*k} = (D^{*k} - S^k)/\alpha$, k = 1,2

5. Results of Step 4 are combined to obtain the embedded watermark

$W^* = W^{*1} + W^{*2}$

III. EXPERIMENTAL RESULTS

The proposed watermarking method is software implemented in MATLAB. We test the proposed scheme on gray scale image with the size 256x256 and watermarking image with the size 128x128. The cover image, the watermarking image, the watermarked image and extracted watermark image are shown in Figure1.We used the scaling factor 0.01.Scaling factor is used to control the watermark strength.

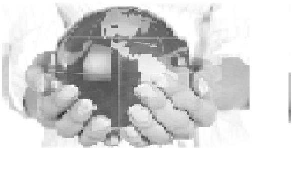

Fig1:a)Cover Image

b)Watermarking Image

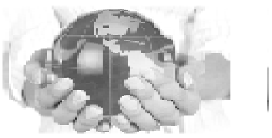

Fig1: c)Watermarked Image

d)Extracted Watermark Image

PSNR can be calculated as

$$PSNR = 10 \cdot \log_{10}\left(\frac{MAX_I^2}{MSE}\right) = 20 \cdot \log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right) = 20 \cdot \log_{10}(MAX_I) - 10 \cdot \log_{10}(MSE) \quad (2)$$

Where MSE is defined as Mean Squared Error between original and distorted images, which is defined in equation (3).

$$MSE = \frac{1}{m\,n}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}[I(i,j) - K(i,j)]^2 \quad (3)$$

where I is the original image and K is the distorted image. In the proposed as well the previous watermarking techniques, the watermarked image has been subjected to several types of image manipulations including Gaussian noises, median filtering image adjustment, histogram equalization ,cropping and rotation. So we evaluated the robustness of the proposed scheme by applying these attacks. The imperceptibility of watermark in the proposed method has been evaluated against incidental attacks by using the metric PSNR and compared with [6].A comparative study on Table 2 reveals the fact that the quality of watermarked image in the proposed scheme has improved a lot.

Table 2: Assessment of PSNR

Attacks	PSNR	
	Method[6]	Proposed
------	59.1168	80.0631
Gaussian noise	38.3272	56.9593
Median filt.	29.5727	56.9593
Hist.equal.	19.0944	56.9593

Robustness of the proposed method under the common image processing operations has been identified with the help of Normal cross correlation. Table 3 shows the experimental results. Normal cross Correlation (NCC) is calculated between watermarked image and extracted image. The watermarked image is attacked with cropping, Gaussian noise, histogram equalization, Median filtering and rotation. The NCC values are calculated and variation of PSNR and NCC values can be seen in the table.

Table:3 NCC values of extracted watermark subjected to various attacks.

SF	GN	RO	CR	MF	HE	CA
.01	.982795	.982473	.869641	.937598	.965637	.92497
.03	.990369	.990231	.922314	.964371	.980901	.93925
.05	.989351	.992362	.935861	.968731	.978567	.94190

Experimental results shown in Table:3 describe the resilient nature of the watermarking scheme for aforementioned attacks. As the scaling (SF) is gradually increased from .01 to .05 ,we can observe an increase in the normalized cross correlation values of the extracted watermarks, also signifying degradation in the watermarked image quality. We carry out cropping of the watermarked image and extract corresponding watermark, which results in no significant degradation in the extracted watermark quality even in the presence of Gaussian noise. This proves robustness of the scheme. The watermarked image with different attacks and the recover watermark are shown in the figures1 to 5 below.


Fig1:a)Cont.adjust.


b)Recover Watermark

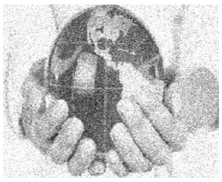
Fig2:a)Gaussian Noise


b)Recover Watermark


Fig3:a)Histogram Equalization


b)Recover Watermark


Fig4:a)Median Filtering


b)Recover Watermarking


Fig5:a)Rotation 45^0


b)Recover Watermark

IV. CONCLUSION

A new watermarking scheme is proposed in this paper. The watermark is embedded in the high frequency subbands and successfully extracted. The watermark embedding process does not degrade the visual quality of the image. Moreover the authentication process provides qualities like imperceptibility, robustness and security. The algorithm was tested with several standard test images and the experimental results demonstrated that it created high quality images and it was robust versus different attacks. Moreover the results of proposed scheme are compared with that of previous method [6], the results obtained show that the proposed technique is highly robust against attacks. Future work aim at making suitable enhancements to identify malicious attacks.

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Efficient Tree Based Structure for Mining Frequent Pattern from Transactional Databases

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ABSTRACT

Many different types of data structure and algorithm have been proposed to extract frequent pattern from a large given database. One of the fastest frequent pattern mining algorithm is the CATS algorithm, Which can efficiently represent whole data structure over single scan of the database. We have proposed an efficient tree based structure and algorithm that provide the performance improvement over CATS algorithm in terms of execution time and memory usage.

KEYWORDS: *Frequent Pattern Mining, Association Rule, Minimum Support, Transactional databases.*

I. INTRODUCTION

Frequent Pattern Mining plays a very important role in data mining technique. There are many various studies about the problem of frequent pattern mining and association rule mining in large transactional databases. Frequent pattern mining technique are divided into 2 categories : Apriori based algorithm and Tree structure based algorithm. The apriori based algorithm uses a generate and test strategy for finding frequent pattern by constructing candidate items and checking their frequency count and minimum support against transactional databases. The tree structure based algorithm follows a test only approach. There is no need to generate candidate items sets and test only the minimum support count or frequency count.

In particular, several tree structures have been devised to represent frequent pattern from transactional databases. Most of the tree based algorithm allow efficient incremental mining over single scan of the database as well as efficient insertion or deletion of transaction at any time. One of the fastest frequent pattern mining algorithm is CATS algorithm which can represent the whole data structure and allow frequent pattern mining over single scan of the database. The CATS algorithm enable frequent pattern mining without rebuilding the whole data structure. This paper describe improvement over the original CATS approach in terms of memory usage and execution time. The proposed tree structure allow insertion or deletion of transactions at any time like CATS tree algorithm but usually result in more efficient frequent pattern mining process.This paper is organized as follow : Section II describes some related work and the background knowledge of tree based algorithms. In Section III describe our proposed tree structure, its construction algorithm. Section IV shows comparison with CATS FELINE algorithm. In section V we show experimental result of our proposed algorithm. Section VI shows a conclusion.

II. Related Work

FP tree is one of the oldest tree structure based algorithm that do not use candidate item sets. In FP tree algorithm all items are arranged in descending order of their frequency. After constructing FP tree an iterative algorithm is used for mining the frequent patterns. Then the infrequent items are removed from prefix path of an existing node and the remaining items are regarded as the frequent patterns from transactional databases.
Another tree structure based algorithm is CAN tree algorithm and it construct a tree similar to the FP tree and it also does not require rescan of the original database once it is updated. CAN tree contains all the transactions in some canonical order, so the ordering of the nodes in CAN tree will be unaffected by any major changes like insertion, deletion or modification of the transaction.

CATS tree is a prefix tree. In CATS tree path from the root to the leaves represent set of transactions. After constructing CATS tree from database, it enables frequent pattern mining with different minimum supports without rebuild the whole tree structure.

CATS – FELINE algorithm is an extension of the CATS tree. CATS – FELINE algorithm build a conditional condensed CATS tree in which all infrequent patterns are removed and is different from a conditional FP tree. CATS – FELINE algorithm has to traverse both up and down the CATS tree.

III. Proposed Algorithm

Now we describe our proposed tree structure and it's algorithm. Our main focus is to construct a conditional condensed tree from CATS tree.

Like CATS – FELIENE Algorithm the overall mining process proceeds below :
Step 1 : First convert the CATS tree From database scan.

Step 2 : Now convert CATS tree into condensed tree with nodes having the frequency count less than the minimum support are removed.

Step 3 : Construct Conditional condensed CATS – tree for items with frequency count greater than the minimum support.

Step 4 : For each Conditional Condensed CATS tree from step 3, Item sets with minimum support are mined.
Our Proposed algorithm differ from CATS – FELINE algorithm. CATS-FELINE algorithm construct conditional condensed tree recursively for each frequent item sets. Our proposed algorithm generate a single condensed tree for each item using a pre – order traversal of the original CATS tree.

To understand the basic idea behind the algorithm, we will use the database shown in table (Assume the minimum support is 3).
Now Consider the transactional databases shown in the table 1

TID	Original Transactions
1	B, A, C, M, D, I, G, Q
2	B, C, M, A, F, L, O
3	B, F, J, H
4	F, R, K, S, I
5	A, C, B, M, E, L, I, N

Table 1 : Transactional databases

Given the above database, the original CATS tree constructed from a database scan and its condensed one are shown in figure

1 **Figure 1(A) : CATS Tree**

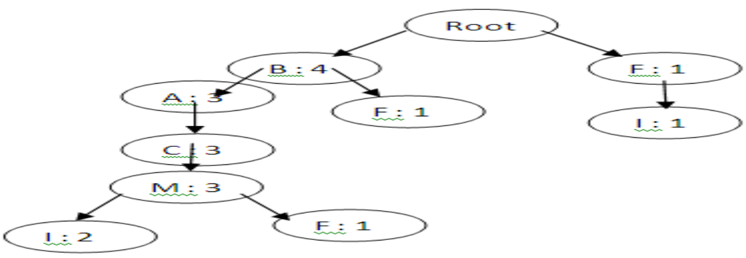
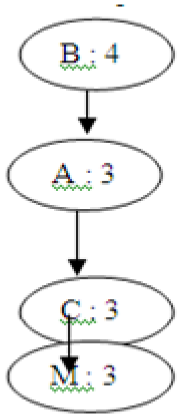


Figure 1(B) : Condensed Tree

Figure 1 : CATS Tree and it's Condensed Tree

This condensed tree, frequency count for each item and the required minimum support will be the input to our proposed algorithm. Given the above condensed tree our proposed algorithm starts building conditional condensed tree for each frequent pattern as follows:From the above figure 1 item B has the highest frequency. Our proposed algorithm construct conditional condensed tree for B first. By traversing the leftmost path of the



tree of figure 1 it will construct a partial tree as shown in figure 2.

Figure 2 : First step of creation conditional Condensed tree

After B-A-C-M has been added to the current conditional condensed tree , the node for (I : 2) will be encountered in the pre order traversal. In the case for node (I : 2), the node I is not frequent and there is no node for I in the current conditional condensed tree. Then a node is created for (I : 2) and will be inserted to the current tree as a child of the root.

The same process applies to node (F : 1) and the figure 3 shows the resulting conditional Condensed tree after the left subtree of the original Condensed tree hase been traversed.

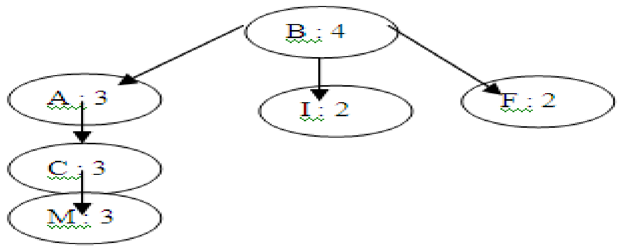


Figure 3:Second step of creation conditional Condensed tree

Now traverse the right sub tree of the condensed tree. It has one node for I and F so it should be placed as a child of the root. So the count of the node I and F should be incremented by 1 respectively. Figure 4 shows the Final conditional condensed tree for the above databases.

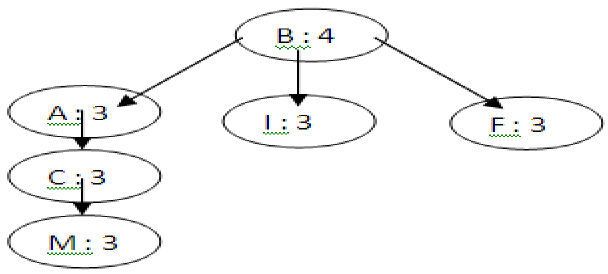


Figure 4 : Final step of creation conditional Condensed tree

IV. COMPARISON WITH CATS – FELINE ALGORITHM

Given the same database, conditional condensed tree constructed by CATS – FELINE and our proposed algorithm will be different as shown in the figure 5. The major difference is due to the way how the infrequent items are dealt with. From the figure CATS - FELINE algorithm keeps many separate node (I:2 and I:1) for infrequent items such as node I. Hence it needs more memory space for storing infrequent items. In our Proposed algorithm separate infrequent items are collapsed into single child nodes of the root.

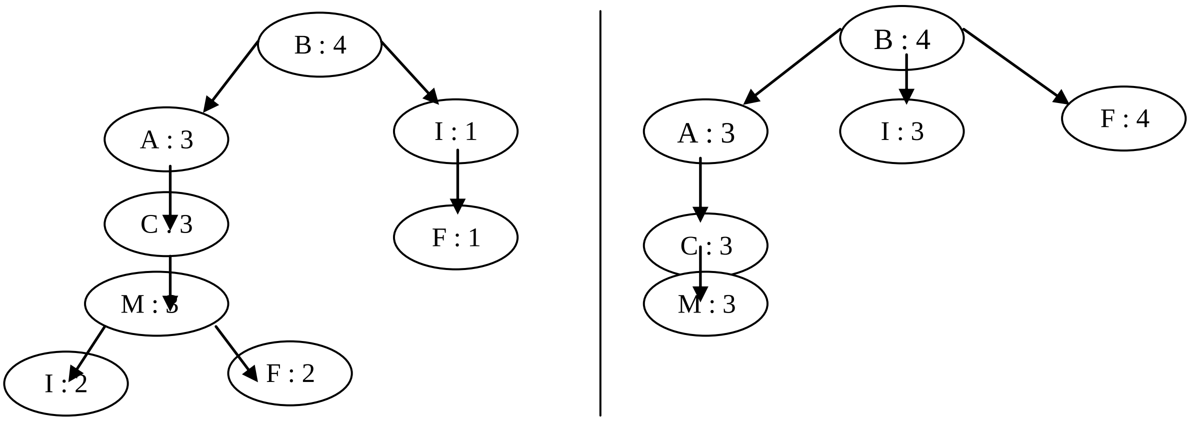


Figure 5 : Comparison with CATS – FELINE algorithm

V. Experiment Result

We have downloaded datasets from http://fimi.ua.be/data website (Frequent Pattern Itemeset Mining Implementations). Program are written in Microsoft Visual Studio 10 and run on the Windows 7 operating system on a 2.13 GHz machine with 4 GB of main memory. Table – 3 and Table – 4 shows total execution time required to extract all frequent patterns for Chess datasets and retailers dataset respectively by our proposed data structure and CATS – FELINE data structure for different minimum support.

Minimum Support	CATS – FELINE ALGORITHM	Our Proposed Algorithm
0.90	29	15
0.70	22.5	10
0.50	18.2	12
0.30	14.2	8
0.25	8.2	2.3

Table 2 : Execution time for Accident database for different Minimum Suppport

Minimum Support	CATS – FELINE ALGORITHM	Our Proposed Algorithm
0.90	5200	3700
0.70	5400	4200
0.50	6500	4900
0.30	7200	5200
0.25	7800	5400

.

Table : Execution time for Retailer database for different Minimum Suppport

VI. CONCLUSION

In this Paper, We have described an efficient tree based structure for representing a conditional condensed tree for mining frequent patterns from transactional databases. Performance improvement of our proposed algorithm over CATS – FELINE algorithm by conducting various minimum support values and different sizes of databases.Our Proposed Algorithm reduces the overall processing time to extract frequent pattern from transactional databases compare to CATS – FELINE algorithm. It also support iterative mining like CAN tree and FP tree means it can extract the frequent patterns without rescan the original database

Acknowledgement

I forward my sincere thank to Prof. Mehul P Barot for there valuable suggestion during my desertion. His suggestion are always there whenever I needed it.

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Local Maximum Lifetime Algorithms For Strong *K*-Barrier

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ABSTRACT

Barrier coverage of wireless sensor networks are been studied intensively in recent years under the assumption that sensors are deployed uniformly at random in a large area. In this paper a new network construction method of sensor nodes for Border Security Systems is proposed. This Barrier coverage are known to be a appropriate model of coverage for sensor barriers to detect intruders moving along restricted crossing paths, which is achieved by barriers of sensors. A Border Security System watches intruders by using sensor nodes with communication function. The detection of some intruders and the use of a long-term operation system are required in this system. This paper suggests a new Divide-and-Conquer scheme. Based on it, a new local maximal lifetime algorithm can be designed and following protocol for strong k- barrier with coordinated sensors. By computer simulation, we try to show that the proposed barrier coverage network construction methods are suitable for Border Security Systems and reduce the power consumption of the whole network system by effective control of sensor nodes.

KEYWORDS: *barrier coverage, data fusion, local algorithm, security, wireless sensor* network;

I. INTRODUCTION:

The main applications of wireless sensors involves movement detection, such as when deploying sensors along international borders to become aware of illegal intrusion, around a chemical factory to identify the spread of lethal chemicals, on both sides of a gas pipeline to detect potential damages, etc. barrier coverage, which guarantees that every movement crossing a barrier of sensors will be detected, which is known to be an appropriate model of coverage for such applications [1]. Chen et al. [2] devised a centralized algorithm to find out whether a region is k-barrier covered, and resulting the critical conditions for weak barrier coverage in a randomly deployment sensor network. But the centralized algorithm could acquire high communication overhead and computation cost on large sensor networks, and conditions for strong barrier coverage remain an open problem. Liu et al[3]., first discussed the strong barrier coverage problem. They map the strong barrier coverage as a discrete bond percolation model and derive the conditions of having multiple disjoint sensor barriers.

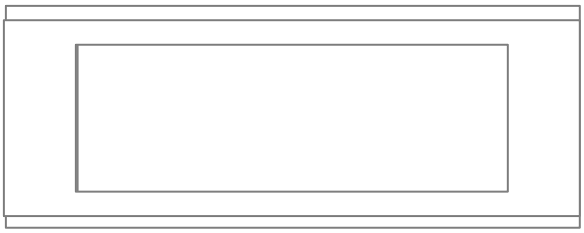

Figure 1: Weak coverage and Strong coverage.

In Figure 1, it illustrates [3] the difference between strong barrier coverage and weak barrier coverage. In the top figure, the network has weak barrier coverage for all orthogonal crossing paths (dashed paths). However, there is an uncovered path (solid path) through the region. The bottom figure shows an example of strong barrier coverage where no intruders can cross the region undetected, no matter how they choose their crossing paths. The barrier is highlighted using shaded sensing areas.

In [3], they proposed a critical condition for weak barrier coverage. But conditions for strong barrier coverage remain an open problem. In [5-8], detection coverage models have been suggested based on different event scenarios and detection techniques. In [8], Yang and Qiao first induced the detection coverage model into barrier coverage and theoretically analyzed the constraints between data fusion algorithm and coverage regions. By considering the above reasons, this paper talks about the setbacks of constructing strong *k*- barrier based on detection coverage model. We consider neighboring sensors can cooperate in surveillance by data fusion.
In particular, our contributions are as follows:

- First work is the problem of constructing strong *k*- barrier based on detection coverage model and data fusion.
- Second to formalize a coordinated detection coverage model, where the data fusion rule is described by a general function f(x).
- Third is to analyze the influencing factors of barrier coverage lifetime, and transfer it to a multi-objective optimization problem.
- And fourth to introduce a new Divide-and-Conquer scheme to design a new local maximal lifetime algorithm.

II. EARLIER METHODOLOGY:

The local barrier coverage algorithms that been introduced in [1, 2, 3, 4, 5, 6, 8] have introduced the centralized algorithms. One of algorithms for local barrier coverage, called RIS (Random independent sleeping algorithm). This algorithm is based on a power saving method, in which the sensor nodes are scheduled and switch between two modes, Active and Sleep. RIS provides weak barrier coverage with the high probability of intrusion detection, in such a way that each sensor, in certain periods, selects Active or Sleep mode, with a predetermined probability rate, P. The presented method will be based on the power saving method, used by RIS. However, the modes considered in sensor nodes have been changed to Active and Passive modes. It must be noticed that RIS does not guarantee the barrier coverage, deterministically. Initially global active scheduling algorithms are not achievable in a large scale sensor network. Second, [1] proved that one sensor cannot locally determines whether the surveillance field is k-barrier covered or not.

2.1.Traditional Activity of Scheduling Strategy

One traditional method is to start the nodes with highest left energy [1,2,3,4], which can avoid the nodes with less left energy died too early and prolong the barrier coverage lifetime. Yet there usually exists the situation that the horizontal projection of above-mentioned nodes is relative small, i.e. the count of active nodes is not optimal. The other method is to activate the least nodes by greedy algorithms [8][9]. The nodes in suitable location can been activated frequently and died untimely, which affect the sensor network connectivity, and further shorten barrier coverage lifetime.

2.2. Proposed work:

The main problem to be solved includes providing a k-barrier graph which creates and describes k-barrier coverage in a barrier area. As a result, all paths crossing through the barrier area are covered k-times, by the network sensors. The proposed method consists:

2.3.Modeling Maximum Barrier Coverage Lifetime

An effective sensor activity scheduling should tradeoff the count of nodes in a cover set, their left energy and consumed energy in one cycle. As a result, maximum of barrier coverage lifetime essentially is a multi objective optimization problem. We can form the problem as three minimizing objectives and one maximization objective, i.e. minimizing the count of active nodes ,minimizing the total energy used in one cycle, minimizing the ratio of an active node's consumed energy in one cycle and its left energy, the maximizing minimum ratio of an active node's left energy and its initialized energy. The *n* nodes only can switch between active state and sleep state, and the active nodes whose count is less than *n* can make up not less than *k*-disjoint barrier, *n* and *k* are constraints.

2.4.k-CLBCS Algorithm

In this paper, it suggests a global *k*-CLBCS algorithm for constructing Local *k*-Barrier with Coordinated Sensors, the main idea of *k*-CLBCS algorithm is described as follows:
step1: Calculate every edge's capacity, and construct the coverage graph *G(N)*;
step2: Search *k* disjoint paths from *s* to *t* in the *G(N)*;
step3: If the *k* disjoint paths are found, return the nodes *ID* that should be activated to form *k*-barrier, otherwise, return constructing failure.

2.5.k-SBCCS Protocol

Based on the overlapped divide-and-conquer scheme and *k*- CLBCS algorithm, we propose a practical protocol. A sink and n sensors are assumed in the rectangle belt, at the beginning, all sensors are active. The main idea of *k*-SBCCS Protocol (Protocol of Strong *k*-Barrier Coverage with Coordinated Sensors) is described as follows:

step1: Sink divide the belt region into v equal-width sub-regions, and broadcast the value of (width of each sub region),(width of overlapped strip)and v(equal width sub-regions).
step2: Every node calculates which sub-region it belongs to, judge if it is located in the overlapped strip, and reports its information to the sensor which have highest energy.
step3: In each sub-region, the sensor who has the highest energy runs k- CLBCS algorithm .If k disjoint barriers are found, it activates these sensors, otherwise, it reports the failure information to sink.
step4: The activated sensor who has the highest energy in every overlapped strip checks if the overlapped strip is strong k-barrier covered or not. If it found the overlapped strip not strong k-barrier covered, some other nodes will be activated to form strong k-barrier coverage in the overlapped strips. If all live sensors in the overlapped strip can't form strong k-barrier, the above sensor reports the failure information to sink.
step5: Repeat step3 and step4 until all sensors die.

III. RESULTS:

The advantage of this divide-and-conquer over centralized approach is:

- **Lower communication overhead and computation costs.** By dividing the large network area into small segments, the message delay, communication overhead, and computation cost can be significantly reduced. The location and sensing area information of a sensor node only need to be broadcast within the strip segment (or within the thin vertical strip) where the node is located, resulting in a smaller delay and communication overhead compared to the whole network broadcasting.

- **Improved robustness of the barrier coverage.** In a centralized approach which constructs global horizontal barriers for the whole strip, a horizontal sensor barrier could be broken if some nodes on the barrier fail, or become compromised or displaced by adversaries. In our divide-and-conquer approach, the original strip is divided into segments by interleaving vertical barriers. In case of node failure, these vertical barriers act as firewalls" that prevent intruders from moving from its current segment to adjacent segments. This limits the barrier damages within the local segment and hence improving the robustness of the barrier coverage .improving the robustness of the barrier coverage.

- **Strengthened local barrier coverage.** By dividing the original strip into small segments and computing barriers in each segment, a larger number of local horizontal barriers will be found in each segment than for the whole strip. These local barriers are not necessarily part of the global barriers for the whole strip, whose number remains unchanged. Since adjacent segments are blocked by interleaving vertical barriers, a larger number of local barriers results in strengthened local barrier coverage for each segment.

IV. CONCLUSION

In this paper, we introduce a k-barrier coverage protocol, called *k*-SBCCS, for prolonging the network lifetime. The proposed protocol tries to prolong the network lifetime by establishing a balance in using nodes energies. The proposed protocol maximum lifetime scheduling for strong *k*- barrier coverage based on detection coverage model, which is more appropriate for intrusion detection scenarios. we transfer maximal barrier coverage lifetime to a multi objective optimization problem, and model the evaluation function as the capacity of coverage graph.Moreover, based on the enhanced coverage graph, we propose *k*- CLBCS algorithm of maximum network lifetime. Theoretical proof shows that the activated nodes by in every overlapped strip can form k-barrier. At last, we design a new Divide-and-Conquer scheme and *k*- SBCCS protocol for strong *k*-barrier with coordinated sensors.

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Sign Language Recognition System

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ABSTRACT:

Communication is the process of exchanging information, views and expressions between two or more persons, in both verbal and non-verbal manner. Hand gestures are the non verbal method of communication used along with verbal communication. A more organized form of hand gesture communication is known as sign language. In this language each alphabet of the English vocabulary is assigned a sign. The physically disabled person like the deaf and the dumb uses this language to communicate with each other. The idea of this project is to design a system that can understand the sign language accurately so that the less fortunate people may communicate with the outside world without the need of an interpreter. By keeping in mind the fact that in normal cases every human being has the same hand shape with four fingers and one thumb, this project aims at designing a real time system for the recognition of some meaningful shapes made using hands.

KEYWORDS: *Edge Detection, Human Computer Interface (HCI), Image Processing, kNN Search, Peak Detection, Sign Language Recognition System (SLRs),*

I. INTRODUCTION

A gesture may be defined as a movement, usually of hand or face that expresses an idea, sentiment or emotion e.g. rising of eyebrows, shrugging of shoulders are some of the gestures we use in our day to day life. Sign language is a more organized and defined way of communication in which every word or alphabet is assigned some gesture. In American Sign Language (ASL) each alphabet of English vocabulary, A-Z, is assigned a unique gesture. Sign language is mostly used by the deaf, dumb or people with any other kind of disabilities. With the rapid advancements in technology, the use of computers in our daily life has increased manifolds. Our aim is to design a Human Computer Interface (HCI) system that can understand the sign language accurately so that the signing people may communicate with the non signing people without the need of an interpreter. It can be used to generate speech or text. Unfortunately, there has not been any system with these capabilities so far. A huge population in India alone is of the deaf and dumb. It is our social responsibility to make this community more independent in life so that they can also be a part of this growing technology world. In this work a sample sign language [1] has been used for the purpose of testing. This is shown in figure 1.

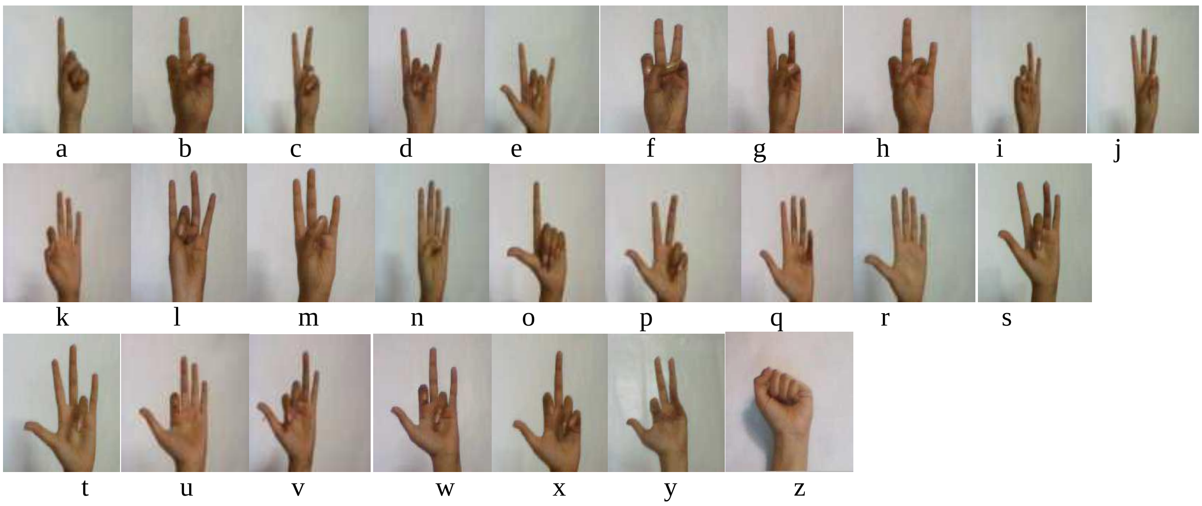


Figure.1. Sample sign language

No one form of sign language is universal as it varies from region to region and country to country and a single gesture can carry a different meaning in a different part of the world. Various available sign languages are American Sign Language (ASL), British Sign Language (BSL), Turkish Sign Language (TSL), Indian Sign Language (ISL) and many more. There are a total of 26 alphabets in the English vocabulary. Each alphabet may be assigned a unique gesture. In our project, the image of the hand is captured using a simple web camera. The acquired image is then processed and some features are extracted. These features are then used as input to a classification algorithm for recognition. The recognized gesture may then be used to generate speech or text. Few attempts have been made in the past to recognize the gestures made using hands but with limitations of recognition rate and time. This project aims at designing a fully functional system with significant improvement from the past works.

II. LITERATURE REVIEW

The importance of sign language may be understood from the fact that early humans used to communicate by using sign language even before the advent of any vocal language. Since then it has been adopted as an integral part of our day to day communication. We make use of hand gestures, knowingly or unknowingly, in our day to day communication. Now, sign languages are being used extensively as international sign use for the deaf and the dumb, in the world of sports by the umpires or referees, for religious practices, on road traffic boards and also at work places. Gestures are one of the first forms of communication that a child learns to express whether it is the need for food, warmth and comfort. It increases the impact of spoken language and helps in expressing thoughts and feelings effectively. Christopher Lee and Yangsheng Xu [2] developed a glove-based gesture recognition system that was able to recognize 14 of the letters from the hand alphabet, learn new gestures and able to update the model of each gesture in the system in online mode, with a rate of 10Hz. Over the years advanced glove devices have been designed such as the Sayre Glove, Dexterous Hand Master and Power Glove. The most successful commercially available glove is by far the VPL Data Glove as shown in figure 2.

Figure. 2. VPL data glove

It was developed by Zimmerman during the 1970's. It is based upon patented optical fiber sensors along the back of the fingers. Star-ner and Pentland developed a glove-environment system capable of recognizing 40 signs from the American Sign Language (ASL) with a rate of 5Hz. Hyeon-Kyu Lee and Jin H. Kim [3] presented work on real-time hand-gesture recognition using HMM (Hidden Markov Model). P. Subha Rajam and Dr. G. Balakrishnan [4] proposed a system for the recognition of south Indian Sign Language. The system assigned a binary 1 to each finger detected. The accuracy of this system was 98.12%. Olena Lomakina [5] studied various approaches for the development of a gesture recognition system. Etsuko Ueda and Yoshio Matsumoto [6] proposed a hand-pose estimation technique that can be used for vision-based human interfaces. Claudia Nölker and Helge Ritter [7] presented a hand gesture recognition modal based on recognition of finger tips, in their approach they find full identification of all finger joint angles and based on that a 3D modal of hand is prepared and using neural network. In 2011, Meenakshi Panwar [8] proposed a shape based approach for hand gesture recognition with several steps including smudges elimination orientation detection, thumb detection, finger counts etc. Visually Impaired people can make use of hand gestures for writing text on electronic document like MS Office, notepad etc. The recognition rate was improved up to 94% from 92%.

III. SIGN LANGUAGE RECOGNITION SYSTEM

The sign language recognition done using cameras may be regarded as vision based analysis system [9]. The idea may be implemented using a simple web camera and a computer system. The web camera captures the gesture image with a resolution of 320x240 pixels. The captured image is then processed for recognition purpose. The idea may be represented by the block diagram as shown in figure 1.

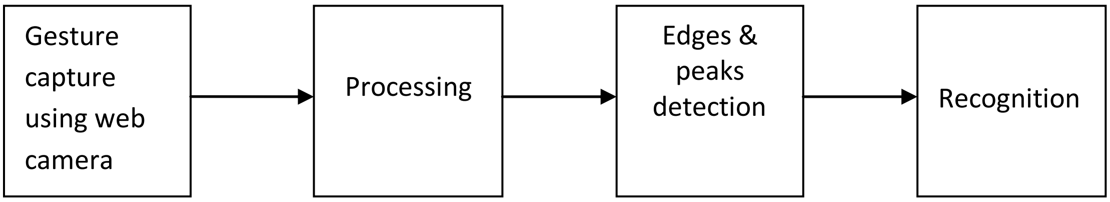


Figure.3. System Block Diagram

3.1 Gesture capture using web camera

The first step towards image processing is to acquire the image. The acquired image that is stored in the system windows needs to be connected to the software automatically. This is done by creating an object. With the help of high speed processors available in computers today, it is possible to trigger the camera and capture the images in real time. The image is stored in the buffer of the object.As has been already discussed, the image is acquired using a simple web camera. Image acquisition devices typically support multiple video formats. When we create a video input object, we can specify the video format that you want the device to use. If the video format as an argument is not specified, the video input function uses the default format. Use the imaqhwinfo [10] function to determine which video formats a particular device supports and find out which format is the default. As an alternative, we can specify the name of a device configuration file, also known as a camera file or digitizer configuration format (DCF) file.

Figure. 4. Acquired image, gesture ‘d’

Some image acquisition devices use these files to store device configuration information. The video input function can use this file to determine the video format and other configuration information. The imaqhwinfo function is used to determine if our device supports device configuration files. If the input is an RGB image, it can be of class uint8, uint16, single, or double. The output image, I, is of the same class as the input image. If the input is a colormap, the input and output colormaps are both of class double.
The acquired image is RGB image and needs to be processed before its features are extracted and recognition is made.

3.2 Processing

The captured image is a RGB image. This image is first converted into grayscale as some of the preprocessing operations can be applied on grayscale image only.

Figure. 5. Gray Scale Image, gesture'd'

3.3 Edges & peaks detection

The edges are detected in the binary image. A number of edge detection techniques [10] [11] may be used in MATLAB. The Edge Detection block finds the edges in an input image by approximating the gradient magnitude of the image. The block convolves the input matrix with the Sobel, Prewitt, or Roberts kernel. The block outputs two gradient components of the image, which are the result of this convolution operation. Alternatively, the block can perform a thresholding operation on the gradient magnitudes and output a binary image, which is a matrix of Boolean values. If a pixel value is 1, it is an edge. For Canny, the Edge Detection block finds edges by looking for the local maxima of the gradient of the input image. It calculates the gradient using the derivative of the Gaussian filter. The Canny method uses two thresholds to detect strong and weak edges. It includes the weak edges in the output only if they are connected to strong edges. As a result, the method is more robust to noise, and more likely to detect true weak edges. In this project we have used canny edge detection.

The purpose of edge detection in general is to significantly reduce the amount of data in an image, while preserving the structural properties to be used for further image processing. Canny edge detection was developed by John F. Canny (JFC) in 1986. Even though it is quite old, it has become one of the standard edge detection methods and it is still used in research. The Canny edge detector works on gray scale image. In image processing finding edge is fundamental problem because edge defines the boundaries of different objects. Edge can be defined as sudden or strong change in the intercity or we can say sudden jump in intensity from one pixel to other pixel. By finding the edge in any image we are just reducing some amount of data but we are preserving the shape. The Canny edge detection algorithm is known as the optimal edge detector. Canny, improved the edge detection by following a list of criteria. The first is low error rate. Low error rate means edges occurring in images should not be missed and that there are NO responses to non-edges. The second criterion is that the edge points be well localized. In other words, the distance between the edge pixels as found by the detector and the actual edge is to be at a minimum. A third criterion is to have only one response to a single edge. This was implemented because the first 2 were not substantial enough to completely eliminate the possibility of multiple responses to an edge . Based on these criteria, the canny edge detector first smoothes the image to eliminate and noise. It then finds the image gradient to highlight regions with high spatial derivatives. The algorithm then tracks along these regions and suppresses any pixel that is not at the maximum (non maximum suppression). The gradient array is now further reduced by hysteresis. Hysteresis is used to track along the remaining pixels that have not been suppressed. Hysteresis uses two thresholds and if the magnitude is below the first threshold, it is set to zero (made a non edge). If the magnitude is above the high threshold, it is made an edge. And if the magnitude is between the 2 thresholds, then it is set to zero The resulting image contains a number of discrete objects. The discontinuities are joined using k-

Nearest Neighbor search. The k-nearest neighbor (kNN) search helps to find the k closest points in X to a query point or set of points. The kNN search technique and kNN-based algorithms are widely used as benchmark learning rules—the relative simplicity of the kNN search technique makes it easy to compare the results from other classification techniques to kNN results. They have been used in various areas such as bioinformatics, image processing and data compression, document retrieval, computer vision, multimedia database, and marketing data analysis. You can use kNN search for other machine learning algorithms, such as kNN classification, local weighted regression, missing data imputation and interpolation, and density estimation.

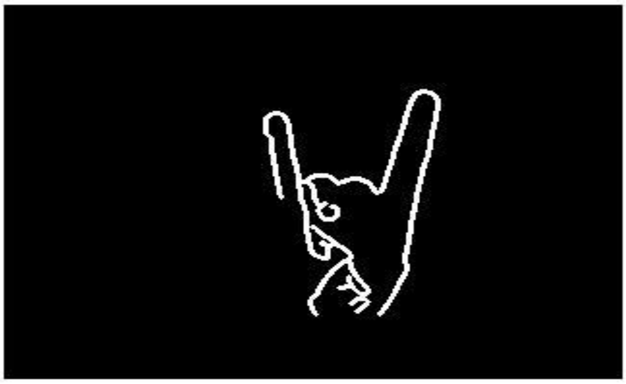


Figure. 6. After Canny's Edge Detection

Watershed Transform may be used in place of kNN search. Watershed transform computes a label matrix identifying the watershed regions of the input matrix A, which can have any dimension. The elements of L are integer values greater than or equal to 0. The elements labeled 0 do not belong to a unique watershed region. These are called watershed pixels. Once the edges are detected, our aim is to detect the finger tips. Wavelet family method is one of the techniques that may be used to detect the peaks. Wavelet analysis consists of decomposing a signal or an image into a hierarchical set of approximations and details. The levels in the hierarchy often correspond to those in a dyadic scale. From the signal analyst's point of view, wavelet analysis is a decomposition of the signal on a family of analyzing signals, which is usually an orthogonal function method. From an algorithmic point of view, wavelet analysis offers a harmonious compromise between decomposition and smoothing techniques. Unlike conventional techniques, wavelet decomposition produces a family of hierarchically organized decompositions. The selection of a suitable level for the hierarchy will depend on the signal and experience. Often the level is chosen based on a desired low-pass cutoff frequency. The finger tips are detected by finding the 1s at the minimum rows. The width and height of the finger is predefined.

3.4 Recognition

Once the finger tips have been detected, our next aim is to match the gesture with the predefined gesture database. This is done using prediction tables. Fuzzy Rule set [10] may be used to make the classification after detecting the finger tips. The logical image is converted back to RGB. An RGB image, sometimes referred to as a true color image, is stored as an m-by-n-by-3 data array that defines red, green, and blue color components for each individual pixel. RGB images do not use a palette. The color of each pixel is determined by the combination of the red, green, and blue intensities stored in each color plane at the pixel's location. Graphics file formats store RGB images as 24-bit images, where the red, green, and blue components are 8 bits each. This yields a potential of 16 million colors. The precision with which a real-life image can be replicated has led to the nickname "truecolor image." An RGB array [12] can be of class double, uint8, or uint16. In an RGB array of class double, each color component is a value between 0 and 1. A pixel whose color components are (0,0,0) is displayed as black, and a pixel whose color components are (1,1,1) is displayed as white. The three color components for each pixel are stored along the third dimension of the data array. For example, the red, green, and blue color components of the pixel (10,5) are stored in RGB(10,5,1), RGB(10,5,2), and RGB(10,5,3), respectively. Wavelet family method is one of the techniques that may be used to detect the peaks. Wavelet analysis consists of decomposing a signal or an image into a hierarchical set of approximations and details. The levels in the hierarchy often correspond to those in a dyadic scale. From the signal analyst's point of view, wavelet analysis is a decomposition of the signal on a family of analyzing signals, which is usually an orthogonal function method. From an algorithmic point of view, wavelet analysis offers a harmonious compromise between decomposition and smoothing techniques. Unlike conventional techniques, wavelet decomposition produces a family of hierarchically organized decompositions. The selection of a suitable level for the hierarchy will depend on the signal and experience. Often the level is chosen based on a desired low-pass cutoff frequency.

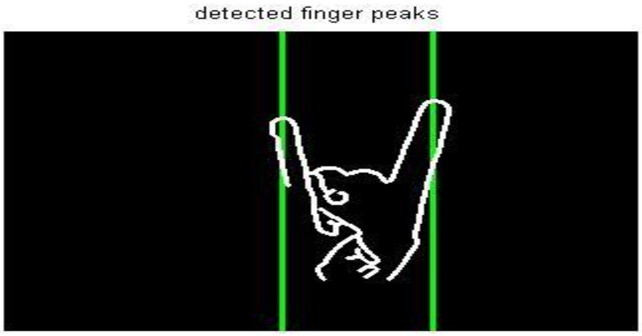


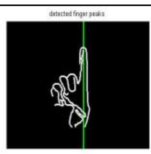
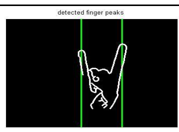
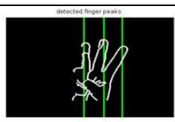
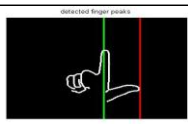
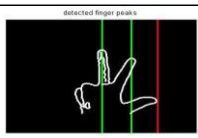
Figure. 7. Detected Finger Peaks

The finger tips are detected by finding the 1s at the minimum rows. The width and height of the finger is predefined. Once the gesture has been recognized, it may be used to generate speech or text.

IV. RESULT AND CONCLUSION

This project is designed to improve the recognition rate of the alphabet gestures, (A-Z), in previously done works []. Six alphabets are chosen for this purpose. These are alphabet A, alphabet D, alphabet J, alphabet O, alphabet P, and alphabet Q. Alphabet A has been chosen as it is recognized easily at 100% rate to show that this project not only improves the recognition rates of lacking alphabets, but also maintains the 100% recognition rate of other alphabets. The recognition time has also been improved significantly.It was observed that the recognition rate was fairly improved and recognition time was reduced significantly. This has been achieved by using knn search instead of contour method as is done before.

Table 1. Result

S.No.	Alphabet	Gesture	Recognized Gesture	Recognition Rate	Recognition Time (seconds)
	A			100%	1.52
	D			100%	1.50
	J			100%	1.61
	O			100%	1.50
	P			100%	1.57

This result is achieved only when the images are taken by following the given set of rules:
The gesture is made using right hand only.
The camera is at a distance of at least 1feetfrom the camera.
The background of the image is plain without any external objects.

The hand is in approximate centre.

This result was achieved by following simple steps without the need of any gloves or any specifically colored backgrounds. This work may be extended to recognizing all the characters of the standard keyboard by using two hand gestures. The recognized gesture may be used to generate speech as well as text to make the software more interactive.This is an initiative in making the less fortunate people more independent in their life. Much is needed to be done for their upliftment and the betterment of the society as a whole.

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Enhancing The Security Of Wsn In Agriculture

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ABSTRACT:

Sensor is the device which takes or senses the physical or chemical quantities of the particular environment and then gives the information to the particular person or the other sink node which is specially designed for the collecting of the data from where the persons can get the information about that environment and act accordingly so that proper action can be taken. Whenever we use the sensors the network formed is called as the WSN (Wireless Sensor Network) and whenever we discuss about the WSN there is the possibility that at any certain point the security will be compromised since it is not that much secure network which is to be used for the transferring of the important data.In this paper we have proposed a method for the field of agriculture so that whenever the data will be transferred to the co-ordinating node then that data has to reach its destination (co-ordinating node) without any problem like congestion, node failure, hacking etc. And if any problem comes then that will be notified to the user suddenly.

Keywords: WSN, Sensor, Node.

I. INTRODUCTION

Sensors are the sophisticated devices that are frequently used to detect and respond to electrical or optical signals. A sensor converts the physical parameter (like: temperature, blood pressure, humidity, speed etc.) into a signal which can be measured electrically. For e.g. if we take the example of the thermometer then the mercury present in the thermometer constricts or expands depending on the amount of the heat sensed by the thermometer. There are various types of the sensors are present depending upon the need of the various fields elated to our day to day life. List of the various types of the sensors are:

[1] For sound and Vibration
[2] For transportation
[3] For chemicals
[4] For electric currents, electric potential etc.
[5] For environment, weather, moisture, humidity
[6] For flow, fluid velocity
[7] For ionizing radiation, subatomic particles
[8] For navigation instruments
[9] For optical, light, imaging
[10] For pressure
[11] For force, density etc.
[12] For thermal, heat, temperature.
[13] Various sensor technologies etc.

Since it is not possible to study all the types of the sensors we want to contribute my work towards the field of the agriculture since our major part of the economy depends upon the agriculture. With the help of the technology, better resources will be provided to the agriculture field so that the yield of the crops can be obtained. In the last some of the years we have seen that because of the natural calamities the huge number of the crops have been destroyed and as a result of which the results were alarming, various farmers has ended their life. In today’s time when we have made so much of the development in the various different fields like industries etc. our agriculture area still remains dependent on the natural resources. Due to which the farmers has to face bad results because the amount of the resources which the part of the field requires also depends upon the various factors but if that particular amount cannot be reached then definitely that crop will be suffered and indirectly that will affect the farmers also.

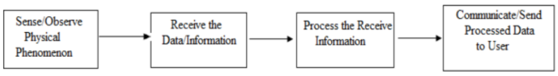

Fig 1: Basic concept of the Sensor Network

Fig 1 shows how the sensor network works in the field where the network is being installed. Firstly the sensors observe the physical phenomenon then it is being received by the sink node and then the data will be processed carefully and finally the data will be communicated to the user which is called as the processed data. For e.g. Suppose in a field we are providing the water for irrigation and some of the water gets stuck to a particular area and on the other hand the other area is not at all getting the sufficient water then in that case, if we are using the sensors in the field a message will be given to the particular coordinating node with the help of which the farmer will easily get to know that which of the area is still in the need of water and if we are not using the sensors in the field then there are chances that the crop will be affected.

Today, the land in our country is also very much limited so if we want to take the maximum yield from the less land then certain technologies certainly has to be used in the agriculture and the use of the WSN in the agriculture is a step with the help of which the better results can be taken in the limited land. So, this type of the agriculture where the precise amount of the resources has to be provide for the increase in the output of the crops is called as the Precision Agriculture which means that the everything will be provided in the precise amount. Humidity[1] or moisture is a universal parameter and its control is considered to be very important in a variety of fields such as industries related to the precision manufacturing, fiber, food etc. Moisture is undesirable whether it appears in the houses, textiles, packaging materials, electronic appliances, chemicals etc. Knowing the moisture content of the soil would enable farmers to tailor their activities to achieve crop yield optimization. Soil moisture detection has been used for monitoring and evaluating construction sites, landscape sites, mining operations, forest areas, flood control areas etc. The rest of the paper is organized as follows: related work is discussed in the Section 2, Section 3 depicts the proposed work which is being by done by me and finally Section 4 concludes the paper.

II. RELATED WORK

The sensor node lifetime depends mostly upon the battery life. In many of the cases, the WSN node has limited power source and replenishment of power may be limited or impossible together. Power consumption requires optimization[2][3][4]. Also whenever we talk of the sensor which is being used to sense of the different types of the soil then a standard test usually includes determination of the available phosphorus, exchangeable potassium, calcium, magnesium etc., their saturation percentages, their pH values[5] etc. Optical sensors appear to have great potential for determining soil organic matter content. They measure soil color that was historically used to assess soil carbon[5]. Persistent or sustained congestion occurs when the long term arrival rate at a link exceeds its capacity. This happens when the source data sending rate increases and the buffer over flows. While transient congestion only introduces a delay in data transmission , persistent congestion results in data loss.
Congestion results in packet drops, increased delays, unreliability, lower throughput, wastage of communication resources, power, and eventually decreases lifetime of the WSN. Congestion control involves methods for monitoring and regulating the total amount of data entering the network to keep traffic levels at an acceptable value. Congestion control in WSN has a rich history of algorithm development and theoretical study. Various schemes for congestion control have been proposed and implemented over the years. Also they can be classified based on whether they follow a traditional layered approach or cross layer approach[9].The various types of the security[6] issues has to be considered whenever we talk of the wireless sensor networks. Since, no wire is being used in the wireless network so there is more possibility that the network will be very much vulnerable to the various attacks. Various number of the attacks have been reported in the WSN. Some of them are:

1. Sink hole attacks
2. Sybil attacks
3. Wormhole attack
4. Hello flood attacks
5. Selective forwarding attacks
6. Routing loops etc…

III. PROPOSED WORK

As we have discussed earlier that in the wireless networks there is high possibility of the security breach. There are a lot of attacks which can attack the network. But the one on which we want to work is the problem of congestion. We will be taking a field of the large area in which various sensors will be installed forming a WSN in the agricultural field. In the whole network one node will be the master (sink) node and the others will be the source node which will be sensing the conditions and sending the messages to the master node.But there is the possibility that at some point of time the various source nodes will be sending a lot of the data and there is the chance that the master node is not able to process the message at that time. So, the congestion will goes on increasing which will affect the performance of the network that is the data which will be coming can be discarded by the master node. So, to avoid the discarding of the data packets a protocol (DSR/AODV) will be implemented on the network and with the help of which if there is any congestion in the network then that will be shown as a message on the display so that the user can get the information about the congestion and rectify it at the right time. That implementation of the routing of the messages will be in the NS2 so that the routing of the packets can be shown on the NAM i.e. Network Animator.

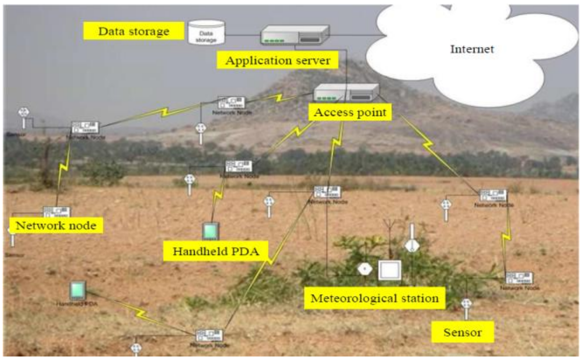

Fig 3. Normal installation of the Sensors in the Field

From **Fig 3** it is clear that how the sensors are being installed in the normal field so that the important information can be transferred to the common node which is called as the sink node. The sensor nodes can be the handheld pc etc. But in the normal models the data is being transferred regularly but the other things are not being considered like the errors, the congestion in the flow of the data etc. So, in our work we have tried to resolve the congestion in the network because of which the data can be transferred without any problem. In our work we will be applying the AODV routing protocol in the network so that if any of the congestion will occur then it will be notified to the user and so the proper action can be taken by the user. Also, we will be tracking the flow of the data on the NS2 and will try to simulate the model so that the data flow and the other things can be easily tracked and simulated. Also in our work an X-Graph will be prepared which will be showing the relation between the no. of packets and the time with the help of which the result will be shown that will try that after transferring how much of the data what will be the loss of packets when we are considering the congestion as the limiting point for any type of the network in the particular field.

Application Layer ∗ Reliability of the data. ∗ Use of cryptographic tech.
Network Layer ∗ Routing of the messages. ∗ Packets dropped completely or selectively. ∗ **Congestion leading to loss of data.**
Data Link Layer ∗ Error detection & correction. ∗ Vulnerable to jamming.
Physical Layer ∗ Transmission Media ∗ Node capture attacks.

Fig 2. Normal Layered Architecture of the WSN in Agriculture

Application Layer ∗ Reliability of the data. ∗ Use of cryptographic tech.
Network Layer ∗ Routing of the messages. ∗ Packets dropped completely or selectively. ∗ **Detecting the congestion and notify to the user for rectification.**
Data Link Layer ∗ Error detection & correction. ∗ Vulnerable to jamming.
Physical Layer ∗ Transmission Media ∗ Node capture attacks.

Fig 3. Proposed Architecture with rectification of congestion

IV. CONCLUSION AND FUTURE SCOPE

Since, the network formed is the WSN so there is more possibility of the attacks. So, with the help of the technique which we want to apply on the field of the agriculture one step in the attacks can be resolved upto an extent. Also, the performance of the network can be increased by eliminating the problem of the congestion. This problem resolution will also be very much beneficial to the farmers to increase the yield of the crop.

If we consider the future scope in this type of the work then the advancement in this type of the work can lead to the very much of the advancement in the agricultural field. In this type of the work the WSN can be directly connected to the internet with the help of which the data can be accessed with the help of the internet so that if the farmer is not there in the field then also the farmer can easily get the information about the field. Also, if the farmers don't know how to operate the internet then for that purpose the coaching the e-choupals have been operated so that the farmers will be able to access the internet.

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Report on Reputation Based Data Aggregation For Wireless Network

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ABSTRACT:

wireless sensor network consists of spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, sound, pressure, etc. and to cooperatively pass their data through the network to a main location.In wireless networks, malicious sensor nodes send false data reports to distort aggregation results. Existing trust systems rely on general reputation to mitigate the effect of this attack. This report is the implementation of one of a novel reliable data aggregation protocol, called RDAT i.e Reliable Data Aggregation Protocol.In this report Reliable Data Aggregation Protocol with functional reputation is implemented. It is based on the concept of functional reputation. Functional reputation enables data aggregators to evaluate each type of sensor node action using a respective reputation value thereby increasing the accuracy of the trust system. The simulation results show that protocol RDAT significantly improves the reliability of aggregated data in the presence of compromised nodes.

I. INTRODUCTION

The field of wireless sensor networks combines sensing, computation, and communication into a single tiny device. Through advanced mesh networking protocols, these devices form a sea of connectivity that extends the reach of cyber space out into the physical world. As water flows to fill every room of a submerged ship, the mesh networking connectivity will seek out and exploit any possible communication path by hopping data from node to node in search of its destination. The power of wireless sensor networks lies in the ability to deploy large numbers of tiny nodes that assemble and configure themselves. Usage scenarios for these devices range from real time tracking, to monitoring of environmental conditions, to ubiquitous computer environment, to in situ monitoring of the health of structures or equipment. The application demands for robust, scalable, low-cost and easy to deploy networks are perfectly met by a wireless sensor network. If one of the nodes should fail, a new topology would be selected and the overall network would continue to deliver data. If more nodes are placed in the field, they only create more potential routing opportunities. There is extensive research in the development of new algorithms for data aggregation, ad-hoc routing and distributed signal processing in context of wireless sensor networks. As the algorithms and protocols for wireless sensor network are developed, they must be supported by a low power, efficient and flexible hardware platform.

1.1 Overview of wireless sensor network

The concept of wireless sensor networks is based on a simple equation:

Sensing+CPU+Tranceiver=Thousands of potential applications

As soon as people understand the capabilities of a wireless sensor network, hundreds of applications spring to mind. It seems like a straightforward combination of modern technology. However , actually combining sensors , radios and CPUs into an effective wirelss sensor network requires a detailed understanding of the both capabilities and limitations of each of the underlying hardware components, as well as detailed understanding of modern networking technologies and distributed systems theory. Each individual node must be designed to provide the set of primitives necessary to synthesize the interconnected web that will emerge as they are deployed, while meeting strict requirements of size, cost and power consumption. Recent advances in micro-electro-mechanical systems (MEMS) technology, wireless communications, and digital electronics have enabled the development of low-cost, low-power, multifunctional sensor nodes that are small in size and communicate in

short distances. These tiny sensor nodes, which consist of sensing, data processing, and communicating components, leverage the idea of sensor networks based on collaborative effort of a large number of nodes.
Sensor networks represent a significant improvement over traditional sensors, which are deployed in the following two ways :

• Sensors can be positioned far from the actual phenomenon, i.e., something known by sense perception. In this approach, large sensors that use some complex techniques to distinguish the targets from environmental noise are required.

• Several sensors that perform only sensing can be deployed. The positions of the sensors and communications topology are carefully engineered.

They transmit time series of the sensed phenomenon to the central nodes where computations are performed and data are fused. A sensor network is composed of a large number of sensor nodes, which are densely deployed either inside the phenomenon or very close to it. The position of sensor nodes need not be engineered or pre-determined. This allows random deployment in inaccessible terrains or disaster relief operations. On the other hand, this also means that sensor network protocols and algorithms must possess self-organizing capabilities. Another unique feature of sensor networks is the cooperative effort of sensor nodes. Sensor nodes are fitted with an on-board processor. Instead of sending the raw data to the nodes responsible for the fusion, sensor nodes use their processing abilities to locally carry out simple computations and transmit only the required and partially processed data.

1.2 Classification System Design

Classification plays a vital role in many information management and retrieval tasks. Based on the organization of categories, The sensor nodes are usually scattered in a sensor field as shown in Fig. 1. Each of these scattered sensor nodes has the capabilities to collect data and route data back to the sink and the end users. Data are routed back to the end user by a multi-hop infrastructure less architecture through the sink.The sink may communicate with the task manager node via Internet or Satellite. This protocol stack combines power and routing awareness, integrates data with networking protocols, communicates power efficiently through the wireless medium, and promotes cooperative efforts of sensor nodes. The protocol stack consists of the application layer, transport layer, network layer, data link layer, physical layer, power management plane, mobility management plane, and task management plane. Depending on the sensing tasks, different types of application software can be built and used on the application layer. The transport layer helps to maintain the flow of data if the sensor networks application requires it. The network layer takes care of routing the data supplied by the transport layer. Since the environment is noisy and sensor nodes can be mobile, the MAC protocol must be power aware and able to minimize collision with neighbors' broadcast. The physical layer addresses the needs of a simple but robust modulation, transmission and receiving techniques. In addition, the power, mobility, and task management planes monitor the power, movement, and task distribution among the sensor nodes. These planes help the sensor nodes coordinate the sensing task and lower the overall power consumption.

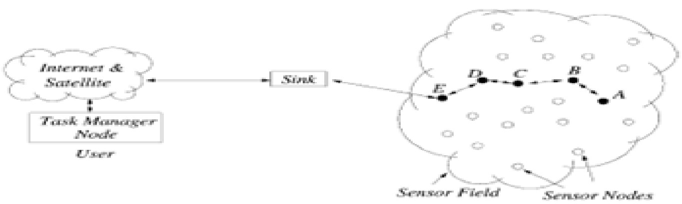

Fig. 1 : Sensor nodes scattered in a sensor field.

The power management plane manages how a sensor node uses its power. For example, the sensor node may turn off its receiver after receiving a message from one of its neighbors. This is to avoid getting duplicated messages. Also, when the power level of the sensor node is low, the sensor node broadcasts to its neighbors that it is low in power and cannot participate in routing messages. The remaining power is reserved for sensing. The mobility management plane detects and registers the movement of sensor nodes, so a route back to the user is always maintained, and the sensor nodes can keep track of who are their neighbor sensor nodes. By knowing who the neighbor sensor nodes are, the sensor nodes can balance their power and task usage. The task management plane balances and schedules the sensing tasks given to a specific region. Not all sensor nodes in that region are required to perform the sensing task at the same time. As a result, some sensor nodes perform the task more than the others depending on their power level. These management planes are needed, so that sensor nodes can work together in a power efficient way, route data in a mobile sensor network, and share resources between sensor nodes. Without them, each sensor node will just work individually. From the whole sensor network standpoint, it is more efficient if sensor nodes can collaborate with each other, so the lifetime of the sensor networks can be prolonged.

II. APPROACHES

2.1 Functional Reputation Based Data Aggregation

Consider a large sensor network with densely deployed sensor nodes. Due to the dense deployment, sensor nodes have overlapping sensing ranges and events are detected by multiple sensor nodes. Hence, aggregation of correlated data at neighboring sensor nodes is needed. Some sensor nodes are dynamically designated as data aggregators to aggregate data from their neighboring sensor nodes, although every sensor node is assumed to be capable of doing data aggregation. To balance the energy consumption of sensor nodes, the role of data aggregator is rotated among sensor nodes based on their residual energy levels. Sensor nodes have limited computation and communication capabilities. For example, the Mica2 motes have a 4Mhz 8bit Atmel microprocessor, and are equipped with an instruction-memory of 128KB and a RAM of 4KB. All messages are time-stamped and nonces are used to prevent reply attacks. Sensor nodes employ monitoring mechanisms to detect malicious activities of their neighbours. Sensor nodes establish pairwise shared keys with their neighbours using an existing random key distribution protocols . Pairwise keys are used for data authentication. Data are transmitted in plain text unless it is stated otherwise. Intruders can compromise sensor nodes via physical capturing or through the radio communication channel. Once a sensor node is compromised, all information of the node becomes available to the intruder. Although compromised nodes can perform many types of attacks to degrade the network's security and performance, we only consider the attacks against integrity of the aggregated data. We assume that compromised nodes send false data (sensing reports) to data aggregators. If a compromised node is selected as data aggregator it can inject false data into aggregated data. In addition, compromised nodes selectively forward and misdirect aggregated data to distort the integrity of the aggregated data.

2.2 Reliable data aggregation protocol (RDAT)

The basic idea behind protocol RDAT is to evaluate trustworthiness of sensor nodes by using three types of functional reputation, namely sensing, routing, and aggregation .Sensor nodes monitor their neighborhood to obtain first-hand information regarding their neighboring nodes. For sensing, routing, and aggregation tasks, each sensor node Ni records good and bad actions of its neighbors in a table referred to as functional reputation table. Functional reputation tables are exchanged among sensor nodes to be used as second-hand information during trust evaluation. The functional reputation tables are piggy backed to other data and control packets in order to reduce the data transmission overhead. When sensor node Ni needs to interact with its neighbour Nk , Ni evaluates the trustworthiness of Nk using both first-hand and second-hand information regarding Nk . Functional reputation for aggregation ($R_{a,b}^{aggregation}$) is needed by sensor nodes to evaluate the trustworthiness of data aggregators. Functional reputations for routing ($R_{a,b}^{routing}$)and sensing ($R_{a,b}^{sensing}$) are used by data aggregators to increase the security and reliability of the aggregated data. Functional reputation values are quantified using beta distributions of node actions as explained next.

2.3 Beta reputation system

As the success of Bayesian formulation in detecting arbitrary misbehavior of sensor nodes is , we select a Bayesian formulation, namely beta reputation system, for trust evolution. In this section, before giving the details of protocol RDAT, we present a brief information about beta reputation system. Posteriori probabilities of binary events can be represented as beta distributions which is indexed by the two parameters α and β . The beta distribution f (p|α,β) can be expressed using the gamma function Γ as:

$$f(p|\alpha,\beta) = (\Gamma(\alpha+\beta)/\ \Gamma(\alpha)+\Gamma(\beta))\ p\alpha-1(1-p)\beta-1$$
$$0 \le p \le 1,\ \alpha > 0,\ \beta > 0$$

The probability expectation value of the beta distribution is given by E(p) = α/(α+β). To show that how beta function can be employed in sensor networks let us consider the task of target detection as an action with two possible outcomes, namely "correct" and "false". Let r be the observed number of "correct" target detections and s be the the observed number of "false" target detections by a sensor node. The beta function takes the integer number of past observations of "correct" and "false" target detections to predict the expected frequency of "correct" target detections by that sensor node in the future which is achieved by setting:

$$\alpha = r+1 \quad \beta = s+1, \text{ where } r, s \geq 0.$$

The variable p represents the probability of "correct" target detections and f $(p|\alpha,\beta)$ represents the probability that p has a specific value. The probability expectation value is given by E(p) which is interpreted as the most likely value of p. Hence, a sensor node's reliability can be predicted by beta distribution function of its previous actions as long as the actions are represented in binary format.

2.4 Computing functional reputation and trust

Functional reputation value ($R_{a,b}^{X}$) is computed using beta density function of sensor node Nk's previous actions with respect to function X. Trust ($T_{i,j}^{X}$) is the expected value of $R_{a,b}^{X}$.Let us take routing task as an example. If sensor node Ni counts the number of good and bad routing actions of Nk as α and β, respectively. Then, Ni computes the functional reputation $R_{a,b}^{routing}$ about node Nk as Beta(α+1,β+1). Following the definition of trust, $T_{i,j}^{routing}$ is calculated as the expected value of $R_{a,b}^{routing}$

$$T_{i,j}^{routing} = E(Beta(\alpha+1,\beta+1))$$
$$= \alpha+1/\alpha+\beta+2$$

This equation shows that the expected value of the beta distribution is simply the fraction of events that have had outcome α. Hence, functional reputation value of routing is given by the ratio of good routing actions to total routing actions observed. This is an intuitive decision and it justifies the use of the beta distribution. In the above formula, $R_{a,b}^{routing}$ represents node Ni's observations about node Nk . In other words, it just involves first-hand information. Reputation systems that depend on only first-hand information has a very large convergence time . Hence, second-hand information is desirable in order to confirm firsthand information. In protocol RDAT, neighboring sensor nodes exchange their functional reputation tables to provide secondhand information and this information is included in trust evaluation. Let us assume that sensor node Ni receives secondhand information about node Nk from a set of N nodes and $S_{info}(r_{k,j})$ represents the second-hand information received from node Nk ($k \in N$). Ni already has previous observations about Nj as $\alpha_{i,k}$ and $\beta_{i,j}$. Further assume that, in a period of Δt, Ni records $r_{a,b}$ good routing actions and $s_{i,j}$ bad routing actions of Nk . Then, Ni computes the trust $T_{i,j}^{routing}$ for Nk as follows.

$$\alpha_{i,j}^{routing} = \nu^*\alpha_{i,j} + r_{a,b} + \Sigma\, S_{info}^{routing}(r_{k,j})$$
$$\beta_{i,j}^{routing} = \nu^*\beta_{i,j} + r_{i,j} + \Sigma\, S_{info}^{routing}(r_{k,j})$$
$$T_{i,j}^{routing} = E(beta(\alpha_{i,j}^{routing} +1,\ \beta_{i,j}^{routing} +1))$$

where $\nu < 1$ is the aging factor that allows reputation to fade with time. Integration of first and second hand information into a single reputation value is studied in by mapping it to Dempster-Shafer belief theory . We follow a similar approach and use the reporting node Nk's reputation to weight down its contribution to the reputation of node Nk . Hence, second-hand information $S_{info}(r_{k,j})$is defined as

$$S_{info}(r_{k,j}) = (2^*\alpha_{i,k} * r_{k,j})/((\beta_{i,k} +2) * (r_{k,j} + s_{k,j} +2) * (2 * \alpha_{i,k}))$$
$$S_{info}(s_{k,j}) = (2^*\alpha_{i,k} * s_{k,j})/((\beta_{i,k} +2) * (r_{k,j} + s_{k,j} +2) * (2 * \alpha_{i,k}))$$

The idea here is to give greater weight to nodes with high trust and never give a weight above 1 so that second-hand information does not outweigh first-hand information. In this function, if $\alpha_{i,k} = 0$ the function returns 0, therefore node Nk's report does not affect the reputation update.

2.5 Secure and reliable data aggregation

In protocol RDAT, data aggregation is periodically performed in certain time intervals. In each data aggregation session, secure and reliable data aggregation is achieved in two phases. In the first phase, before transmitting data to data aggregators, each sensor node *Ni* computes $R_{a,b}^{aggregation}$ value for its data aggregator Aj and evaluate the trustworthiness of Aj . If trustworthiness of Aj is below a predetermined threshold, then Ni does not let Aj to aggregate its data. To achieve this, Ni encrypts its data using the pairwise key that is shared between the base station and Ni and sends this encrypted data to the base station along with a report indicating Ajmay be compromised. Based on the number of reports about Aj over the time, the base station may decide that Aj is a compromised node and it should be revoked from the network. In the second phase of data aggregation session, the following Reliable Data Aggregation (RDA) algorithm is run by data aggregators. Algorithm RDA depends on $R_{a,b}^{sensing}$ and $R_{a,b}^{routing}$ functional reputation values to mitigate the effect of compromised sensor nodes on aggregated data.

The Algorithm RDA is-

- Input: Data aggregator Aj , Aj's neighboring nodes {N1,N2, ...,Ni}, trust values of neighboring nodes computed by Aj { $T_{j,1}^{sensing}$,..., $T_{j,i}^{sensing}$ } and{ $T_{j,1}^{routing}$,..., $T_{j,i}^{routing}$ }.
- Output: Aggregated data Dagg .
- Step 1: Aj requests each Ni to send its data for data aggregation.
- Step 2: Sensor nodes {N1,N2, ...,Ni} transmit data {D1,D2, ...,Di} to Aj .
- Step 3: Aj updates trust values $T_{i,j}^{sensing}$ and $T_{i,j}^{routing}$ of each Ni based on the first and second hand information regarding Ni .
- Step 4: Aj weights data Di of sensor node Ni using the $T_{i,j}^{sensing}$ and $T_{i,j}^{routing}$.
- Step 5: Aj aggregates the weighted data to obtain Dagg.

Since compromised nodes send false sensing reports in order to deceive the base station, Algorithm RDA considers trustworthiness of sensor nodes with respect to sensing function to increase the reliability of aggregated data. To achieve this, Aj weights data of each sensor node Ni with respect to the sensor node's trust value $T_{i,j}^{sensing}$ and $T_{i,j}^{routing}$. By weighting sensor data based on trust levels, data aggregators reduce the compromised sensor nodes' effect on the aggregated data. This reason is that a compromised node Ni is expected to have low $T_{i,j}^{sensing}$ and $T_{i,j}^{routing}$ values as shown in next section.

3.1 Experimental Simulation and Results

These various algorithms have their implemented results upon which simulations have carried out in order tomeasure the performance parameters of the algorithms over the datasets. The results are summarized in the following tables.

Fig – cluster formation

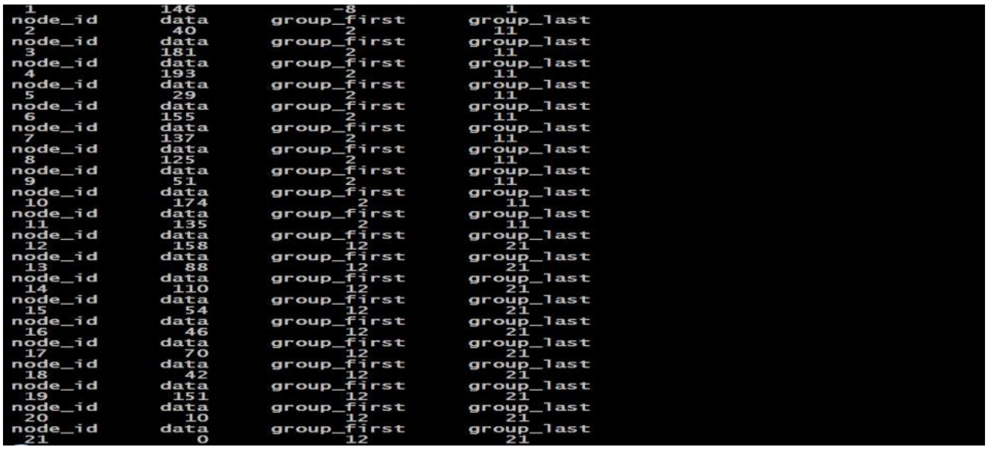

Fig- node data

Fig – functional reputation table

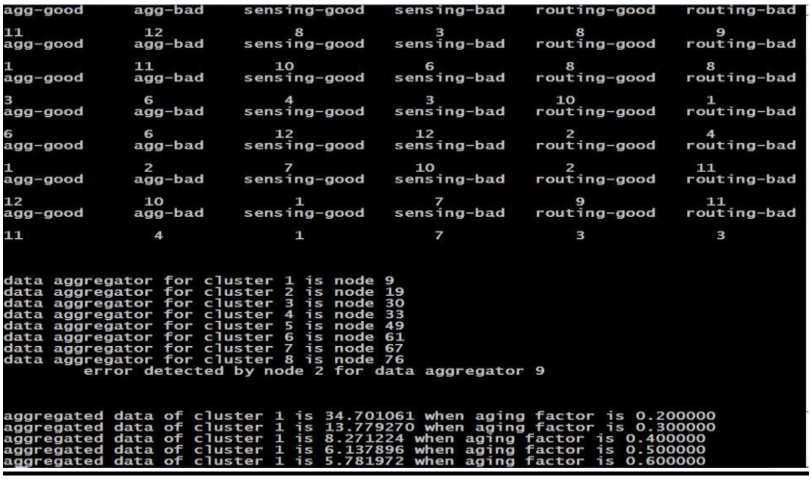

Fig –data aggregator allocation

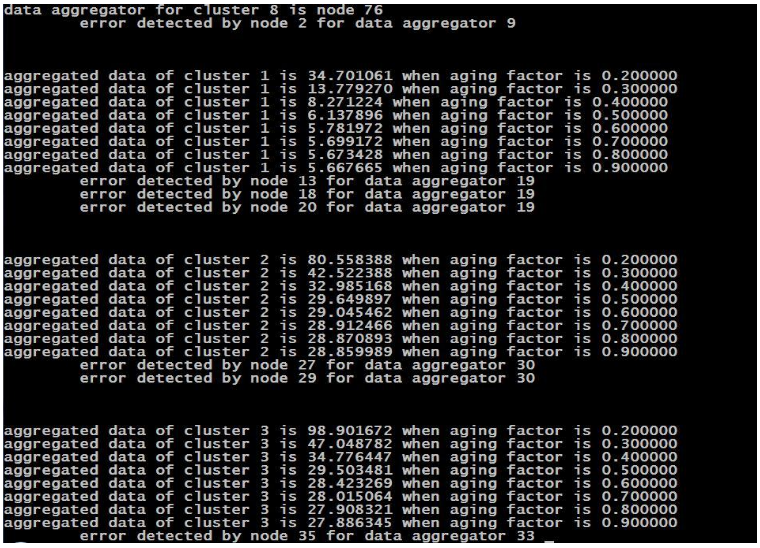

Fig – aggregated data for clusters

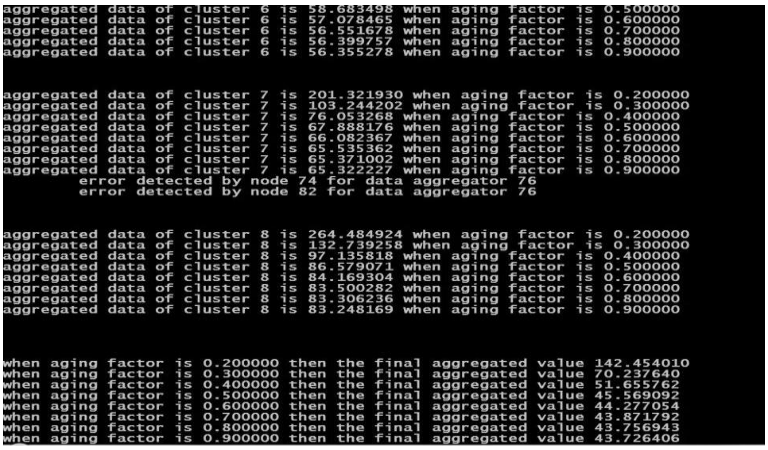

Fig - final aggregat

II. CONCLUSION

In wireless sensor networks, compromised sensor nodes can distort the integrity of aggregated data by sending false data reports and injecting false data during data aggregation. Since cryptographic solutions are not sufficient to prevent these attacks, general reputation based trust systems are proposed in the literature. This paper has presented a novel reliable data aggregation and transmission protocol (RDAT) that introduces functional reputation concept. In comparison with general reputation, the simulation results show that protocol RDAT improves the security and reliability of the aggregated data by using functional reputation concept.Future work includes the simulation of this protocol on any simulation software such as Network Simulator (NS-2) or QUALNET or any other simulation software and get the exact results and compare these results with the implementation results of another reliable data aggregation protocol i.e "Ant Colony data gathering protocol". Carrying out more detailed simulator runs would also allow the protocols to be evaluated in more detail

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Text Assisted Defence Information Extractor

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ABSTRACT

The huge amount of news information available on the web or in a huge textual repository requires the use of Information Extraction (IE) techniques to filter the information needed by different category of users. Such techniques differ from a normal search. The main objectives of the Information Extraction System are: reduce the time spent in reading the articles included in the corpus, avert the redundancy and addition of various annotation lists. In this context, article recognition and extraction have become key points. In this paper we initially define the various processing resources as they are the base for an efficient Information Extraction System. Following this, an information extraction tool has been discussed, which is being developed for use of Defence Research & Development Organization using open source software and focuses on extracting defence related keywords from a pool of textual data. Preliminary result is very promising, although more refinement is under process.

KEYWORDS: *Annie Transducer, Annotation sets, GATE, Information Extraction, Jape Grammar, Processing Resources, Text Mining*

I. INTRODUCTION

Development and advancement in defence domain by researchers and scientists have led to large amount of text information in form of research papers, technical reports and other textual documents. It remains a tough task for the readers or researchers to find out the relevant information from such a huge information repository in textual format. This leads to the implementation of text mining techniques on such repositories. Text mining is the process to extract expressive information from an ocean of text data by use of variety of techniques. As 'Defence Scientific Information and Documentation Centre (DESIDOC)' is the centralized information centre of DRDO, it was facing similar challenges. Therefore, text mining techniques are being implemented to enable the users in tracing out the desired information with ease and relevance. As a part of the project, a text-assisted defence information extractor has been developed using open source software. The extractor helps in identifying subject related keywords or group of keywords from domain-specific document collections. Information Extraction is a process of transforming information from unstructured data sources (e.g. .pdf, .txt files etc) to structured data. For implementing the application, an open source text mining tool has been used which is General Architecture for Text Engineering (GATE). Gate is a portable framework written in java for developing and deploying software components that describe how to process human language.

II. COMPONENT OF INFORMATION EXTRACTOR

2.1 GAZETTEER [1]

A gazetteer is a directory which consists of information about places, people etc. The role of the gazetteer is to identify entity names in the text based on lists. For example, ANNIE gazetteer lists, used in GATE, are plain text files, with one entry per line. Gazetteer list is a file with a '.lst' extension that consists of one entry at each line. A gazetteer list typically includes named entities (names, institutions, etc.), entity components such as prefixes of locations etc. Each list has a major type, minor type and a language. It is preferable to specify the major type while creating the list, while specifying the minor type and language is optional. We can modify the gazetteer lists and even create new ones. The major and minor types and the entries in the lists can also be modified. The newly created list needs to be mentioned with its major and minor type in the '.def' file of the ANNIE's gazetteer. The transducer basically uses up the entries in the gazetteer to create new annotations.

2.2 Sentence splitter

A sentence splitter divides a spawn of text into sentences. A question mark and an exclamation mark are used to end a sentence. A period succeeded by an upper case letter ends a sentence. There are some exceptions such as the abbreviations in which periods are used, but this will not end a sentence. The open source ANNIE sentence splitter produces sentences as an outcome of splitting the entire text in the corpus. To run the POS (Parts of Speech)-Tagger we need to initially implement the sentence splitter, both collectively are domain and application independent. The gazetteer lists are used up by the splitter to differentiate sentence ending full stops from abbreviations in the text. It is very essential for the working of the POS Tagger.

2.3 Tokeniser

When a stream of text is broken into some basic meaningful elements like phrases, symbols or words, so that they become inputs for further processing in text mining, the process is called tokenization and the basic elements are called tokens. In general the token is a word but it is very difficult to define what exactly a "word" is. There are basically five types of tokens-word, number, symbol (+, =, etc), punctuation marks and finally the space and control tokens. The tokenization is based upon a set of rules: that is on the left hand side we have the pattern to be matched and on the right hand side we have the actions to be taken up. The different tokeniser available is Treebank Tokeniser, S-Expression, ANNIE Tokeniser etc.

2.4 POS Tagger (Parts of Speech Tagger) [2]

Tagging refers to the automatic assignment of descriptors to the given tokens. The descriptor is called tag. The tag may indicate one of the parts-of-speech, semantic information etc. So tagging is a kind of classification. The process of assigning one of the parts of speech to the given word is called Parts Of Speech tagging. It is commonly referred to as POS tagging. Parts of speech include nouns, verbs, adverbs, adjectives, pronouns, conjunction and their sub-categories. Taggers use several kinds of information such as dictionaries, lexicons, rules for identification of token. A modified version of one of the best known Tagger, the Brill Tagger is ANNIE's POS Tagger. It produces a POS Tag as an annotation on each word or symbol. Default lexicon rule set is being used up in which there is alternates lexicons for all upper-case and lower case corpora. For this first the tokeniser and splitter must be run.

2.5 Transducer

A transducer refers to a technical term in physics or engineering that converts one form of energy into another. In the present context, the transducer is one that converts text from one form to another. The task of the open source 'ANNIE Name Entity Transducer' is to find terms that suggest entities. The JAPE grammar is a very important part of the transducer. We can either use the default jape rules in the main. jape (<GATEhome> / plugins/ ANNIE/ resources/ NE/ main. jape) file or we can create new transducers. These hand crafted jape grammar rules define the patterns over the annotations. The jape grammar either makes use of the gazetteer or will match the word using the 'Token String' method.

2.6 JAPE Grammar

To support our application we use an agglomeration of pattern rules popularly known as the JAPE grammar. The grammar is divided into two segments that is left side and right side. The annotation pattern that contains regular expression operators (e.g. +,*) should be present on the left hand side of the rule. The statements used to manipulate the annotations and the actions to be taken are specified on the right hand side of the rule. Labels are used in the RHS to reference the annotations matched in the LHS.

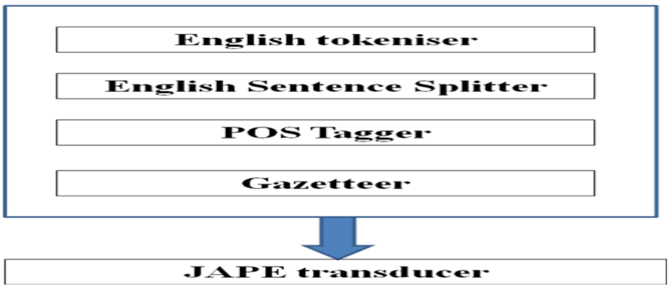

Fig 1.Components of Information Extractor

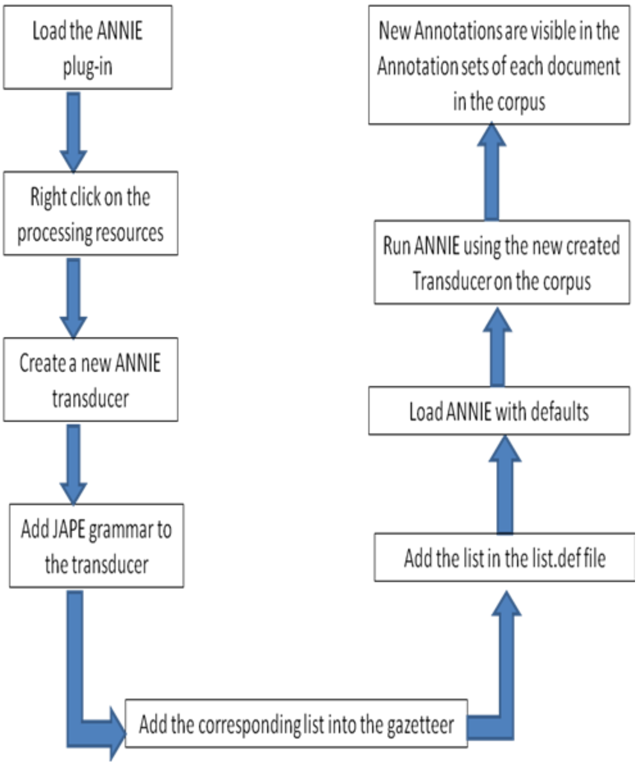

Fig 2. Steps to create a new mark-up

III. THE 'INFORMATION EXTRACTOR' FOR DESIDOC

As mentioned in section 1, DESIDOC has developed an information extractor, using open source software GATE, which helps in identifying subject related keywords or group of keywords from domain-specific document collections. Under this section, the methodology of this development has been explained in brief.

3.1Steps in Development of Information Extractor

Fig 2 depicts the protocol followed in development of the information extractor tool. Initially after starting the gate application, a new corpus is created and saved into a data store. Next, the newly created corpus is populated with text documents containing domain specific information. Next, the ANNIE plug-in is loaded to activate all its processing resources. A new annotation is formulated by creating a JAPE grammar based on our requirements. Now, JAPE grammar is incorporated into the newly created ANNIE transducer. Then, a new list is created in the ANNIE Gazetteer using the extension .lst. Next, the list is populated with the information about the newly created annotation. The file is listed in the .def file with its major type and minor type. Reinitialize the ANNIE Gazetteer so that the list is incorporated in it. Now load ANNIE with default, change the default transducer with the newly created one and run it on the corpus. At last for each document in the corpus the annotations are visible on the right hand side of the gate GUI.

Fig 3 presents the output of a domain specific extractor. The above mentioned idea is implemented through creating a corpus which contains the document about defence related warfare. The tree like structure on the left in the screenshot shows the Gate Application, Language Processing and Processing Resources. The central view displays the document from which the specific information is extracted. The right side tree structure depicts domain specific mark-ups. The ticked mark-ups highlight the desired keywords in the central portion of the screenshot.

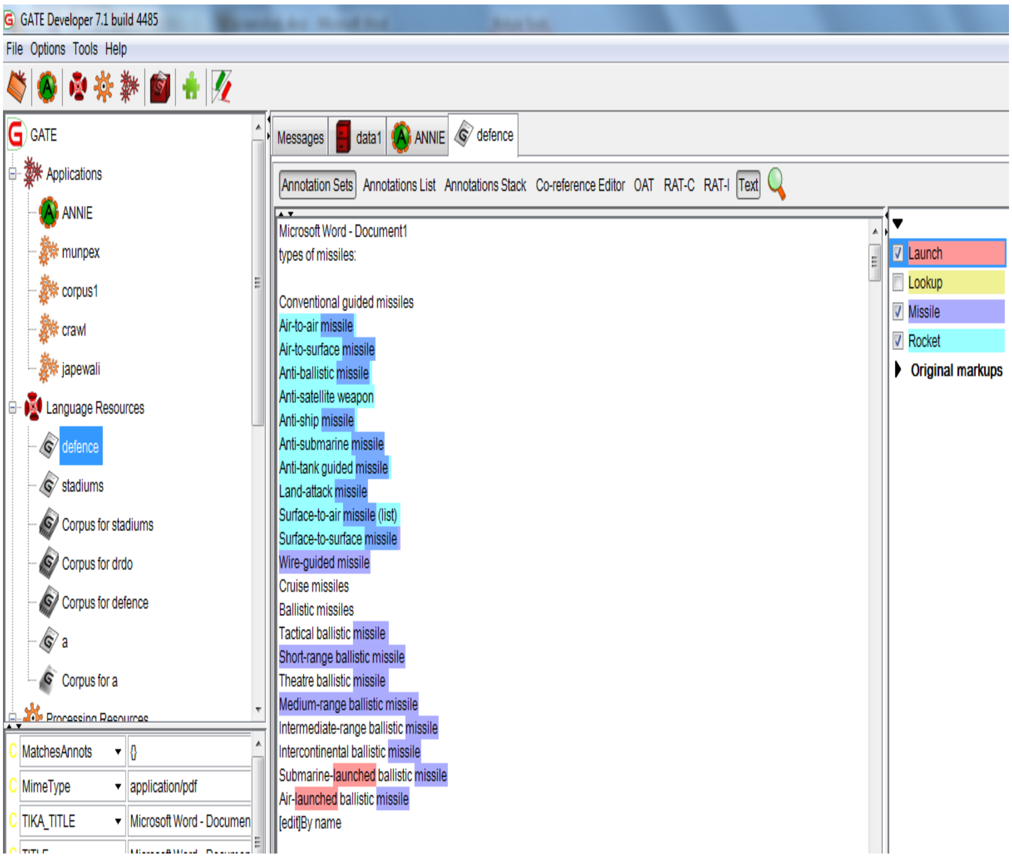

Fig 3 Launch, Missile, Rocket Mark-up created at right hand side

IV. CONCLUSION AND FUTURE SCOPE

In this paper we present a method through which new Annie Transducer and Annotations could be created. The text assisted defence information extractor identifies desired keywords from the collection of domain specific documents. To improve the efficiency of the text assisted defence information extractor, a GUI is under development that will enable users to submit queries and search for desired information in the corpus and also a dictionary may be provided using 'WordNet' that will sense parts of speech which were earlier unsearchable.

Acknowledgement

The authors would like to thank The Director of Defence Scientific Information and Documentation Centre, Defence Research and Development Organisation, Metcalfe house, New Delhi, India.

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Analytical Review of Model Simplification Aspects for Wind Turbine Based Doubly Fed Induction Generator.

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ABSTRACT

There has been a fast growing demand for the application of doubly fed induction generators (DFIG) in wind power plants in recent years. They have in particular dominated the market in last two years. DFIG is an ideal candidate to satisfy the requirements of the recently proposed challenging grid codes. In order to investigate the transient response of doubly fed induction generator (DFIG) under various disturbances, an accurate modeling is required. In this paper simulation results of transient responses of DFIG during faults for different order models are reviewed. However, many uncertainties still exist regarding validated comprehensive DFIG models. This paper attempts to clarify the ambiguities in various model orders. Impact of various orders such as fifth, third and simplified model, accurate model including saturation, excluding saturation is discussed here. A brief review of assumptions and considerations with the choice of reference frames is also included.

KEY WORDS: *DFIG, Electric variables control, Flux Saturation, Induction Machine, Machine Models, Power system transient stability, Wind energy generation*

I. INTRODUCTION

Share of wind energy in the power system has been increasing with the time. The use of variable speed wind energy conversion systems is becoming more popular due to the development in the field of power electronics. Currently, the doubly fed induction generator (DFIG) wind turbines dominate the market due to cost-effective provision of variable-speed operation with constant frequency. DFIG is a wound rotor induction generator in which rotor winding is fed through back to back variable frequency variable voltage source convertors. Their ability to control electrical torque and reactive power offer superior performance concerning system stability. With changing wind speed, one can adjust the frequency of the injected rotor voltage of the DFIG to obtain a constant-frequency at the stator. Adequate modeling of these systems and clear understanding of the effects of different simplifications is paramount if reliable results of simulations of power systems with high penetration of DFIG-based wind plants are sought. Efficient modeling and simulation techniques for induction generators will facilitate the research on wind turbine generation. . The wind energy industry is rather opaque regarding modeling as most of the data is usually confidential or requires rigorous field or laboratory experiments. The DFIG mathematical models are simplified either in order to save computational time or to eliminate the requirement for hard-to obtain data. In order to investigate the impacts of DFIGs installations on the operation and control of the power system, accurate models are required. A fifth order and reduced order (3rd) machine models are discussed. To derive more accuracy in these modeling orders more simplified and accurate models are also included in the review. The response of the DFIG for voltage control (VC) and its performance during a network fault especially voltage sags are addressed. Here presented is the analysis of the previously published papers, this paper aims to clarify some of the uncertainties associated with DFIG modeling. It also provides numerous simulation results that illustrate the influence of different parameters and modeling on transient operation of DFIG-based wind plants.

In this paper, Section II takes the overview of the assumptions to be made along with the choice of reference frame for particular modeling. Section III focuses on equations of various modeling and their simplifications. Section IV includes the results of simulations performed to validate the previous. Section V analyses those results from utility point of view and section VI concludes.

1.1.Overview of Considerations

Three phase stator and rotor windings of an induction machine can be represented by two sets of orthogonal fictious coils. d-q or two axis model for the study of transient behavior has proven to be reliable and accurate. Though rotation of the d-q axis can be arbitrary, three reference speeds i.e reference frames as follows,

- The stationary reference frame - the d,q axes do not rotate;
- The synchronously rotating reference frame - the d,q axes rotate at synchronous speed;
- The rotor reference frame - the d,q axes rotate at rotor speed.

Following explains choice of reference frame as elaborated in [9]

A. Stationary reference frame

When θ = 0; the d, q axes do not rotate therefore it called as stationary reference frame. Also the +d-axis is chosen to coincide with the stator phase A axis.

If the bus-bar voltages are

$$V_{as} = V_m \cos(w_{st} + \gamma)$$
$$V_{bs} = V_m \cos(w_{st} + \gamma - \lambda) \quad \ldots (1)$$
$$V_{cs} = V_m \cos(w_{st} + \gamma + \lambda)$$

If the motor terminals are directly connected to bus-bar and by using parks transformation

$$V_{ds} = V_m \cos(w_{st} + \gamma)$$
$$V_{qs} = -V_m \sin(w_{st} + \gamma) \quad \ldots (2)$$

From the above equations; the voltage applied to the stator d-axis coil, is the same as the stator phase A voltage. i.e $Vas = Vds$ where Vas is a stator phase A voltage and Vds is stator d-axis coil voltage. This means that the stator d-axis current Ids exactly equal to the phase A current Ias therefore it is not necessary to compute Ias separately at each step of integration process through inverse parks transformation This saves computer time and hence is an advantage of the stationary reference frame.

B. Synchronously rotating reference frame

When θ = Wst; the d, q axes rotate at synchronous speed. Therefore it is called synchronously rotating frame, without any capacitor the terminal voltage changes from eqn (2) to

$$V_{ds} = V_m \cos\gamma$$
$$V_{qs} = -V_m \sin\gamma \quad \ldots(3)$$

This means that the stator voltages are DC quantities and this has advantages in the field of feedback controller design when the motor equations are linearized around a steady operating point. In this frame we can use larger step length while digital integration; since the variables are slowly changing DC quantities during transient conditions.

C. Rotor reference frame

When θ = $\int Wr\, dt$; The d, q reference frame rotate at rotor speed therefore it is called rotor reference frame, also the d-axis position coincides with the rotor phase A axis.
Without any capacitors the terminal voltages changes from eqn (2)

$$V_{ds} = V_m \cos(sw_{st} + \gamma)$$
$$V_{qs} = -V_m \sin(sw_{st} + \gamma) \quad \ldots (4)$$

The d, q voltages are therefore of slip frequency and the d-axis rotor current behaves exactly as the phase A rotor current does. This means that it is not necessary to compute the phase A rotor current I_{as} at each step of the digital integration process through the inverse of Park's transform. This saves computer time and hence is an advantage of the rotor reference frame when studying rotor quantities.The model of an induction generator can have various orders. 5th order model is considered to be a full order model for an induction generator. When fifth i.e full order model is to be used, it demands consideration of differential equations for the whole network as stator circuit is directly connected to the stator circuit. Simplified fifth order doesn't take into account certain terms with low weight and employs the FOC algorithm. Third order model excludes stator dynamics reducing the step size for computations. Differential equations of previous order are ignored while developing this stage.In these orders effect of flux saturation is usually given no importance but its inclusion leads to an accurate model.Per unit representation are desirable to be used while analysis as it enables the conversion of whole system to pu quantities on a single power base.

II. VARIOUS MODELS OF DFIG

A. Fifth order model

The references [1][2][3][9] shows the fifth order model of the induction machine in Synchronous reference frame. However in this model effect of main flux and leakage flux is neglected.

The equations (5) and (6) gives d and q axis voltages of stator and rotor windings respectively,

$$\begin{cases} \bar{v}_{ds} = \bar{R}_s \times \bar{i}_{ds} - \bar{\lambda}_{qs} + \dfrac{1}{\omega_s}\dfrac{d}{dt}\bar{\lambda}_{ds} \\ \bar{v}_{qs} = \bar{R}_s \times \bar{i}_{qs} + \bar{\lambda}_{ds} + \dfrac{1}{\omega_s}\dfrac{d}{dt}\bar{\lambda}_{qs} \end{cases} \quad \dots (5)$$

$$\begin{cases} \bar{v}_{dr} = \bar{R}_r \times \bar{i}_{dr} - s \times \bar{\lambda}_{qr} + \dfrac{1}{\omega_s}\dfrac{d}{dt}\bar{\lambda}_{dr} \\ \bar{v}_{qr} = \bar{R}_r \times \bar{i}_{qr} + s \times \bar{\lambda}_{dr} + \dfrac{1}{\omega_s}\dfrac{d}{dt}\bar{\lambda}_{qr} \end{cases} \quad \dots (6)$$

Equation (7) represents stator and rotor flux in d-q synchronous reference frame respectively,

$$\begin{cases} \bar{\lambda}_{ds} = \bar{L}_{ss} \times \bar{i}_{ds} + \bar{L}_m \times \bar{i}_{dr} \\ \bar{\lambda}_{qs} = \bar{L}_{ss} \times \bar{i}_{qs} + \bar{L}_m \times \bar{i}_{qr} \end{cases}$$
$$\begin{cases} \bar{\lambda}_{dr} = \bar{L}_{rr} \times \bar{i}_{dr} + \bar{L}_m \times \bar{i}_{ds} \\ \bar{\lambda}_{qr} = \bar{L}_{rr} \times \bar{i}_{qr} + \bar{L}_m \times \bar{i}_{qs} \end{cases} \quad \dots (7)$$

As in [3]voltage behind a transient model for DFIG can be obtained, by defining e_d and e_q,

$$\bar{e}_d = -\frac{\bar{L}_m}{\bar{L}_{rr}}\bar{\lambda}_{qr} \quad \text{and} \quad \bar{e}_q = \frac{\bar{L}_m}{\bar{L}_{rr}}\bar{\lambda}_{dr} \quad \dots (8)$$

And with some manipulations,

$$\begin{cases} \bar{v}_{ds} = \bar{R}_s \times \bar{i}_{ds} - \bar{X}_1 \times \bar{i}_{qs} + \bar{e}_d + \dfrac{\bar{X}_1}{\omega_s}\dfrac{d}{dt}\bar{i}_{ds} + \dfrac{1}{\omega_s}\dfrac{d}{dt}\bar{e}_q \\ \bar{v}_{qs} = \bar{R}_s \times \bar{i}_{qs} + \bar{X}_1 \times \bar{i}_{ds} + \bar{e}_q + \dfrac{\bar{X}_1}{\omega_s}\dfrac{d}{dt}\bar{i}_{qs} - \dfrac{1}{\omega_s}\dfrac{d}{dt}\bar{e}_d \end{cases} \quad \dots (9)$$

$$\begin{cases} \bar{i}_{dr} = \left(\dfrac{\bar{\lambda}_{dr} - \bar{L}_m \times \bar{i}_{ds}}{\bar{L}_{rr}}\right) = \dfrac{1}{\bar{L}_m}\,\bar{e}_q - \dfrac{\bar{L}_m}{\bar{L}_{rr}}\,\bar{i}_{ds} \\ \bar{i}_{qr} = \left(\dfrac{\bar{\lambda}_{qr} - \bar{L}_m \times \bar{i}_{qs}}{\bar{L}_{rr}}\right) = -\dfrac{1}{\bar{L}_m}\,\bar{e}_d - \dfrac{\bar{L}_m}{\bar{L}_{rr}}\,\bar{i}_{qs} \end{cases} \quad \dots (10)$$

The electromagnetic torque,

$$T_e = \bar{L}_m(\bar{i}_{dr} \times \bar{i}_{qs} - \bar{i}_{qr} \times \bar{i}_{ds}) \quad \dots (11)$$

And finally mechanical torque,

$$\frac{d\omega_r}{dt} = \frac{1}{J} \times (T_m - T_e) \quad \dots (12)$$

These constitute fifth order model which includes stator transients and state variables are stator and rotor flux components and the rotor speed as well. Current components based state space model can possibly be derived by putting stator and rotor flux equations in voltage equations of the same. [1][2][3][5]

B. Third order model-

Neglecting the rate of change of stator flux linkage is a standard method of reducing the order of the induction generator model. The reduced i.e third order model can be derived by ignoring the differential term in equation (5). Neglecting the stator transients,

The reduced order d and q axis stator and rotor voltages,

$$\begin{cases} \bar{v}_{ds} = \bar{R}_s \times \bar{i}_{ds} - \bar{\lambda}_{qs} \\ \bar{v}_{qs} = \bar{R}_s \times \bar{i}_{qs} + \bar{\lambda}_{ds} \end{cases} \quad \dots (13)$$

$$\begin{cases} \bar{v}_{dr} = \bar{R}_r \times \bar{i}_{dr} - s \times \bar{\lambda}_{qr} + \dfrac{1}{\omega_s}\dfrac{d}{dt}\bar{\lambda}_{dr} \\ \bar{v}_{qr} = \bar{R}_r \times \bar{i}_{qr} + s \times \bar{\lambda}_{dr} + \dfrac{1}{\omega_s}\dfrac{d}{dt}\bar{\lambda}_{qr} \end{cases} \quad \dots (14)$$

When stator transients are neglected (9) can be reduced to,

$$\begin{cases} \bar{v}_{ds} = \bar{R}_s \times \bar{i}_{ds} - \bar{X}_1 \times \bar{i}_{qs} + \bar{e}_d \\ \bar{v}_{qs} = \bar{R}_s \times \bar{i}_{qs} + \bar{X}_1 \times \bar{i}_{ds} + \bar{e}_q \end{cases} \quad \dots (15)$$

$$\begin{cases} \bar{i}_{ds} = \dfrac{1}{\bar{L}_{ss}}\,\bar{v}_{qs} - \dfrac{\bar{L}_m}{\bar{L}_{ss}}\,\bar{i}_{dr} \\ \bar{i}_{qs} = -\dfrac{1}{\bar{L}_{ss}}\,\bar{v}_{ds} - \dfrac{\bar{L}_m}{\bar{L}_{ss}}\,\bar{i}_{qr} \end{cases} \quad \dots (16)$$

The electromagnetic torque,

$$T_e = -\frac{\bar{L}_m}{\bar{L}_{ss}}(\bar{i}_{dr} \times \bar{v}_{ds} + \bar{i}_{qr} \times \bar{v}_{qs}) \quad \ldots (17)$$

In the third order model state variables are two components of the rotor flux linkage and rotor speed.

C. Simplified modeling of DFIG-

To study behavior of DFIG-based WTs under generic conditions the fifth-order model is popular. But this kind of model raises a complicated system. A complex analysis under transient conditions, the high computational cost of the equation in standards simulators necessitates development of aggregated models.

Considering

1) A field-oriented control (FOC) algorithm for the rotor side converter acts as a current source.

2) Synchronous reference frame.Certain low weight components of the equations in the system and the stator electric transient are neglected.Simplified fifth order model enables simplification of some terms of the stator voltage. FOC algorithm regulates dq components of the rotor currents to be injected to the DFIG to perform a decoupled control of the positive sequence of P and Q.Considering the voltage and flux equations of stator and rotor in fifth order model (eq. 5, 6, 7) linear and applying the Laplace transform, the stator currents in the synchronous reference frame are obtained. Some necessary manipulations with abovementioned considerations give the simplified model as in [3],

$$\begin{aligned} i_{ds} &= \frac{1}{L_s}\frac{\omega_s}{s^2 + 2(R_s/L_s)s + \omega_s^2}v_{qs} - \frac{L_m}{L_s}i_{dr} \\ i_{qs} &= \frac{1}{L_s}\frac{s + R_s/L_s}{s^2 + 2(R_s/L_s)s + \omega_s^2}v_{qs} - \frac{L_m}{L_s}i_{qr}. \end{aligned} \quad \ldots (18)$$

It can be easily observed that the stator voltage and rotor current appear as input variables. Any variation in the stator voltage will introduce oscillations in the *dq* components of the stator currents in the synchronous reference frame.

Accuracy of the simplified model with respect to the resolution of a fifth order are observed by plotting responses of both systems on same graph as in [3].

D. Accurate model-

By reducing the order of the generator computational time can be considerably reduced. Reduced order can be achieved by neglecting differential term in the voltage equations of the machine. [1-4][9] The effect of leakage flux saturation is usually neglected in these papers. In some papers saturation effect is considered but lacks the comparative study among different orders of DFIG model with saturation effect during three phase sag, this is proposed in [4] developing an accurate model. Better representation of the induction machine with saturation under transient condition demands the consideration of variation in the stator and rotor leakage inductances due to saturation in the leakage flux path in saturation effect. To account effect of saturation in leakage flux path, unsaturated stator and rotor leakage reactances in dynamic models in [1-4] are modified by saturation factor *K sat.*

Ksat is introduced as follows,

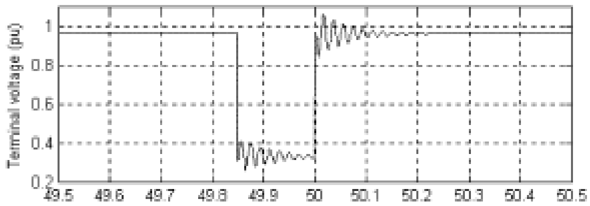
$$K_{sat} = \begin{cases} 1 & I \le I_{sat} \\ \frac{2}{\pi}(\tan^{-1}(\frac{\gamma}{\sqrt{1-\gamma}}) + \gamma\sqrt{1-\gamma}) & I > I_{sat} \end{cases} \quad \ldots (19)$$

Where γ is equal to the ratio between current at which the saturation begins, *Isat*, to the current through the leakage reactance. [4][6]

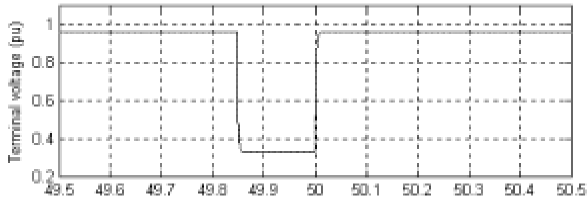
In [4] a 50% voltage sag is considered for simulation. At $t = 5s$, a voltage sag happens. Then at $t = 7s$ the voltage is restored to its presage value, i.e. 1 pu.

III. RESULTS

Simulations carried out to investigate the performance of the DFIG during a system fault in [2]. A fault is applied t= 49.85 s and cleared after 150 ms.



a)



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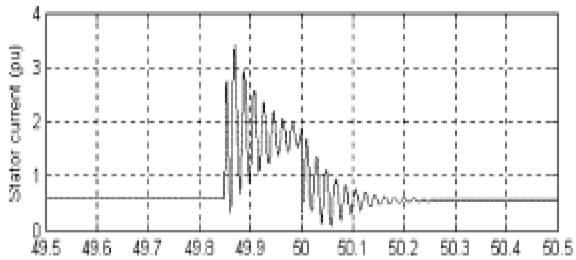
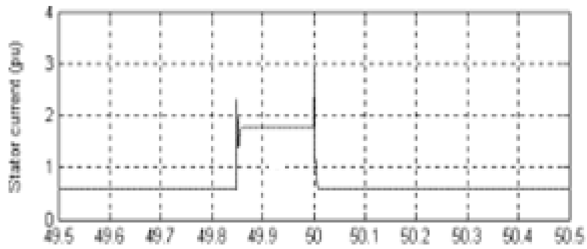


c)



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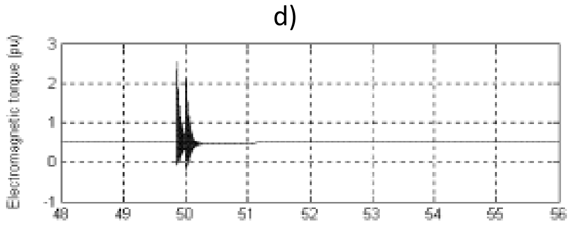

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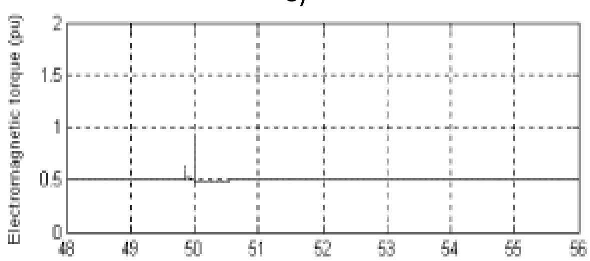
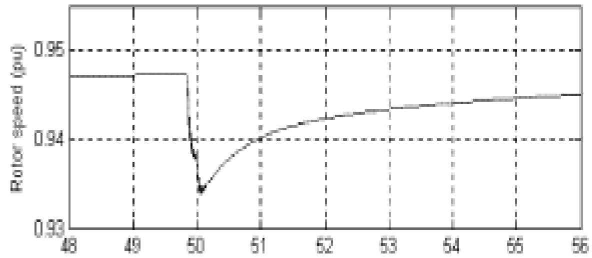
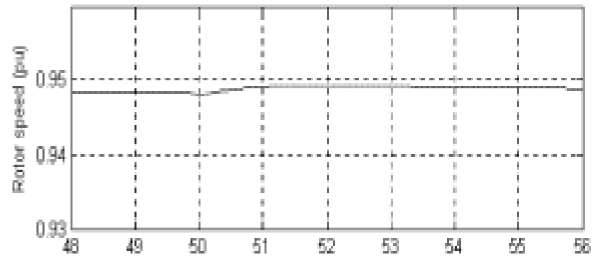


f)



g)



h)

Fig. 1. Response of DFIG to the system fault (all are in pu)

Similar set of results as in fig. 1(a)-(f) for fifth order and third order modeling respectively are obtained for terminal voltage, rotor speed, stator current and electromagnetic torque.

Another investigation of the Influence of various models can be seen in [9] as follows, the third and fifth order, modeled in rotor reference frame.

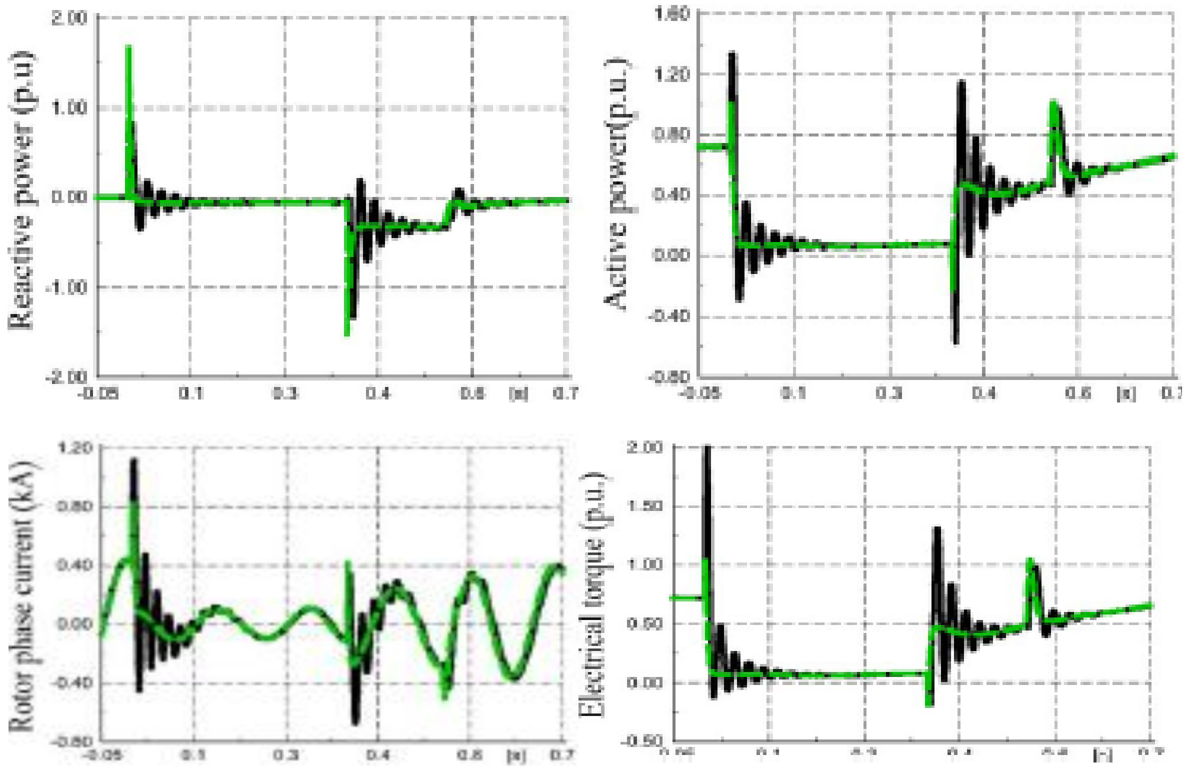


Fig. 2(a) DFIG response to a 350 ms short circuit applied at 0s and removed crowbar at 0.5s.

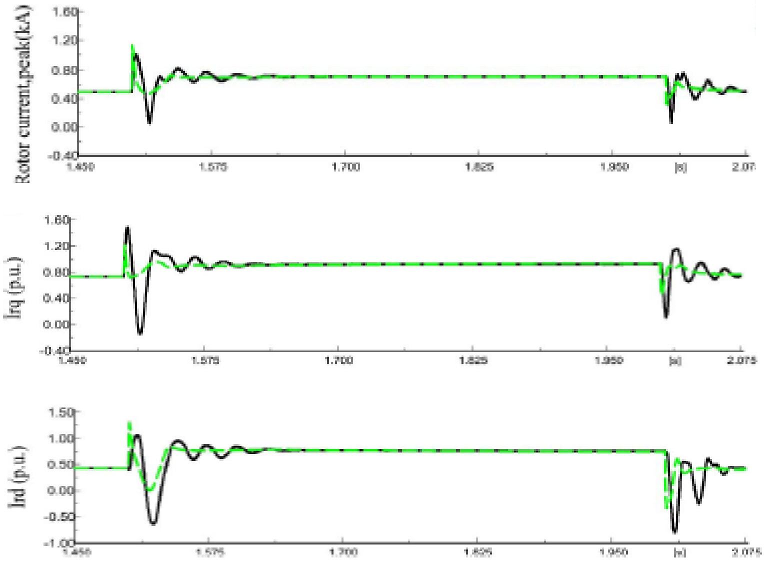
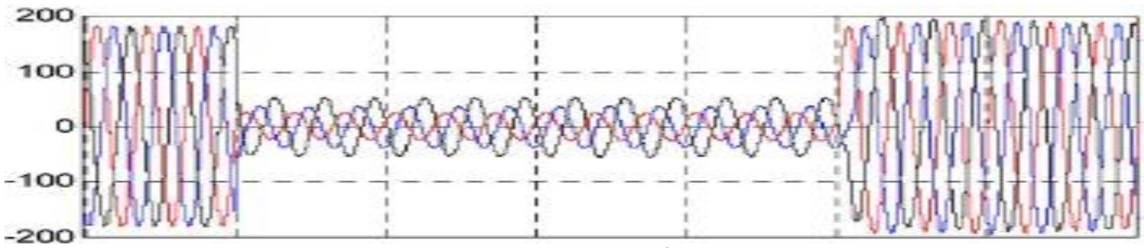
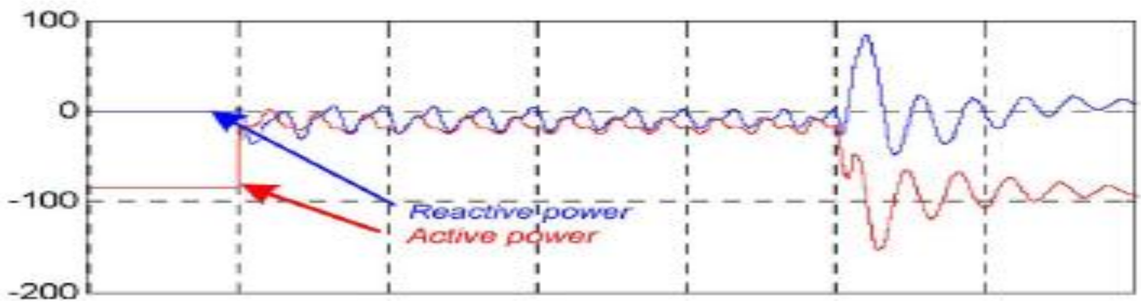


Fig. 2(b) The rotor current response when simulated for 20 % voltage sag with no crowbar operation

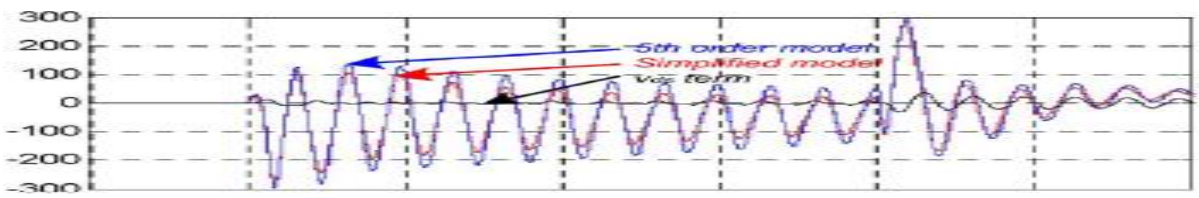
Behavior of DFIG model under three phase to ground fault, one phase to ground fault, two phase to ground fault with simplified and fifth order model as derived in [2] are as follows,



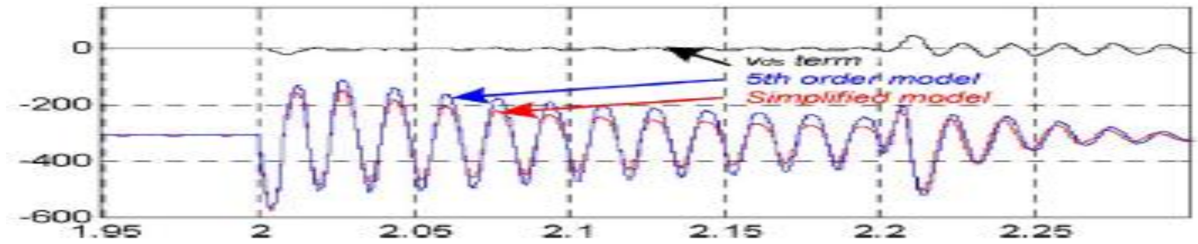
(a) Grid voltage waveforms



(b) Active and reactive power (in kVA).

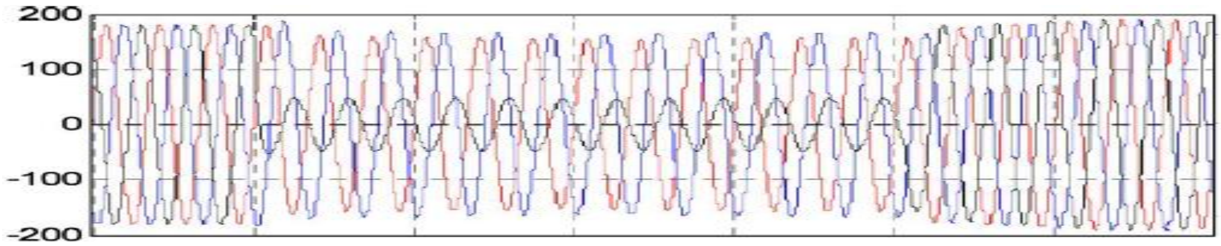


(c) i_{sq} performance

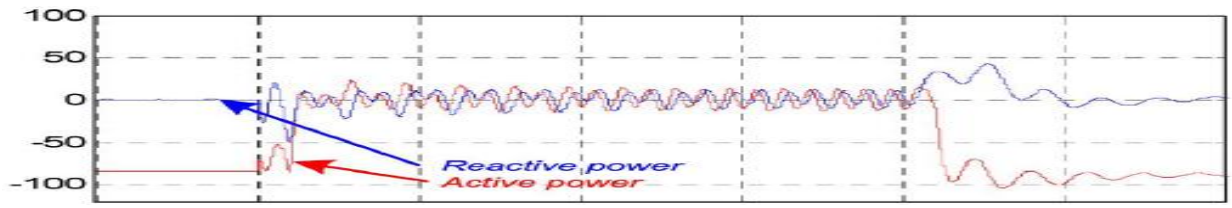


(d) i_{sd} performance

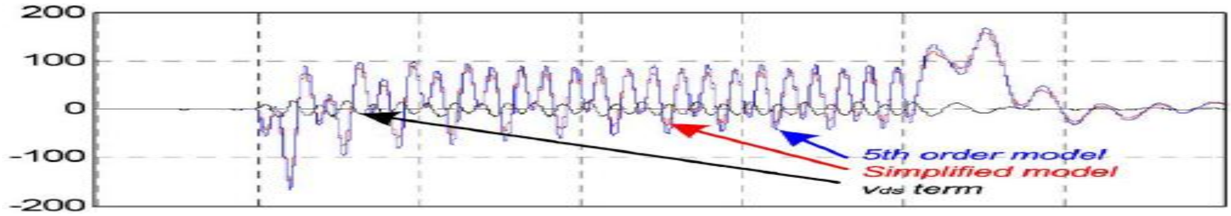
Fig. 3.1 Behavior of the DFIG models under three-phase-to-ground faults with the simplified and fifth-order models.



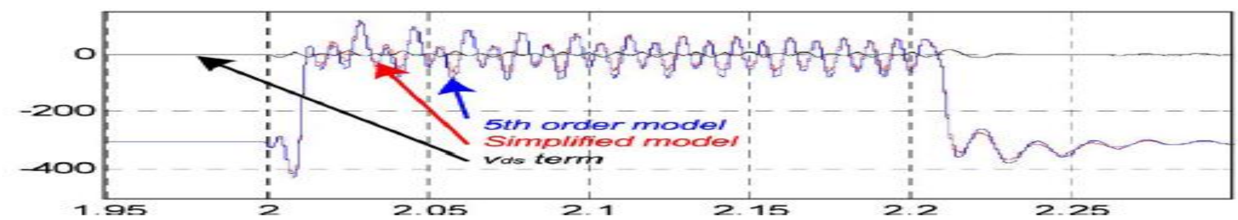
(a) Grid voltage waveforms.



(b) Active and reactive power (in kVA).

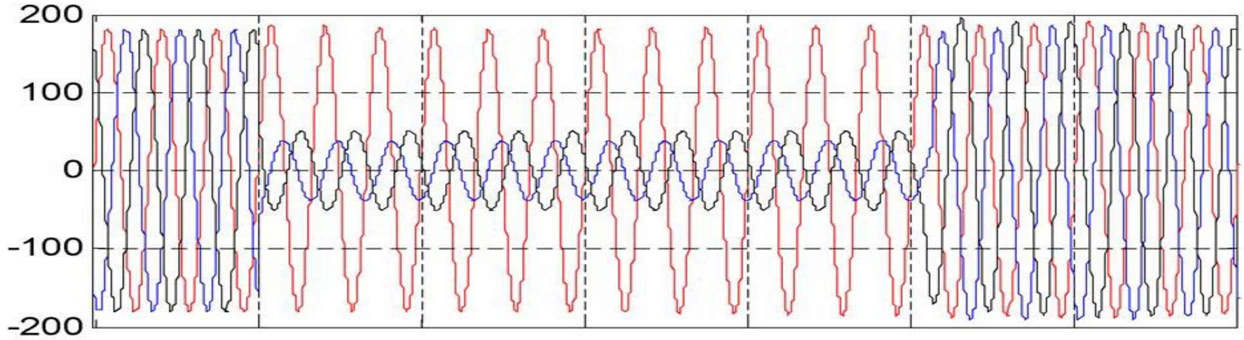


(c) i_{sq} performance

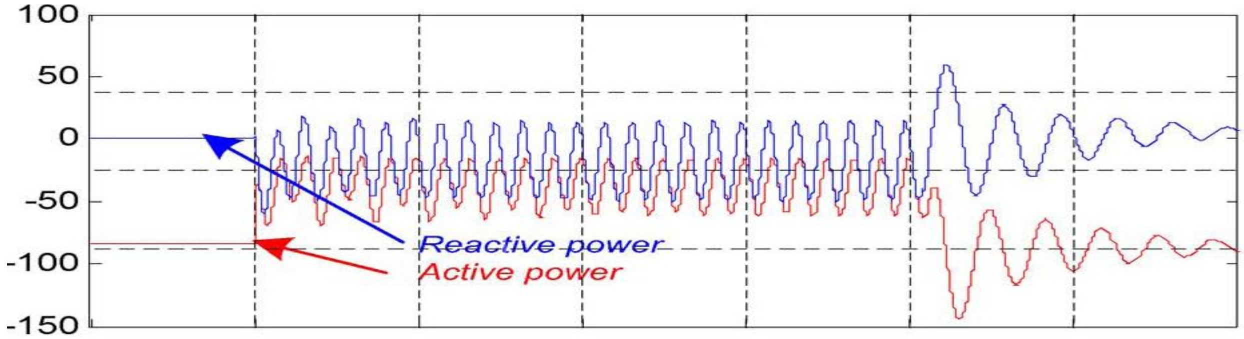


(d) i_{sd} performance

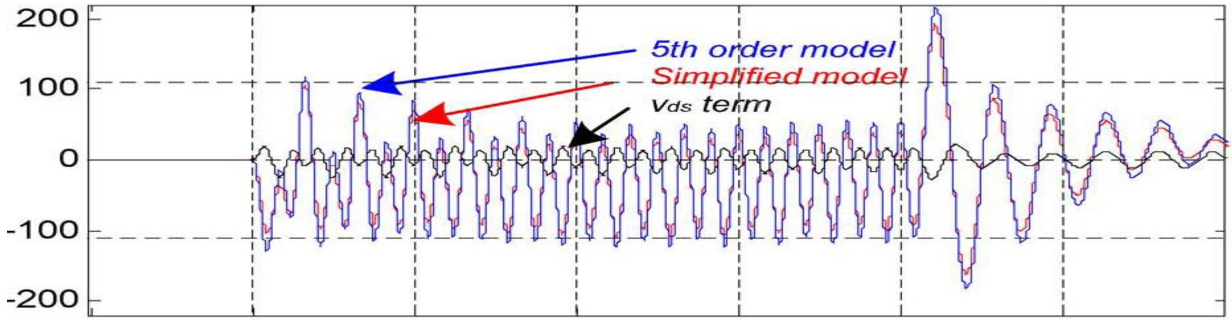
Fig.3.2 Behavior of the DFIG models under one-phase-to-ground faults with the simplified and fifth-order models.



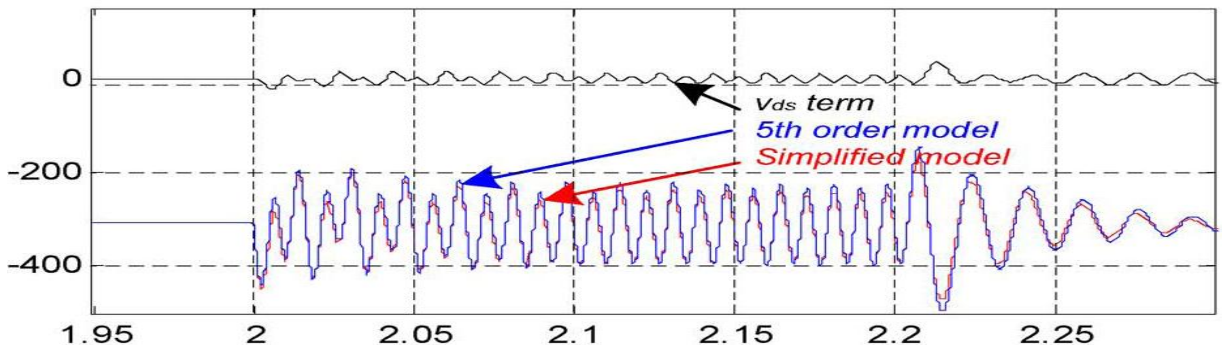
(a) Grid voltage waveforms.



(b) Active and reactive power (in kVA).



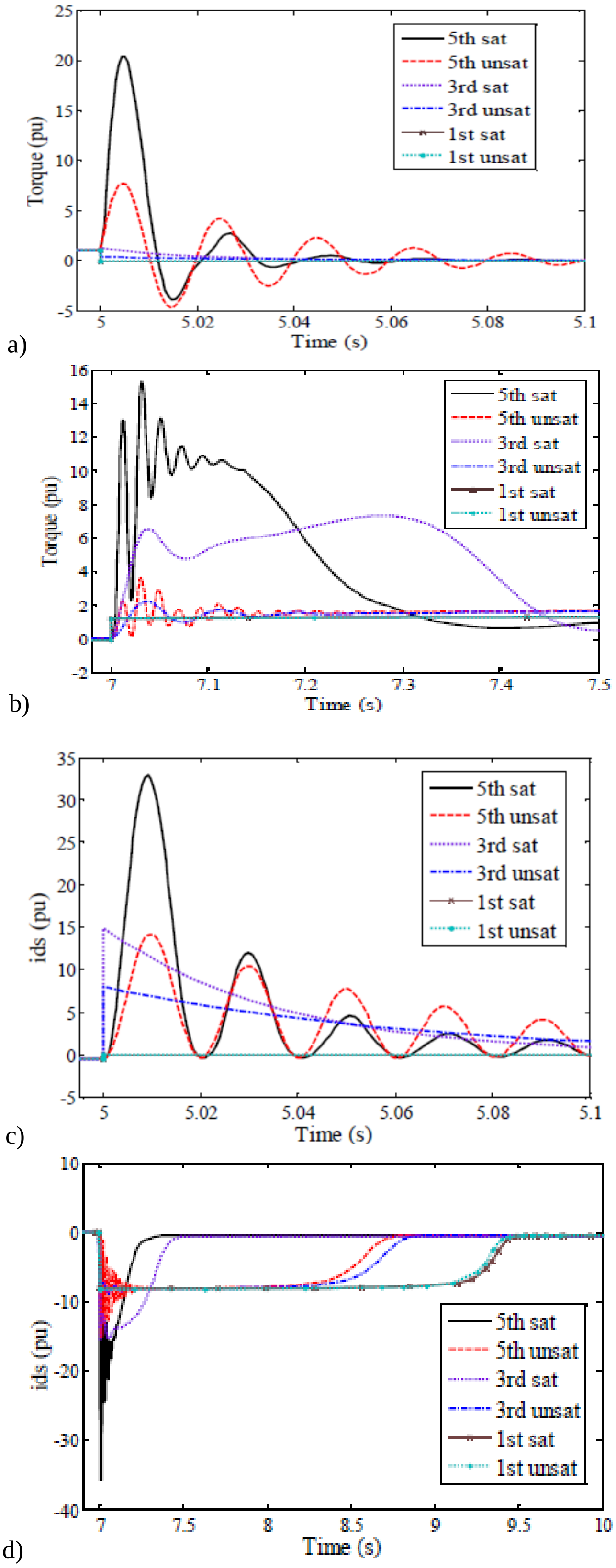
(c) i_{sq} performance



(d) i_{sd} performance

Fig. 3.3 Behavior of the DFIG models under two-phase-to-ground faults with the simplified and fifth-order models.

Following figure shows the simulation results obtained in [4] for Torque, ids, iqs, speed for fifth, third and first order model including and excluding saturation effect.


a)
Torque (pu)
Time (s)
5th sat
5th unsat
3rd sat
3rd unsat
1st sat
1st unsat
b)
Torque (pu)
Time (s)
5th sat
5th unsat
3rd sat
3rd unsat
1st sat
1st unsat
c)
ids (pu)
Time (s)
5th sat
5th unsat
3rd sat
3rd unsat
1st sat
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d)
ids (pu)
Time (s)
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3rd unsat
1st sat
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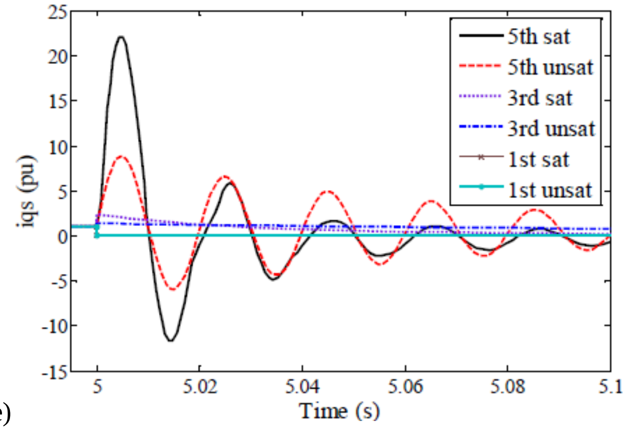
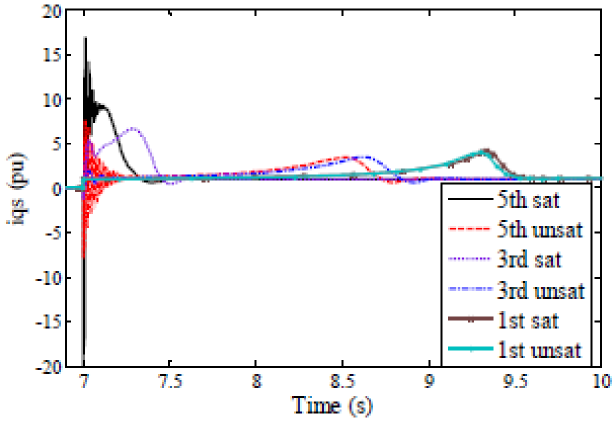
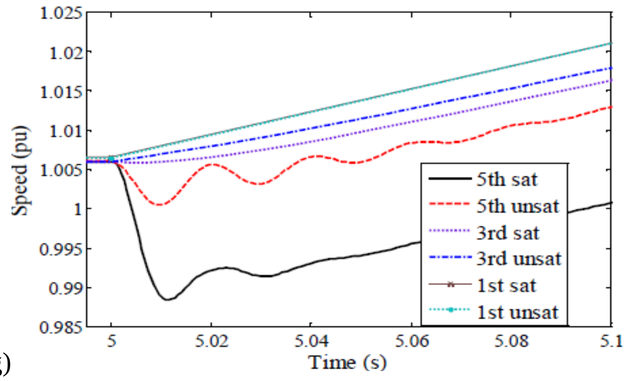


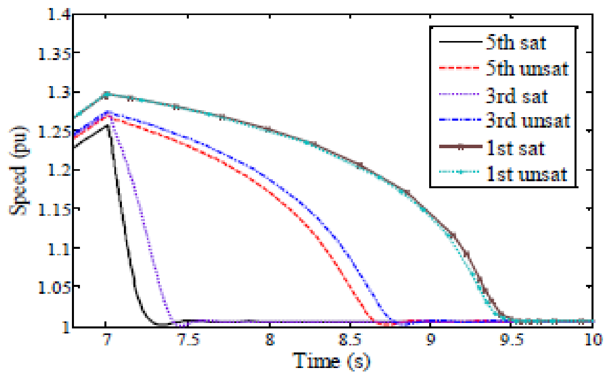
e)



f)



g)



h)

Fig. 4 DFIG transient response due to 50% voltage sag. (a) Torque at voltage sag occurrence, (b) torque at voltage recovery, (c) ids at voltage sag occurrence, (d) i_{ds} at voltage recovery, (e) i_{qs} at voltage sag occurrence, (f) i_{qs} at voltage recovery, (g) speed at voltage sag occurrence, and (h) speed at voltage recovery

IV. DISCUSSION

From the simulations in [2], the rotor current in pu appeared to be very similar to the stator current during the transient. When Machine is operated with increased short term rating of RSC components, the used control strategy and convertor ratings are the factors decide the rotor voltage applied to the DFIG during the network fault. From the fig.1 it can be seen that DFIG response during the fault is more elaborative in the 5th order generator model and includes the transient behavior of the stator current. The 3rd order model though gives a similar mean value of the stator current; details of the transient remain unobserved.In these results Stator flux transients in current, active and reactive power can be clearly traced in fifth order model which is not observed in third order, third order model appears not useful to account for operations of crowbar protection. If DFIG supports reactive power rotor phase A current is higher with fifth order model as seen in 2(a) instead overall peak rotor current is lower as seen in Fig. 2(b). Electrical torque and magnetization of the machine is controlled by q axis and d axis respectively with stator flux oriented reference frame. Fast stator flux change is allowed in third order due to ignored stator flux transients. [3][5] Compared to third order model, Transients in q axis current is higher & d axis current change is small with fifth order model attributes to higher rotor current in third order model. Abrupt stator flux change leads induction of higher rotor current in case of third order and a bit lower rotor current as stator flux change is slower.

For three phase fault, sudden reduction in voltage raises lower power injection in network which also has dependency on RSC control during fault. Perfect matching of dynamic performance of simplified model with fifth order model can be clearly observed in the behavior of i_{ds} and $i_{qs.}$ Oscillations seen in i_{ds} and i_{qs} due to low damping (conditioned by R_s of second order transfer function of eq.18 which is very low in DFIG) in the system. When stator winding is affected by one phase to ground and two phases to ground fault, causes negative sequence voltage translated in 120 Hz oscillations at stator which can be observed higher in second case. Noticeable points in the results are Oscillating V_{ds} which is ignored as its multiplied by lower terms compared to $_{Vqs}$ evidenced the low influence and results of the fifth order are accurately tracked by results of simplified model, precisely describe the dynamic behavior of the DFIG.Fig 4. Shows the simulation results obtained in [4]. At the occurrence of the fault current and torque increases with saturation. Oscillations aren't observed in third and first order model but noticeably in fifth order model. Difference between Saturation and unsaturated model becomes visible as the order increases, hardly noticed in first order. There isn't fall in rotor speed for third and first order models but decreases for saturated and unsaturated model of fifth order.After recovery of fault fifth order model appeared faster to reach steady state than third and first order model. Only transient response of speed, torque and current is affected by saturation and not the steady state.

Table 1. Simplifications used in different order model

Fifth order	Third order	First order
$d\psi_{sq(d)}/dt \neq 0$	$d\psi_{sq(d)}/dt = 0$	$d\psi_{sq(d)}/dt = 0$
$d\psi_{rq(d)}/dt \neq 0$	$d\psi_{rq(d)}/dt \neq 0$	$d\psi_{rq(d)}/dt = 0$
$d\omega_m/dt \neq 0$	$d\omega_m/dt \neq 0$	$d\omega_m/dt \neq 0$

Table 1 shows simplifications employed in various modeling orders at a glance [4]

V. CONCLUSION

If the FOM is used for time-domain simulation, small integration step sizes are required as a result of the small time constants involved. The small integration time step, in addition to the large number of differential equations especially for the grid, results in considerable simulation efforts when studying large systems. These disadvantages limit the applicability of the FOM to small grids. For classical, phasor domain electro-mechanical dynamic studies of large power systems the simplicity and reduced computation time of the 3rd order model appears attractive. For more detailed representations of fault current contribution and investigation of the required ratings of the converters then the 5th order representation may be preferred.Two simple second order transfer functions permit to carry out simulation of large scale wind energy applications. This lead to considerable reduction in computational time as compared to fifth order in simulating behavior of Multiple DFIG. Though complex model can also do, this model appears to be the intuitive estimator for designing strategies of sag response improvement of DFIG.The stator and rotor current of DFIG calculated considering saturation effect are much higher than the values calculated by ignoring it. Rotor speed of saturated model attains steady state value faster as compared to unsaturated models; saturated fifth order reaches faster than others.So saturation effect can be incorporated more importantly to study the transient performance of DFIG and doesn't prove that much useful for steady state.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Harmonic Analysis and Power Factor Correction For Food Processing Industry

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ABSTRACT

Harmonic analysis of the distribution system is essential to study the behavior of equipments connected in the non-sinusoidal system environment for designing and optimal location of filters. Harmonic distortion can have a significant impact on industrial customers such as additional losses and heating of certain network equipment, faulty operation of control equipment and interference in neighboring telecommunication system. In this case study harmonic analysis of food processing industry has done using harmonic analyzer 'YOKOGAVA'. The aim of the study was to improve the power factor, maintain harmonic distortion within acceptable levels and reduce possible resonance problem at the plant. Analysis of voltage and current harmonics is performed at distribution side point of common coupling before and after connecting APFC panel.

KEY WORDS: *APFC Panel, Energy Audit, Harmonics, Nonlinear load, Total Harmonic Distortion, Under loaded motors, Yokogava.*

I. INTRODUCTION

It is the objective of the electric utility to supply its customers with a sinusoidal voltage of fairly constant magnitude and frequency. To ensure compliance with the Grid Code [2] voltage and current distortion levels must satisfy limits set out by IEC 61000-3-6 [5]. In any industry, the three top operating expenses are often found to be on energy, labor and materials. If one were to find out the potential cost savings in each of the components, energy would invariably emerge at the top, and thus energy management function constitutes a strategic area for cost reduction. . Industries use a large amount of electrical energy, and that is why it is important to ensure a loss-free and energy-efficient system in industries [3]. In developing countries like India, where electrical energy resources are scarce and production of electricity is very costly, energy conservation studies are of great importance. Energy audit is the translation of conservation ideas into realities by blending technically feasible solutions with economic and other organizational considerations within a specified time frame [4]. An energy audit is a study of a plant or facility to determine how and where energy is used and to identify methods for energy savings. An energy audit was carried out under four major heads: (i) process section audit, (ii) Refrigeration section audit, (iii) power load audit (motors, compressor, etc.), and (iv) harmonic analysis. Readings were taken under these heads and analyzed to find the scope of energy conservation opportunities in the selected test case industrial unit.

II. AUDITING PROCEDURE

Energy audit cannot be successfully carried out without the commitment from the top management. Management must be firstly convinced of the necessity of implementing energy management and hence energy audit [7] . Energy audit consists of several tasks, which can be carried out depending on the type of the audit and the size and the function of the audited facility [8] . Therefore, an energy audit is not a linear process and is rather iterative. The audit described in this paper has been carried out based on the following functional activities:

- Walk-through survey
- Motor load survey used in various processes
- Harmonic analysis

III. FIELD VISITS AND MEASUREMENT WORK

Katraj Dairy is one of the oldest milk processing industry in Pune, Maharashtra. Readings for harmonic distortion and and for power factor improvement are taken with the help of YOKOGAWA(Harmonic Analyser) before and after connecting APFC Pannal.

3.1 Plant Electrical Energy Consumption

The energy consumption of the industry was identified in terms of the equipments and functional area wise. The results were obtained after measurements during the factory visits. Power analyzers, Harmonic Analyzer, clamp meters, etc. were used to measure the electrical energy consumption of the industry. The total load of the unit is approximately 1326.3 kW .

Sr.no	Sections	Connected load in HP
1	Air compressor section	182
2	Process section	349.5
3	Refrigeration section	882
4	Boiler section	120
5	E.T.P. section	180
6	Raw water sector	30
7	Ice cream plant	10
8	Illumination	15
	Total load in HP	1768.5
	Total load in KW	1326.3

TABLE.1 Total load of Katraj Dairy

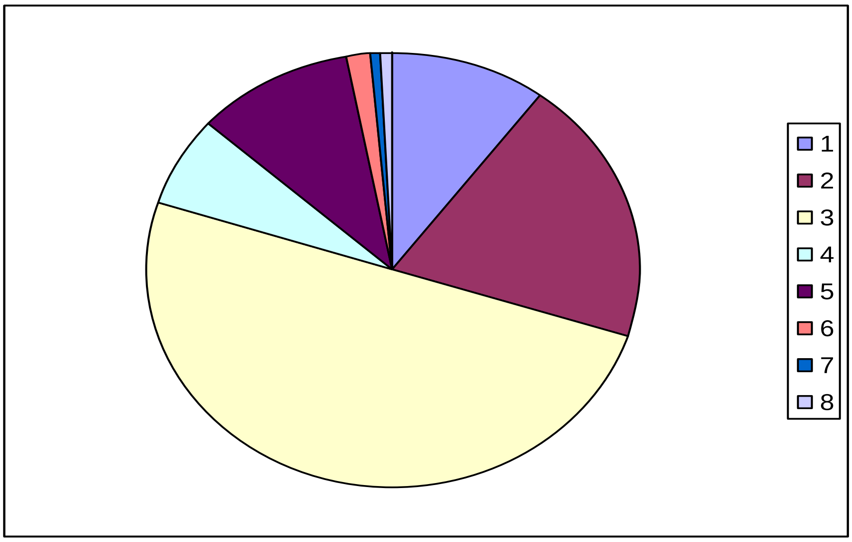

Fig.1Load division chart of Katraj Dairy

The following points can be observed from this survey:

- The major load in the plant is that of refrigeration, which constitutes approximately 66 % of the total load.
- Motor load constitutes approximately 38% of the total load.
- Total number of units consumed per month is 188380 after taking the average of 12 months.

3.3 Motor Survey

For most of the applications, three-phase, 4-pole, 1470- rpm induction motors of Kirloskar make have been used for various production processes in the plant. During survey and measurement process, it was observed that some of the motors are underloaded. And most of the motors used are energy efficient motors. Load on compressor where 45 KW,1460 rpm, 415V,80 amp,3ph,50 Hz motor is used is continuously varying between 40amp to 80 amp. Other motors have almost constant load on them.

3.4 Problems with Underloaded Motor

- An underloaded motor always runs at a low lagging power factor. If the motor is loaded around 50% of the rated load, power factor can be as low as 0.5 lagging. This means industry is utilizing only 50% of the power from the supply mains and paying for 100% if the billing is kVA based.
- Extra expenditure on installation of power factor improvement equipment to maintain the power factor within permissible limits set by the state electricity board needs to be done. Otherwise, penalty has to be paid.
- Efficiency of a standard induction motor is about 87-90% at the rated load and it reduces drastically at half of the rated load depending upon the size of the motor and loading (about 70-75% for 60 hp motor). This means motor will draw more current for the same mechanical output

IV. ENERGY-EFFICIENT MOTORS

More and more industries are switching to energy-efficient motors (EEMs) because EEMs lower the production costs. Just a small increase in motor efficiency can significantly lower the production costs. A motor can cost thousands of rupees a year to operate, so savings of even a few percent add up quickly. An EEM generates savings whenever it is running and as long as it lasts, which may be 20 years or more. EEMs cost more than the standard motors, but purchase price can be paled in comparison to a motor's operating costs. Since the annual operating cost of a motor is often 5-10 times its initial cost, the typical 3-5% higher efficiency of an EEM can more than offset its 15-20% higher initial cost over its life. In addition to costing less to operate, EEMs generally last longer, require less maintenance, and reduce system amperage draw. The efficiency curves of two EEMs are shown

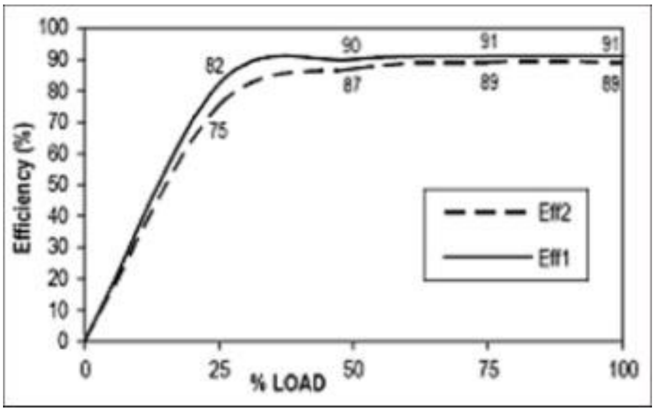

Figure 2: Efficiency of EEMs as per IS-12615 (Eff1 = 2-pole motor, Eff2 = 4-pole motor)

EEMs also offer other advantages, such as longer insulation life, longer lubrication interval, greater inertial acceleration, and higher service factors. In addition, they may be better equipped to handle heavy starting loads, large sustained loads, phase imbalances, voltage excursions, high ambient temperatures, and impaired ventilation. EEMs also do not add as much to air-conditioning loads as standard motors, since they do not give off as much heat.

4.1 Energy-efficient Motor's Performance

The efficiency of a motor is the ratio of the mechanical power output to the electrical power input. Design changes, better materials, and manufacturing improvements reduce motor losses, making premium or EEMs more efficient than the standard motors [Figure 2]. Reduced losses mean that an EEM produces a given amount of work with less energy input than a standard motor. In 1989, the National Electrical Manufacturers Association (NEMA) developed a standard definition for EEMs [10] . The definition was designed to help users identify and compare electric motor efficiencies on an equal basis.

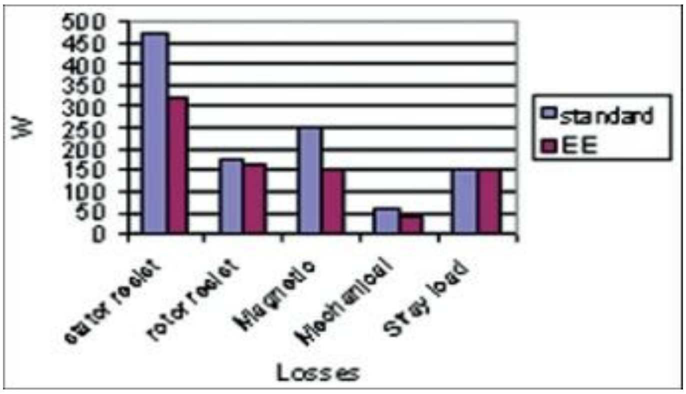

Figure 3: Losses comparison among standard and high efficiency motors [14]

V. Harmonic Analysis

Harmonics are one of the major concerns in a power system. Harmonics cause distortion in current and voltage waveforms resulting into deterioration of the power system. The first step for harmonic analysis is the harmonics from non-linear loads. The results of such analysis are complex. Over many years, much importance is given to the methods of analysis and control of harmonics. Harmonics present in power system also has non-integer multiples of the fundamental frequency and have aperiodic waveform. The harmonics are generated in a power system from two distinct types of loads.

First category of loads are described as linear loads. The linear time-invariant loads are characterized such that application of sinusoidal voltage results in sinusoidal flow of current. A constant steady-impedance is displayed from these loads during the applied sinusoidal voltage. As the voltage and current are directly proportional to each other, if voltage is increased it will also result into increase in the current. An example of such a load is incandescent lighting. Even if the flux wave in air gap of rotating machine is not sinusoidal, under normal loading conditions transformers and rotation machines pretty much meet this definition. Also, in a transformer the current contains odd and even harmonics including a dc component. More and more use of magnetic circuits over a period of time may get saturated and result into generation of harmonics. In power systems, synchronous generators produce sinusoidal voltages and the loads draw sinusoidal currents. In this case, the harmonic distortion is produced because of the linear load types for sinusoidal voltage is small.

Non-linear loads are considered as the second category of loads. The application of sinusoidal voltage does not result in a sinusoidal flow applied sinusoidal voltage for a non-linear devices. The non-linear loads draw a current that may be discontinuous. Harmonic current is isolated by using harmonic filters in order to protect the electrical equipment from getting damaged due to harmonic voltage distortion. They can also be used to improve the power factor. The harmful and damaging effects of harmonic distortion can be evident in many different ways such as electronics miss-timings, increased heating effect in electrical equipments, capacitor overloads, etc. There can be two types of filters that are used in order to reduce the harmonic distortion i.e. the active filters and the passive filters. Active harmonic filters are electronic devices that eliminate the undesirable harmonics on the network by inserting negative harmonics into the network. The goal of harmonic studies is to quantify the distortion in voltage and current waveforms in the power system of industrial units. The results are useful for evaluating corrective measures and troubleshooting harmonic related problems.

5.1 Effects of Harmonics on Networks [10]

- Overloading of neutral conductor
- Reduced efficiency of motors
- Malfunctioning of control equipment
- Poor power factor of the total system due to introduction of distortion power factor
- Overloading of power factor capacitors
- Increase in kVA demand of the plant due to increase in rms current drawn

VI. RESULTS:

Following results are obtained before after connecting APFC panel.
Total consumption for FEB- 2013 is 139300.
KVA demand is 419. MSEB charges 190Rs. Per KVA for industrial load.
Total electricity bill including (TOD tariff, Electricity Duty and other charges) is 10,36,033.06 Rs.
They are getting power factor incentive 67,848.40Rs.
Total current bill is 9,68,184.66 Rs.

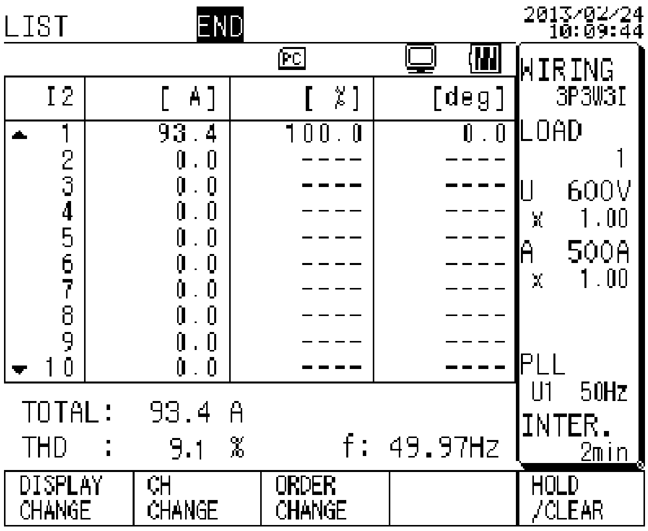

Figure (4) Without APFC panel connected THD = 9.1 %

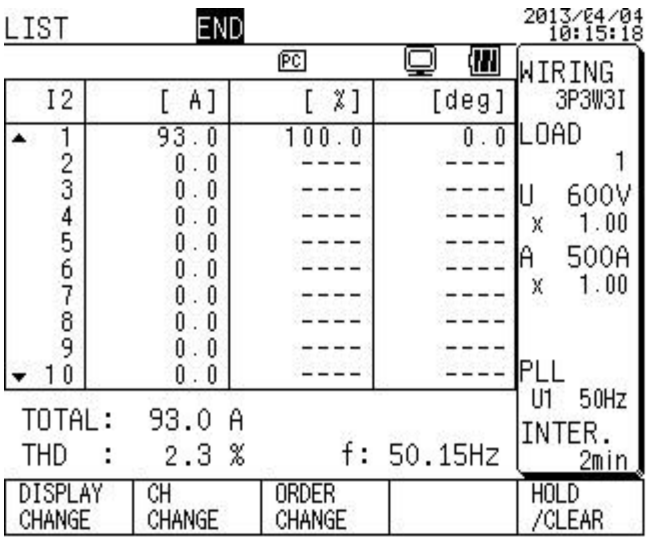

Figure (5) With APFC panel with the system THD = 2.3 %

VII. CONCLUSION

On the basis of Harmonic analysis study & electrical energy audit conducted, the following recommendations have been suggested to the consumer:

- In due course of time, if any motor gets damaged or some new motor is to be purchased, EEMs should be purchased.
- Harmonic components at PCC are greater than the permissible limits. Therefore, the consumer must install harmonic filter to improve the power quality and save the penalty on harmonic emission.
- Harmonic component across individual loads is much higher where variable frequency drives are used, which reflects at the PCC, so a more in-depth analysis is required and a harmonic filter can be designed.
- It is also shown in this paper that the proposed PFC capacitor banks can be tuned to act as harmonic filters and operate to reduce the harmonic distortion to acceptable levels. It is recommended that the PFC capacitor banks be tuned to act as harmonic filters and also that upon completion of the plant expansion harmonic measurement are taken to meet the grid code requirement. Proper size of motor should be used, as per the rated load. If possible, motor should be replaced with a proper size motor in a phased manner.

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Reduction In Harmonic Distortion Of The System Using Active Power Filter In Matlab/Simulink.

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ABSTRACT

A different type of load draws non-sinusoidal current from the mains, degrading the power quality by causing harmonic distortion. These nonlinear loads appear to be prime sources of harmonic distortion in a power system. In addition, the harmonic currents produced by nonlinear loads can interact adversely with a wide range of power system equipment, most notably capacitors, transformers, and motors, causing additional losses, overheating, and overloading and interferences. The aim of this paper is to review an active power filter that commonly used to mitigate harmonics. Thus, to solve this harmonics problems The system is verified by simulation using Matlab/Simulink simulation package. The paper starts with a brief overview of harmonic distortion problems and their impacts on electric power quality, how the active power filter mitigate this problems and the verifying using Matlab software. The proposed filter minimizes the harmonic distortion is within an acceptable range.

KEYWORDS: *Active power filter, current harmonic, load, Matlab, non-linear load, power quality, Total harmonic distortion.*

I. INTRODUCTION

Industrial electronic devices and non linear loads are the major cause of harmonic generation. As the current drawn from the supply no longer remains sinusoidal, thus the resultant waveform is made up of a number of different waveforms of different frequencies, harmonics are a major cause of power supply pollution lowering the power factor and increasing the electrical losses, which may causes a premature equipment failure and higher rating requirement for equipment[10], in a non linear load current and applied voltage are not proportional to each other, when sinusoidal voltage is applied to a nonlinear resistor, we get the resulting current distorted, few percent of increase in a voltage may cause the current to double and take on a different waveshape. This is the main source of harmonic distortion in a power system.[1] modern electrical system is with number of power electronic devices those are nothing but a non linear load which may causes a disturbance in a mains ac current, due to which power system may suffers from adverse effect therefore it has become necessary to reduce harmonic distortion for utilities as well as users[7]. Harmonic distortion in power distribution systems can be suppressed using various techniques such as, by using passive and active filter. Passive filter causes resonance problem, thus affecting the stability of the power distribution systems. Where as an active power filter is to utilize power electronics technologies to produce specific currents components that cancel the harmonic currents components caused by the nonlinear load[2].

1.1.IEEE standard for Harmonic:

The limit on harmonic voltage and current based on IEEE standard 519-1992 [11]. It should be emphasized that the philosophy behind this standard seeks to limit the harmonic injection from individual customers so that they do not create unacceptable voltage distortion under normal system characteristics and to limit overall harmonic distortion in the voltage supplied by the utility. Harmonic filters are applied at different points where power pollution due to harmonics is observed above the desirable limits as recommended by IEEE 519 standard[10].

1.1.Advantages of active filter over passive filter:-

1) Active filter do not resonate with the system where as passive filters resonate with system.
2) They can work independently of the system impedance characteristics and therefore they can be used in very difficult circumstances where passive filters can not operate successfully because of parallel resonance problems[2].
3) They can address more than one harmonic at a time and fight with other power quality problems also
4) They can be programmed to correct harmonics as well as power factor.

1.2.Comparision of passive filter and active filter:

	Passive filter	**Active filter**
Harmonic control by order	Very difficult	Possible via parameters
Harmonic current control	Requires filter for each frequency	Simultaneously monitors many frequencies
Dimension	Large	Small
Weight	High	Low
Influences of a frequency variation	Reduced effectiveness	No effect

Table 1.

1.3.Active Power filter:

Active filter uses harmonic reduction techniques to improve the quality of power, by injecting equal current or voltage distortion into the network but in opposite magnitude, which automatically cancels the actual distortion presented in the circuit. Active Power filters utilize fast-switching insulated gate bipolar transistors (IGBTs) bridge, which produces an output current of the preferred shape such that whenever they are injected into the AC lines, it cancels the original load-generated harmonics. The most important part of the active power filter is the controller part. The improvement of the performance and stability of the filter gate vary as the different control strategies applied to the Active power filter, Therefore control strategies plays an important role in improving the performance and stability of the system. Usually active harmonic filter are designed with two types of control scheme.

1) They performs fast Fourier transforms to calculate the amplitude and phase angle of each harmonic order. The power devices are directed to produce a current of equal amplitude but opposite phase angle for specific harmonic orders.
2) In this method of control is often referred to as full spectrum cancellation in which the full current waveform is used by the controller of the filter, which removes the fundamental frequency component and directs the filter to inject the inverse of the remaining waveform[5].

Active harmonic filter reduces harmonics which are existing due to non linear load in the power system as shown in fig.1 as the non linear load is connected to the generators and motors which are nothing but the sources of harmonics to distort the current and voltage waveform, so it is active power filter who has contractual obligation to confiscate the distortion from the waveform and improve the power quality. The basic thought is to replace the portion of the sine wave that is missing in the current in non-linear load. An electronic control monitors the line voltage and current, by precisely switching the power electronic devices to approach the load voltage or current and force it to be sinusoidal. Active filters can be programmed in a such way that, they correct power factor as well as harmonic distortion. So therefore it is essential to evaluate the parameters of the filter which is to be designed.

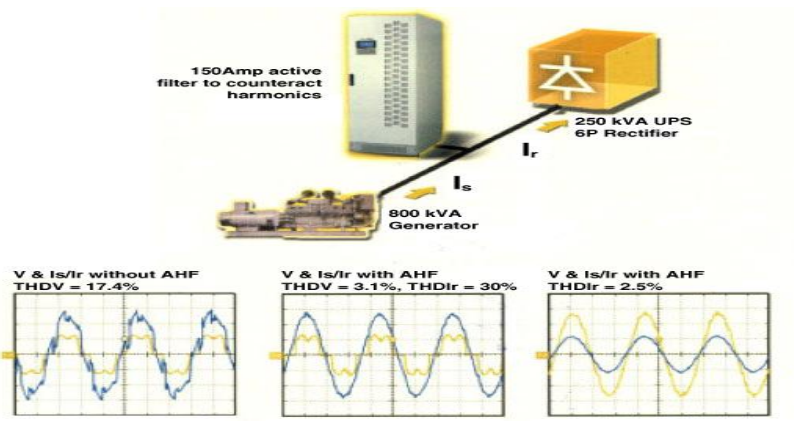

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Fig. 1

II. SYSTEM WITHOUT ACTIVE POWER FILTER:

In modern electrical system there are various types of load as the system supplies power to the different types of load such as

a. Commercial loads: single phase power supplies, fluorescent lightning, adjustable speed drives.
b. Industrial loads: three phase power converters, DC drives, AC drives, arcing devices, saturable devices.

Due to such sources of harmonics, they produces harmonic distortion which effects the imperative equipment like capacitors, transformer, motors, telecommunication, impact on energy and demand metering[2]. The system without filter in Fig. 2 has many distortions which are blamed for many power quality disturbances with high frequency component, it increases closer to the load. mostly harmonics are occurred in a steady state condition and are integer multiple of the frequency.

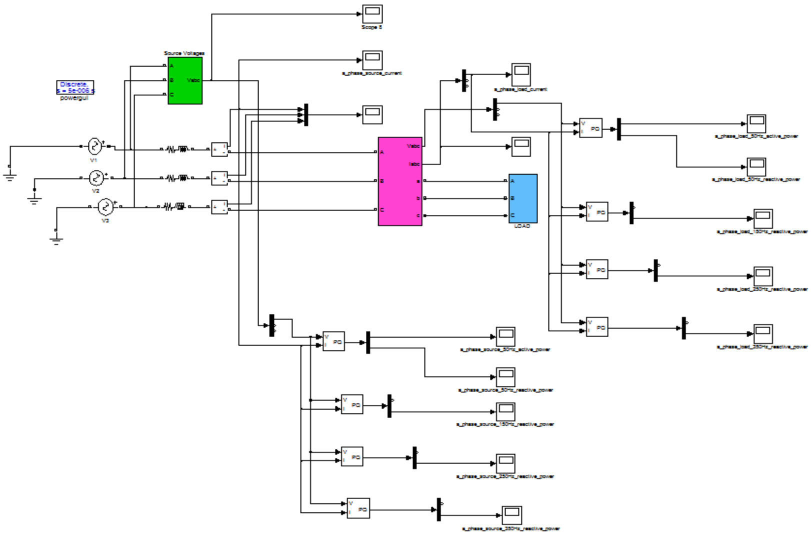

Fig. 2

III. SYSTEM WITH ACTIVE POWER FILTER:

In an active power filter, a harmonics to be eliminated is determined by a controller. The output of this controller is the reference of a three-phase current controlled inverter. In modernelectrical system nonlinear load is connected to the power system and is supplied by the non sinusoidal current .The active power filter is connected in parallel to the mains, on the point of common coupling PCC, and supplies the current harmonics needed to maintain the source current sinusoidal. Traditionally active power filter shunt active filters were proposed as a means of removing[12]

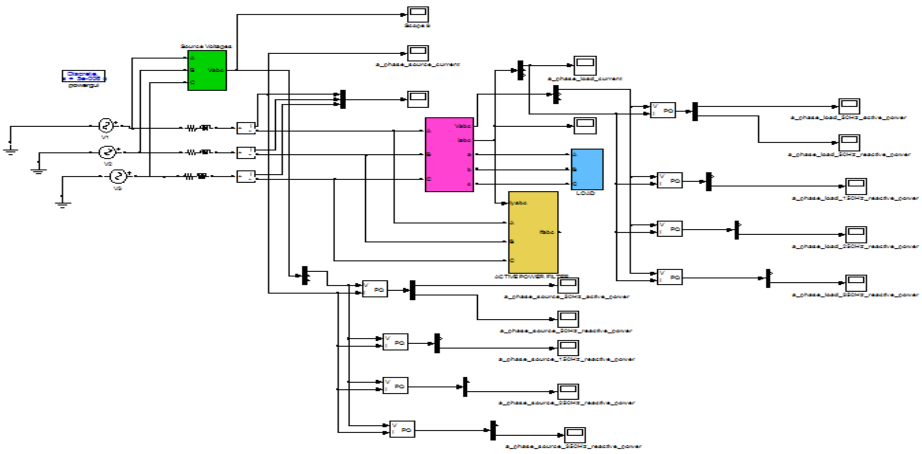

Fig. 3

Active power filter reduces the total harmonic distortion in the system so that the quality of power get enhanced, and this is utterly depends on the filter which is to be designed for the system. Fig. 3 shows the configuration of the system with active power filter, number of scopes connected to the system to see the variations due to harmonic in the current, voltage, active and reactive power waveform at number of harmonic frequency(for 3rd harmonic, frequency equals to 150Hz, for 5th harmonic frequency equals to 250Hz).

3.1.Result:

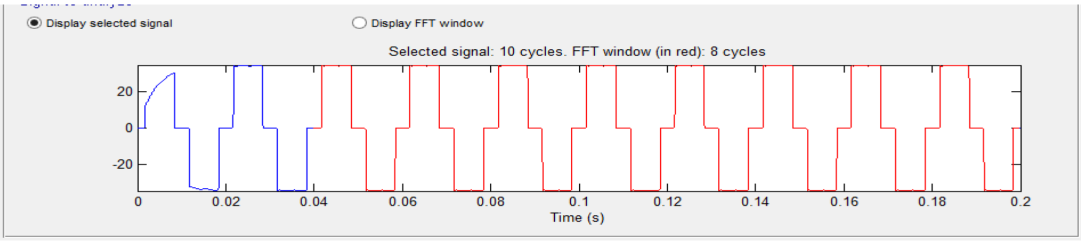

Fig. 4 System signal which is to be analyzed (without filter)

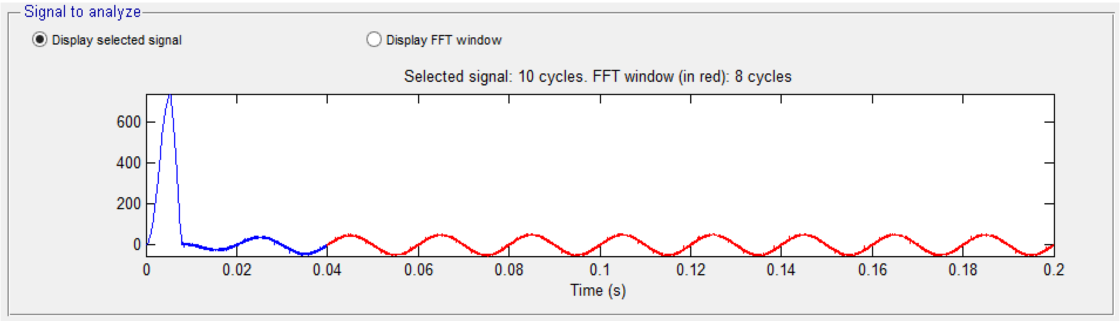

Fig. 5 System signal which is to be analyzed (with filter)

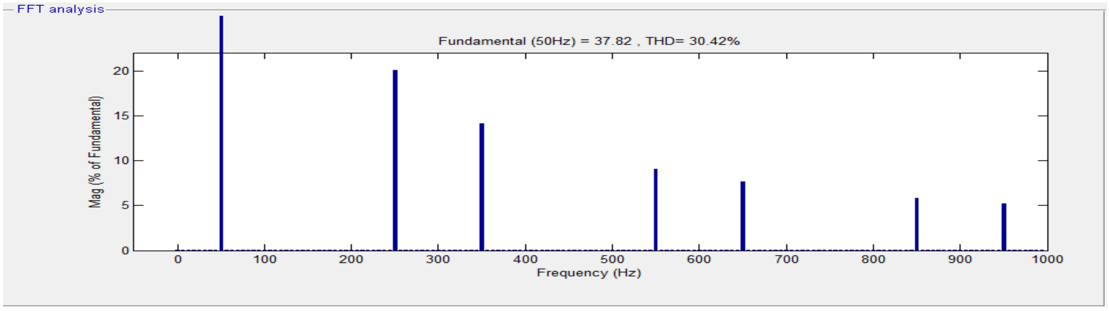

Fig. 6 Bar representation of the signal (without filter)

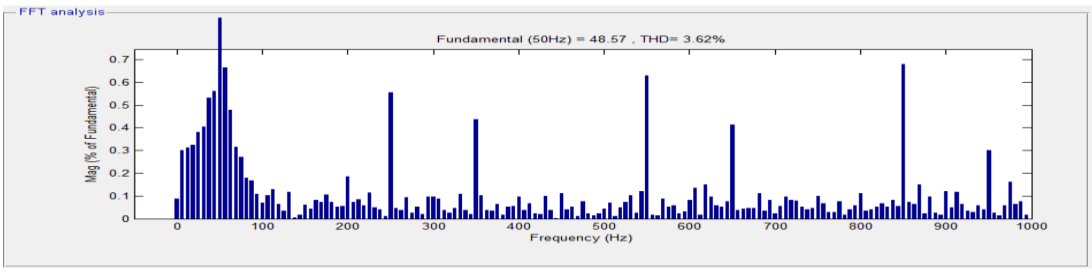

Fig. 7 Bar representation of the signal (with filter)

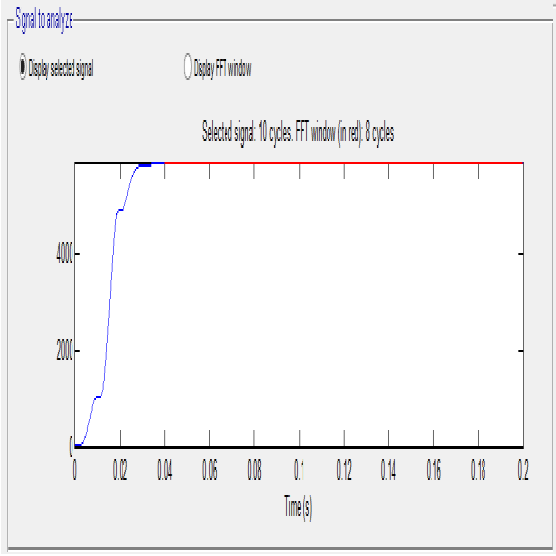

Fig.8 Signal to analyze without filter

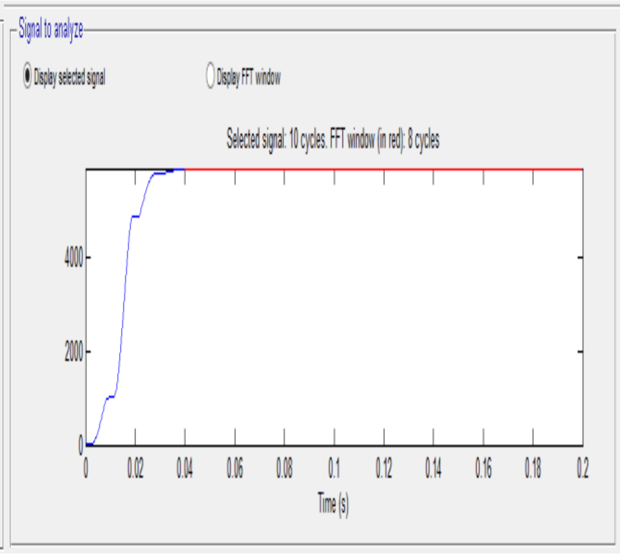

Fig.9 Signal to analyze with filter

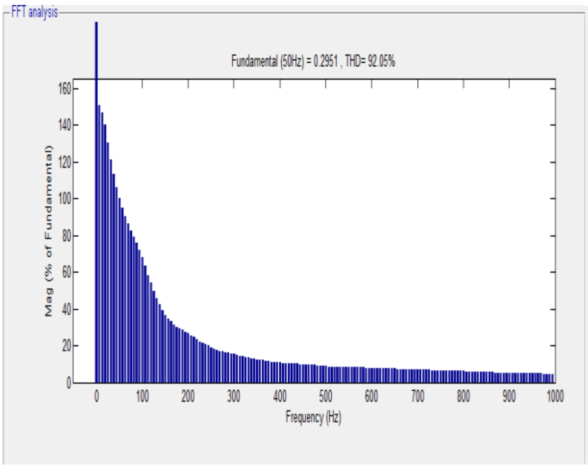

Fig.10 Bar representation of the signal

(without filter)

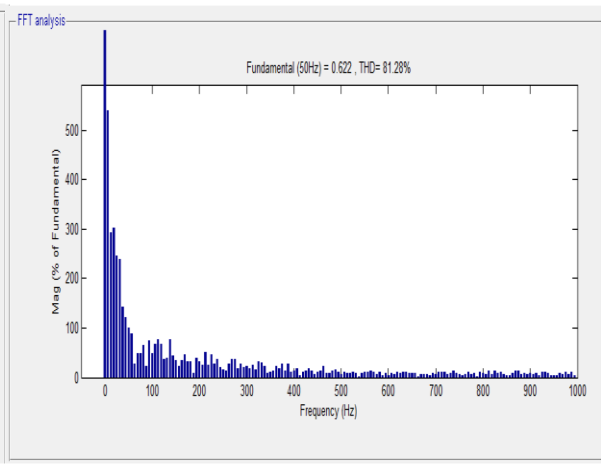

Fig.11 Bar representation of the signal

(with filter)

The bar representations(fig. 6 and fig. 7) of signals(fig. 4 and fig. 5) shows the difference in total harmonic distortion between the system with and without active power filter, total harmonic distortion was 30.42% before implementing active filter and total harmonic distortion get reduces to 3.62% after the implementation of active harmonic filter. Similarly in fig. 10 and 11 having a same signal but first one is without active power filter, and the other one is with active power filter, 11% of reduction in harmonic distortion.

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Efficient Triple Connected Domination Number of a Graph

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ABSTRACT

The concept of triple connected graphs with real life application was introduced in [16] by considering the existence of a path containing any three vertices of a graph G. In [3], G. Mahadevan et. al., was introduced the concept of triple connected domination number of a graph. A subset S of V of a nontrivial connected graph G is said to be triple connected dominating set, if S is a dominating set and the induced sub graph <S> is triple connected. The minimum cardinality taken over all triple connected dominating sets is called the triple connected domination number and is denoted by γ_{tc}. A subset S of V of a nontrivial graph G is said to be an efficient dominating set, if every vertex is dominated exactly once. The minimum cardinality taken over all efficient dominating sets is called the efficient domination number and is denoted by γ_e. In this paper we introduce new domination parameter efficient triple connected domination number of a graph with real life application. A subset S of V of a nontrivial connected graph G is said to be an efficient triple connected dominating set, if S is an efficient dominating set and the induced subgraph <S> is triple connected. The minimum cardinality taken over all efficient triple connected dominating sets is called the efficient triple connected domination number and is denoted by γ_{etc}. We also determine this number for some standard graphs and obtain bounds for general graph. Its relationship with other graph theoretical parameters are also investigated.

KEY WORDS: *Domination Number, Triple connected graph, Triple connected domination number, Efficient triple connected domination number.*

AMS (2010): *05C69*

REAL LIFE APPLICATION OF TRIPLE CONNECTED DOMINATION NUMBER[3] AND EFFICIENT TRIPLE CONNECTED DOMINATION NUMBER

The concept of triple connected graphs with real life application was introduced in [16] by considering the existence of a path containing any three vertices of a graph G. In [3], G. Mahadevan et. al., was introduced the concept of triple connected domination number of a graph. In this paper we introduce new domination parameter efficient triple connected domination number of a graph with real life application.

Suppose we want to locate the three armed forces (Army, Air, Navy) along the border of a country. First we construct a graph whose nodes (Vertices) indicating the critical areas and the edges indicating the paths which are connecting the critical areas of the border. Check whether this graph is triple connected or not.

Case (i)

If the constructed graph is triple connected, then any of the three armed forces (Army, Air, Navy) can locate their strategy in any of the three nodes (i.e.,) the critical areas so that if anyone of the three armed force needs help from the other two forces then it can be call them immediately.

Case (ii)

If the constructed graph is not triple connected, then construct a triple connected dominating set (or efficient triple connected dominating set) in the graph and then the three armed forces (Army, Air, Navy) can locate their strategy in any of the three nodes in the triple connected dominating set (or efficient triple connected dominating set) of the graph so that the critical areas dominated by the triple connected dominating set can contact at least one force directly (exactly one in the case of efficient triple connected dominating set) and the other two forces can be called by that force if necessary.

Case (iii)

If the constructed graph is neither triple connected nor we can find a triple connected dominating set in the graph, then do some necessary corrections in the construction (either by increasing the edges or by increasing the nodes) and make the constructed graph is triple connected or there can find a triple connected dominating set (or efficient triple connected dominating set).

I. INTRODUCTION

By a **graph** we mean a finite, simple, connected and undirected graph G(V, E), where V denotes its vertex set and E its edge set. Unless otherwise stated, the graph G has p vertices and q edges. **Degree** of a vertex v is denoted by d(v), the **maximum degree** of a graph G is denoted by $\Delta(G)$. We denote a **cycle** on p vertices by $C_{p,}$ a **path** on p vertices by P_p, and a **complete graph** on p vertices by K_p. A graph G is **connected** if any two vertices of G are connected by a path. A maximal connected subgraph of a graph G is called a **component** of G. The number of components of G is denoted by $\omega(G)$. The **complement** $\bar{G}$ of G is the graph with vertex set V in which two vertices are adjacent if and only if they are not adjacent in G. A **tree** is a connected acyclic graph. A **bipartite graph** (or **bigraph**) is a graph whose vertex set can be divided into two disjoint sets V_1 and V_2 such that every edge has one end in V_1 and another end in V_2. A **complete bipartite graph** is a bipartite graph where every vertex of V_1 is adjacent to every vertex in V_2. The complete bipartite graph with partitions of order $|V_1|=m$ and $|V_2|=n$, is denoted by $K_{m,n}$. A **star**, denoted by $K_{1,p-1}$ is a tree with one root vertex and p – 1 pendant vertices. The **open neighbourhood** of a set S of vertices of a graph G, denoted by N(S) is the set of all vertices adjacent to some vertex in S and $N(S) \cup S$ is called the **closed neighbourhood** of S, denoted by N[S]. A **cut – vertex (cut edge)** of a graph G is a vertex (edge) whose removal increases the number of components. A **vertex cut**, or **separating set** of a connected graph G is a set of vertices whose removal results in a disconnected. The **connectivity** or **vertex connectivity** of a graph G, denoted by $\kappa(G)$ (where G is not complete) is the size of a smallest vertex cut. A connected subgraph H of a connected graph G is called a **H -cut** if $\omega(G – H) \geq 2$. The **chromatic number** of a graph G, denoted by $\chi(G)$ is the smallest number of colors needed to colour all the vertices of a graph G in which adjacent vertices receive different colour. For any real number x, $\lfloor x \rfloor$ denotes the largest integer less than or equal to x. A **Nordhaus -Gaddum-type** result is a (tight) lower or upper bound on the sum or product of a parameter of a graph and its complement. Terms not defined here are used in the sense of [13].

A subset S of V is called a **dominating set** of G if every vertex in $V - S$ is adjacent to at least one vertex in S. The **domination number** $\gamma(G)$ of G is the minimum cardinality taken over all dominating sets in G. A dominating set S of a connected graph G is said to be a **connected dominating set** of G if the induced sub graph <S> is connected. The minimum cardinality taken over all connected dominating sets is the **connected domination number** and is denoted by γ_c.

Many authors have introduced different types of domination parameters by imposing conditions on the dominating set [17, 18]. Recently, the concept of triple connected graphs has been introduced by Paulraj Joseph J. et. al.,[16] by considering the existence of a path containing any three vertices of G. They have studied the properties of triple connected graphs and established many results on them. A graph G is said to be **triple connected** if any three vertices lie on a path in G. All paths, cycles, complete graphs and wheels are some standard examples of triple connected graphs. In[3], G. Mahadevan et. al., was introduced the concept of triple connected domination number of a graph. A subset S of V of a nontrivial graph G is said to be a **triple connected dominating set**, if S is a dominating set and the induced subgraph <S> is triple connected. The minimum cardinality taken over all triple connected dominating sets is called the **triple connected domination number** of G and is denoted by $\gamma_{tc}(G)$. Any triple connected dominating set with γ_{tc} vertices is called a γ_{tc} **-set** of G. In[4, 5, 6, 7, 8, 9, 10, 11, 12] G. Mahadevan et. al., was introduced **complementary triple connected domination number, complementary perfect triple connected domination number**, **paired triple connected domination number, restrained triple connected domination number, triple connected two domination number, dom strong triple connected domination number, strong triple connected domination number, weak triple connected domination number, triple connected complementary tree domination number of a graph** and investigated new results on them.In this paper, we use this idea to develop the concept of **efficient triple connected dominating set** and **efficient triple connected domination number of a graph.**

Theorem 1.1 [16] A tree T is triple connected if and only if $T \cong P_p$; $p \geq 3$.

Theorem 1.2 [16] A connected graph G is not triple connected if and only if there exists a H -cut with $\omega(G - H) \geq 3$ such that $|V(H) \cap N(C_i)| = 1$ for at least three components C_1, C_2, and C_3 of G – H.

Notation 1.3 [16] Let *G* be a connected graph with *m* vertices $v_1, v_2, \ldots, v_m$. The graph obtained from *G* by attaching n_1 times a pendant vertex of P_{l_1} on the vertex v_1, n_2 times a pendant vertex of P_{l_2} on the vertex v_2 and so on, is denoted by $G(n_1P_{l_1}, n_2P_{l_2}, n_3P_{l_3}, \ldots, n_mP_{l_m})$ where $n_i, l_i \geq 0$ and $1 \leq i \leq m$.

II. EFFICIENT TRIPLE CONNECTED DOMINATION NUMBER OF A GRAPH

Definition 2.1 A subset *S* of *V* of a nontrivial graph *G* is said to be a *efficient triple connected dominating set*, if *S* is a efficient dominating set and the induced subgraph <*S*> is triple connected. The minimum cardinality taken over all efficient triple connected dominating sets is called the *efficient triple connected domination number* of *G* and is denoted by $\gamma_{etc}(G)$. Any efficient triple connected dominating set with γ_{etc} vertices is called a γ_{etc} -set of *G*.

Example 2.2 For the graph G_1 in figure 2.1, $S = \{v_1, v_2, v_7\}$ forms a γ_{etc} -set of G_1. Hence $\gamma_{etc}(G_1) = 3$.

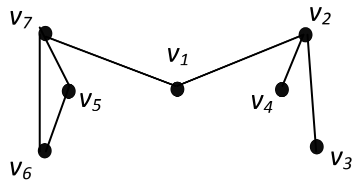


Figure 2.1 : Graph with $\gamma_{etc} = 3$.
G_1

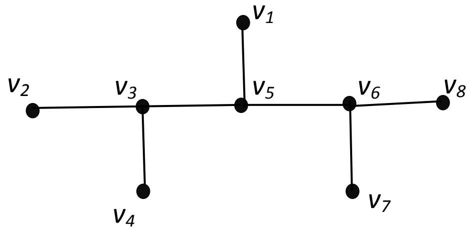
Observation 2.3 Efficient Triple connected dominating set (γ_{etc} -set or etcd set) does not exists for all graphs and if exists, then $\gamma_{etc}(G) \geq 3$.

Example 2.4 For K_5, there does not exists any efficient triple connected dominating set.

Remark 2.5 Throughout this paper we consider only connected graphs for which efficient triple connected dominating set exists.

Observation 2.6 The complement of the efficient triple connected dominating set need not be a efficient triple connected dominating set.

Example 2.7 For the graph G_2 in figure 2.2, $S = \{v_3, v_5, v_6\}$ forms a efficient triple connected dominating set of G_2. But the complement $V - S = \{v_1, v_2, v_4, v_7, v_8\}$ is not a efficient triple connected dominating set.



G_2

Figure 2.2: Graph in which V – S is not an etctd set

Observation 2.8 Every efficient triple connected dominating set is a dominating set but not conversely.

Example 2.9 For the graph G_3 in figure 2.3, $S = \{v_1, v_2, v_3\}$ forms the efficient triple connected dominating set as well as the dominating set of G_3. For the graph G_4 in figure 2.3, $S = \{v_7\}$ is a dominating set but not an efficient triple connected dominating set of G_3.

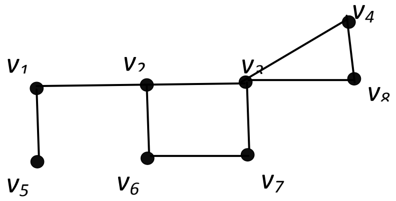
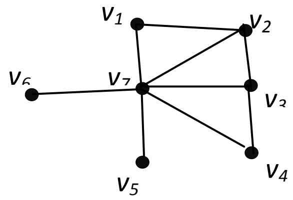


Figure 2.3



G₃ ***G₄***

Theorem 2.10 If the induced subgraph of each connected dominating set of *G* has more than two pendant vertices, then *G* does not contain an efficient triple connected dominating set.

Proof The proof follows from *theorem 1.2*.

Exact value for some standard graphs

1) For any cycle of order $p \geq 3$, $\gamma_{etc}(C_p) = \begin{cases} p & \text{if } p < 5 \\ p-2 & \text{if } p \geq 5. \end{cases}$
2) For any path of order $p \geq 3$, $\gamma_{etc}(P_p) = \begin{cases} p & \text{if } p = 3 \\ p-1 & \text{if } p = 4 \\ p-2 & \text{if } p \geq 5. \end{cases}$
3) For any complete graph of order $p \geq 3$, $\gamma_{etc}(K_p) = p$.
4) For any complete bipartite graph of order $p \geq 4$, $\gamma_{etc}(K_{m,n}) = p$, (where $m + n = p$).
5) For any star of order $p \geq 3$, $\gamma_{etc}(K_{1,n}) = 3$, (where $n+1 = p$).
6) For any wheel graph of order $p \geq 3$, $\gamma_{etc}(W_p) = p$.

Exact value for some special graphs

1) The **Möbius–Kantor graph** is a symmetric bipartite cubic graph with 16 vertices and 24 edges as shown in figure 2.4.

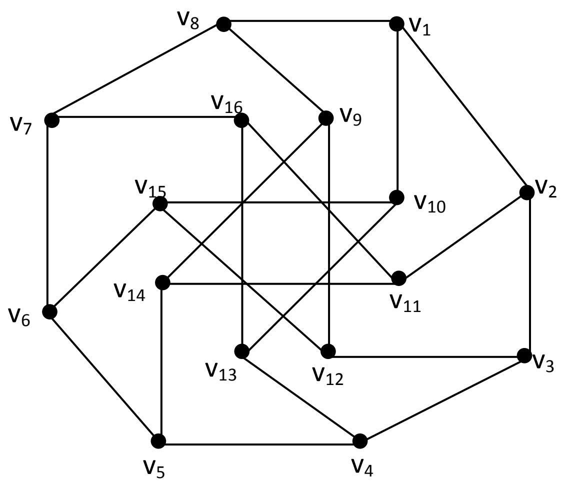


Figure 2.4

For the Mobius – Kantor graph G, $\gamma_{etc}(G) = 8$. Here S = $\{v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8\}$ is an efficient triple connected dominating set.

2) The **Desargues graph** is a distance-transitive cubic graph with 20 vertices and 30 edges as shown in figure 2.5.

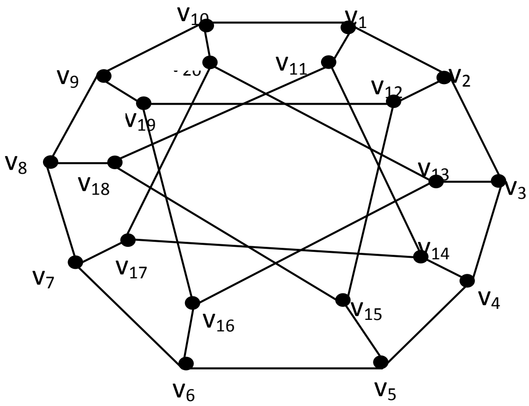


Figure 2.5

For any Desargues graph G, γ_{etc} (G) = 10. Here S = {v_1, v_2, v_3, v_4, v_5, v_6, v_7, v_8, v_9, v_{10}} is an efficient triple connected dominating set.

3) The **Chvátal graph** is an undirected graph with 12 vertices and 24 edges as shown in figure 2.6.

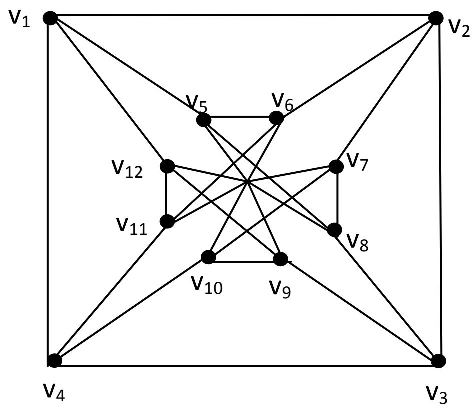


Figure 2.6

For the Chvátal graph G, γ_{etc}(G) = 4. Here S = {v_1, v_2, v_3, v_4} is an efficient triple connected dominating set.

4) The **Dürer graph** is an undirected cubic graph with 12 vertices and 18 edges as shown below in figure 2.7.

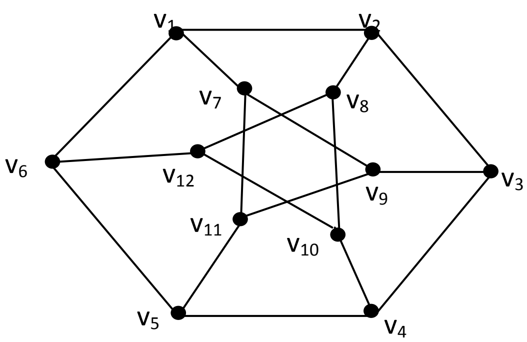


Figure 2.7

For the Dürer graph G, $\gamma_{etc}(G) = 6$. Here S = {v_1, v_2, v_3, v_4, v_5, v_6} is an efficient triple connected dominating set.

5) Any path with a pendant edge attached at each vertex as shown in figure 2.8 is called **Hoffman tree** and is denoted by P_n^+.

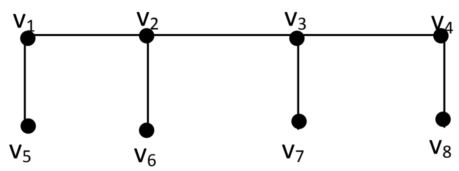


Figure 2.8

For the Hoffman tree G, $\gamma_{etc}(G) = 4$. Here S = {v_1, v_2, v_3, v_4} is an efficient triple connected dominating set.

Theorem 2.11 For any connected graph G with $p \geq 3$, we have $3 \leq \gamma_{etc}(G) \leq p$ and the bounds are sharp.

Proof The lower and upper bounds follows from *definition 2.1*. For C_5, the lower bound is attained and for $K_{3,5}$ the upper bound is attained.

Observation 2.12 For any connected graph G with 3 vertices, $\gamma_{etc}(G) = p$ if and only if $G \cong P_3, C_3$.

Observation 2.13 For any connected graph G with 4 vertices, $\gamma_{etc}(G) = p$ if and only if $G \cong K_4, W_4, C_4$, $K_4 - e$.

The Nordhaus – Gaddum type result is given below:

Theorem 2.15 Let G be a graph such that G and $\bar{G}$ have no isolates of order $p \geq 3$. Then

(i) $\gamma_{etc}(G) + \gamma_{etc}(\bar{G}) \leq 2p$

(ii) $\gamma_{etc}(G). \gamma_{etc}(\bar{G}) \leq p^2$.

Proof The bound directly follows from *theorem 2.11*. For path C_5, both the bounds are satisfied.

III. RELATION WITH OTHER GRAPH THEORETICAL PARAMETERS

Theorem 3.1 For any connected graph G with $p \geq 3$ vertices, $\gamma_{etc}(G) + \kappa(G) \leq 2p - 1$ and the bound is sharp if and only if $G \cong K_p$.

Proof Let G be a connected graph with $p \geq 3$ vertices. We know that $\kappa(G) \leq p - 1$ and by *theorem 2.11*, $\gamma_{etc}(G) \leq p$. Hence $\gamma_{etc}(G) + \kappa(G) \leq 2p - 1$. Suppose G is isomorphic to K_p. Then clearly $\gamma_{etc}(G) + \kappa(G) = 2p - 1$. Conversely, Let $\gamma_{etc}(G) + \kappa(G) = 2p - 1$. This is possible only if $\gamma_{etc}(G) = p$ and $\kappa(G) = p - 1$. But $\kappa(G) = p - 1$, and so $G \cong K_p$ for which $\gamma_{etc}(G) = p$. Hence $G \cong K_p$.

Theorem 3.2 For any connected graph G with $p \geq 3$ vertices, $\gamma_{etc}(G) + \chi(G) \leq 2p$ and the bound is sharp if and only if $G \cong K_p$.

Proof Let G be a connected graph with $p \geq 3$ vertices. We know that $\chi(G) \leq p$ and by *theorem 2.11*, $\gamma_{etc}(G) \leq p$. Hence $\gamma_{etc}(G) + \chi(G) \leq 2p$. Suppose G is isomorphic to K_p. Then clearly $\gamma_{etc}(G) + \chi(G) = 2p$. Conversely, let $\gamma_{etc}(G) + \chi(G) = 2p$. This is possible only if $\gamma_{etc}(G) = p$ and $\chi(G) = p$. Since $\chi(G) = p$, G is isomorphic to K_p for which $\gamma_{etc}(G) = p$. Hence $G \cong K_p$.

Theorem 3.3 For any connected graph G with $p \geq 3$ vertices, $\gamma_{etc}(G) + \Delta(G) \leq 2p - 1$ and the bound is sharp.

Proof Let G be a connected graph with $p \geq 3$ vertices. We know that $\Delta(G) \leq p - 1$ and by *theorem 2.11*, $\gamma_{etc}(G) \leq p$. Hence $\gamma_{etc}(G) + \Delta(G) \leq 2p - 1$. For K_6, the bound is sharp.

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Four Wave Mixing In DWDM Optical System

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ABSTRACT:

Optical nonlinearities give rise to many ubiquitous effects in optical fibres'. These effects are interesting in themselves and can be detrimental in optical communication. In the Dense Wave length division multiplexing system (DWDM) the nonlinear effects plays important role .DWDM system offers component reliability, system availability and system margin. DWDM system carries different channels. Hence power level carried by fiber increases which generates nonlinear effect such as SPM, XPM, SRS, SBS and FWM. Four wave mixing (FWM) is one of the most troubling issues. The FWM gives crosstalk in DWDM system whose channel spacing is narrow. By using the fiber with proper amount of dispersion and by unequal spacing between channels it is possible to suppress FWM crosstalk. In this paper the effect of FWM on optical system is considered and different techniques are compared to suppress FWM. Also optical spectrum and eye diagrams are observed for various dispersion and equal or unequal spacing at attenuation 0.2 dB, power 0.2 mW and wavelength 1550 nm.

KEYWORDS: *FWM, DWDM system, channel spacing, Optical spectrum, cross phase modulation*

I. INTRODUCTION

1.1 Optical Nonlinearities

One of the unique characteristics of optical fibres' is their relatively low threshold for nonlinear effects. This can be a serious disadvantage in optical communications, especially in dense wavelength-division multiplexing (DWDM) systems, where many closely spaced channels propagate simultaneously, resulting in high optical intensities in the fibre [1]. For instance, in a typical commercial 128-channel 10-Gb system, optical nonlinearities limit the power per channel to approximately −5 dBm for a total launched power of 16 dBm. Beyond this power level, optical nonlinearities can significantly degrade the information capacity of the system .On the other hand, optical nonlinearities can be very useful for a number of applications, starting with distributed in-fibre amplification and extending to many other functions, such as wavelength conversion, multiplexing and demultiplexing, pulse regeneration, optical monitoring, and switching. In fact, the development of the next generation of optical communication networks is likely to rely strongly on fibre nonlinearities in order to implement all-optical functionalities. The realization of these new networks will therefore require that one look at the trade off between the advantages and disadvantages of nonlinear effects in order to utilize their potential to the fullest.

The nonlinear interactions in optical fibres depend on the transmission length and the cross-sectional area of the fibre as shown in equation 1. The longer the link length, the more the interaction and the worse the effect of nonlinearity[3].

$$L_e = \frac{1 - e^{-\alpha L}}{\alpha} \qquad (1)$$

Where L_e is effective length, L is link length and α is attenuation constant.

1.2 Types of Optical Nonlinearities

There are two types of nonlinearities one is scattering phenomenon that arise from scattering that are stimulated Brillouin scattering (SBS) and stimulated Raman scattering (SRS). Another is refractive index phenomenon that arise from optically induced changes in the refractive index, and result either in phase modulation [self-phase modulation (SPM) and cross phase modulation (XPM)] or in the mixing of several waves and the generation of new frequencies [modulation instability (MI) and parametric processes, such as four wave Mixing (FWM)][4].

1.2.1 Scattering Phenomenon

In stimulated Brillioun scattering (SBS) the phonons are acoustic phonons. Pump and Stokes waves propagate in opposite directions. It does not typically cause interaction between different wavelengths. It creates distortion in a single channel and depletes the transmitted signal. The opposite traveling Stokes wave means the transmitter needs an isolator.

If two or more signals at different wavelengths are injected into a fiber, Stimulated Raman Scattering (SRS) causes power to be transferred from the lower wavelength channels to the higher-wavelength channels. It has a broadband effect (unlike SBS).In SRS there are both forward and reverse traveling Stokes waves. SRS causes a signal wavelength to behave as a "pump" for longer wavelengths, either other signal channels or spontaneously scattered Raman-shifted light. The shorter wavelengths are attenuated by this process, which amplifies longer wavelengths.SRS takes place in the transmission fiber.

1.2.2 Refractive Index Phenomenon

In self phase modulation (SPM), the intensity modulation of an optical beam results in the modulation of its own phase via modulation of the refractive index of the medium. It is a phenomenon that leads to spectral broadening of optical pulses. SPM is the temporal analog of self-focusing.Cross Phase Modulation (XPM) is a similar effect to SPM, but it involves two optical beams instead of one. In XPM, the intensity modulation of one of the beams in a phase modulation of the other. However, because the total intensity is the square of a sum of two electric-field amplitudes, the spectral broadening caused by XPM is twice as large as in SPM.

1.3 Kerr Effect

It is a nonlinear interaction of light in a medium with an instantaneous response, related to the nonlinear electronic polarization. The Kerr effect is a nonlinear optical effect occurring when intense light propagates in crystals and glasses, but also in other media such as gases. [4].

II. FOUR WAVE MIXING

2.1 Basics of FWM

The interaction of two or more light waves can lead to a second kind of χ (3) nonlinearities. These involve an energy transfer between waves and not simply a modulation of the index seen by one of them due to the other. This interaction is often referred to as "parametric," and these nonlinearities lead to parametric processes. Four wave mixing (FWM) is one of the most troubling issues. Three signals combine to form a *fourth* spurious or mixing component, hence the name four wave mixing, shown in Figure 1 in terms of frequency w:

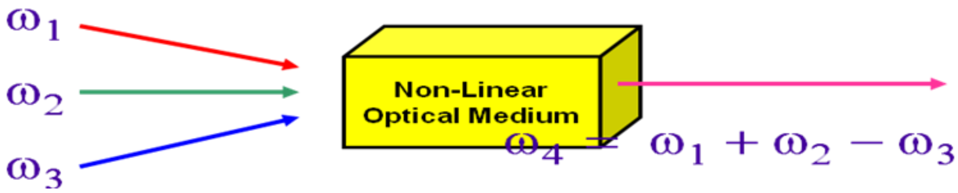

Figure 1 Formation of Fourth Spurious Component

Four-wave mixing transfers' energy from a strong pump wave to two waves up shifted and downshifted in frequency from the pump frequency ω1. If only the pump wave is incident at the fibre, and the phase-matching condition is satisfied, the Stokes and anti-Stokes waves at the frequencies ω3 and ω4 can be generated from noise. On the other hand, if a weak signal at ω3 is also launched into the fibre together with the pump, the signal is amplified while a new wave at ω4 is generated simultaneously. The gain responsible for such amplification is called the parametric gain [4].

2.2 Effects of FWM

Four wave mixing (FWM) is one of the most troubling issues. Three signals combine to form a *fourth* spurious or mixing component, hence the name four wave mixing. Spurious components cause following problems:

- Interference between wanted signal(cross)
- It generates additional noise and degrades system performance
- Power is lost from wanted signals into unwanted spurious signals

The total number of mixing components increases dramatically with the number of channels. The total number of mixing components, M is calculated from the equation 2.

$$M = (½) N^2 (N-1) \qquad (2)$$

Thus three channels create 9 additional signals and so on. As N increases, M increases rapidly. Where N is no. of channels.

2.3 Effect of Dispersion and Channel Spacing on FWM

As dispersion increases effect of four wave mixing decreases. For dispersion 16ps/nm FWM effect reduces but chromatic dispersion increases. At zero dispersion FWM effect more hence fiber having dispersion 4ps/nm is used where FWM effect is less and fiber is called Non-Zero dispersion shifted fiber.Due to equal spacing some FWM components overlap DWDM channels. But in unequal spacing there is no overlapping of DWDM channels and wavelength conversion occurs.

2.4 Minimization of FWM Effects

Traditional non-multiplexed systems have used dispersion shifted fiber at 1550nm to reduce chromatic dispersion. Unfortunately operating at the dispersion minimum increases the level of FWM. Conventional fiber (dispersion minimum at 1330 nm) suffers less from FWM but chromatic dispersion rises .Solution is to use "Non-Zero Dispersion Shifted Fiber" (NZ DSF), a compromise between DSF and conventional fiber (NDSF, Non-DSF). ITU-T standard is G.655 for non-zero dispersion shifted single mode fibers.By using unequal spacing between DWDM channels effect of FWM decreases.

III. EXPERIMENTAL SETUP AND SIMULATION

Experimental set up shown in Figure 2 consists of two channels DWDM system. This consists of laser sources, pulse generator and NRZ converters. Optical scope is connected to observe optical spectrum and electroscope is for eye diagram. And this is simulated by using optsim software. Wavelength of sources is set to 1550 nm and dispersion is varied from 0 to 4 ps/nm/km and optical spectrum is observed.

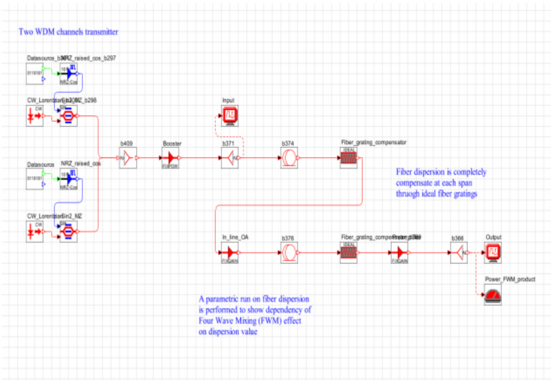

Figure 2 Two Channel DWDM System

Experimental set up shown in Figure 3 consists of four channels DWDM system. Each channel is set to central wavelength 1550nm firstly for equal channel spacing of 0.2nm and then unequal spacing of 0.1, 0.2, 0.1, 0.2 nm respectively. Optical spectrum and eye diagram are observed for equal and unequal spacing keeping dispersion constant.

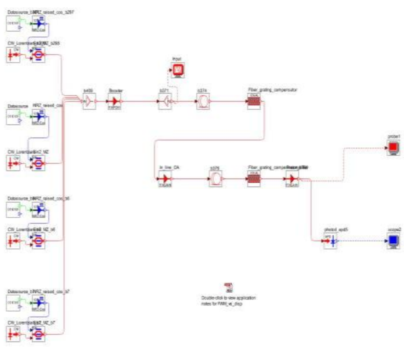

Figure 3 Four Channel DWDM System

IV. RSULTS AND DISCUSSION

By varying the dispersion from 0 to 4 ps/nm/km we observed effect of dispersion on FWM. And also effect equal and unequal spacing on FWM is observed. These effects are shown in following figs.

4.1 Effect of Dispersion

At input when we apply signal observed input optical spectrum as shown in Figure 4. By varying dispersion we observed the effects.

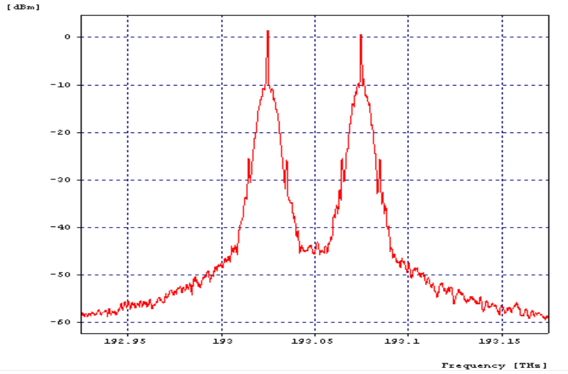

Figure 4 Input Spectrum

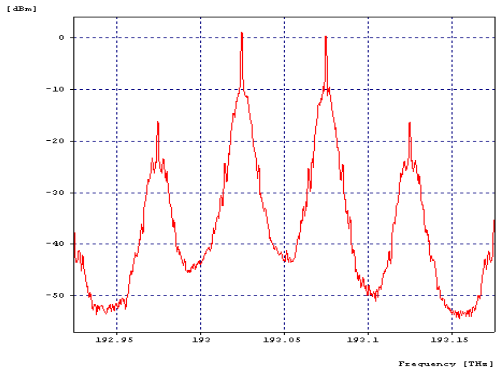

Figure 5 Output spectrum dispersion=0

Fig. 5 shows at zero dispersion FWM effect is more i.e. -15dB and as dispersion increases FWM effect decreases. It is -25dB and -32dB as shown in Figure 6 and Figure 7 respectively.

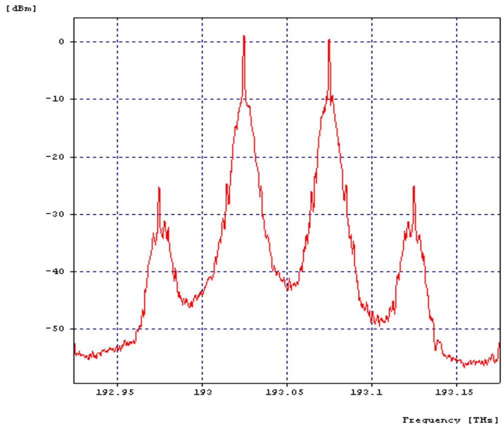

Figure 6 Output spectrum dispersion=1

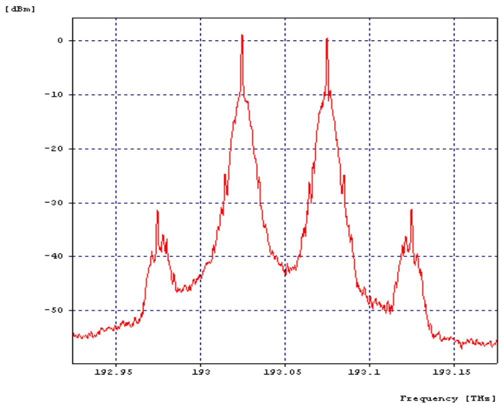

Figure 7 Output spectrum dispersion=2

Further as dispersion is 3 ps/nm/km and 4 ps/nm/km effect of FWM decreases. It is -33dB and -36 dB as shown in Figure 8 and Figure 9 respectively.

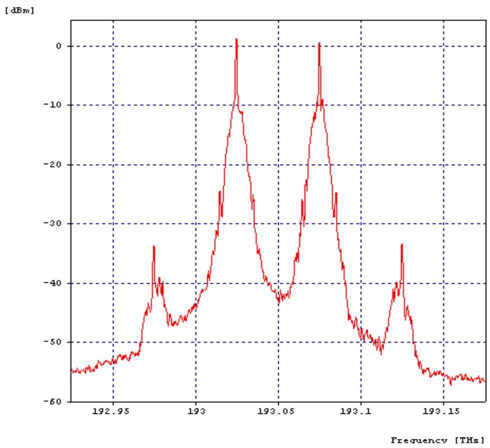

Figure 8 Output spectrum dispersion=3

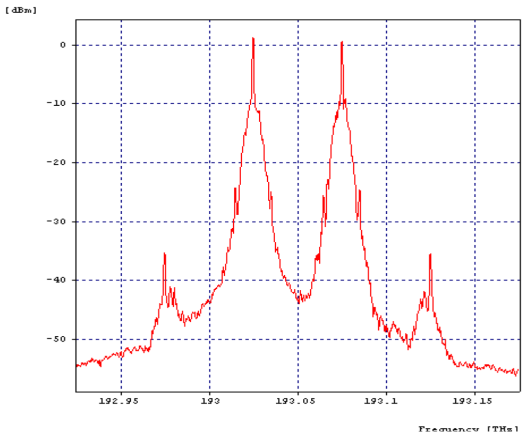

Figure 9 Output spectrum dispersion=4

4.2 Effect of Channel Spacing

Figure 10 shows Optical spectrum and Figure 11 shows eye spectrum for equal spacing of 0.2 nm.

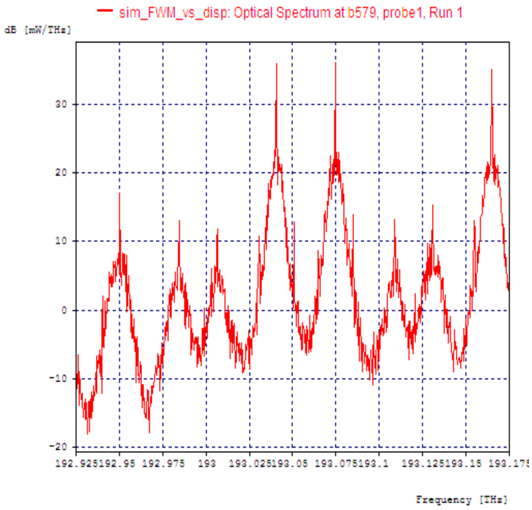

Figure 10 Optical spectrum

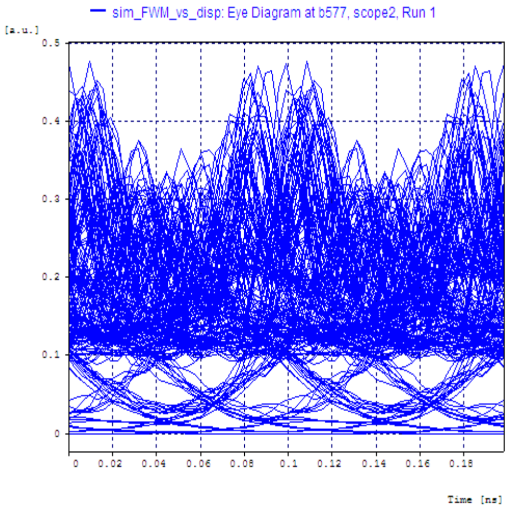

Figure 11 Eye spectrum

As shown in fig 11 eye spectrum is distorted. For equal spacing effect of FWM is more. But for unequal spacing effect of FWM decreases. For this spacings are 0.1, 0.2, 0.1 and 0.2 nm. Figure 12 and Figure 13 show effect of unequal spacing.

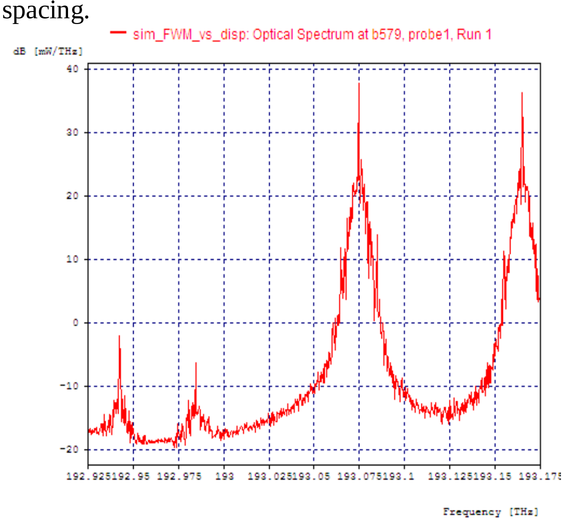

Figure 12 Optical spectrum

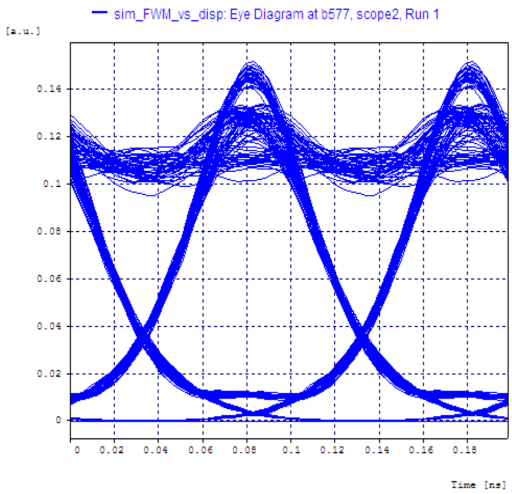

Figure 13 Eye spectrum

V. CONCLUSION

FWM leads to interchannel crosstalk in DWDM systems. It generates additional noise and degrades system performance. By using non zero dispersion shifted fiber i.e. fiber having 4 ps/nm/km and using unequal spacing among channels FWM effect can be reduced. On other hand FWM can be used beneficially for parametric amplification, demultiplexing of OTDM channels, wavelength conversion of WDM channels.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Analyzing Macular Edema In Diabetic Patients

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ABSTRACT

Diabetic macular edema (DME) is an advanced symptom of diabetic retinopathy and can lead to irreversible vision loss. In this paper, a two-stage methodology for the detection and classification of DME severity from color fundus images is proposed. DME detection is carried out via a supervised learning approach using the normal fundus images. A feature extraction technique is introduced to capture the global characteristics of the fundus images and discriminate the normal from DME images. Disease severity is assessed using the neural networks.

KEYWORDS: *Abnormality detection, diabetic macular edema, hard exudates, PCA, Neural network.*

I. INTRODUCTION

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually **Image Processing** system includes treating images as two dimensional signals while applying already set signal processing methods to them. Diabetic macular edema (DME) caused due to diabetes is a high risk complication which_can cause irreversible loss of vision [1]–[3]. Early detection of even a minor sign of DME is essential as it may also appear without any external symptoms[4]. Once detected during retinal examination, it demands immediate treatment ranging from glycemic and blood pressure control, to laser surgery.DME is generally detected directly or indirectly. Direct ways are using stereoscopy (for manual examination) or optical computed tomography images [3]. Indirect method is by detecting the presence of hard exudates (HE) in the retina. HE are formed due to secretion of plasma from capillaries resulting from the complications of retinal vasculature and could lead to retinal swelling. In color fundus images they appear as yellow–white deposits (see Fig. 1). Detecting the presence of hard exudates (HE) in different areas of retina is now considered a standard method to assess DME from color fundus images [1], [4], [5].

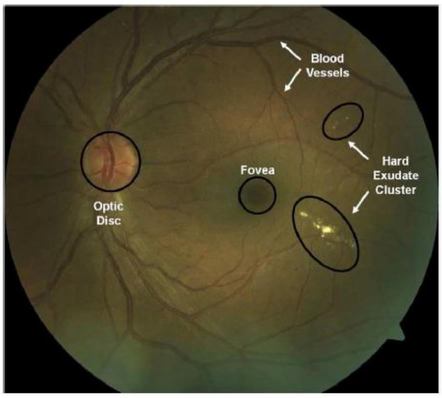


Fig. 1. Color fundus image with anatomical structures and lesions annotated.

The severity of the risk of edema is evaluated based on the proximity of HE to the macula, which is defined to be a circular region centered at fovea and with one optic disc (OD) diameter (see Fig. 1). The risk for DME increases when the HE locations approach the macula, with the risk being the highest when they are within the macula. This is an important factor in DME assessment for further referral of the patients to an expert.

In order to develop a solution for automatic DME assessment, first a decision module is required to validate the presence or absence of HE in a given color fundus image. Once their presence is confirmed, a second module has to assess the macular region for measuring the risk of exhibiting DME. Therefore, in this work, a two-stage methodology for detection and assessment of DME is proposed.

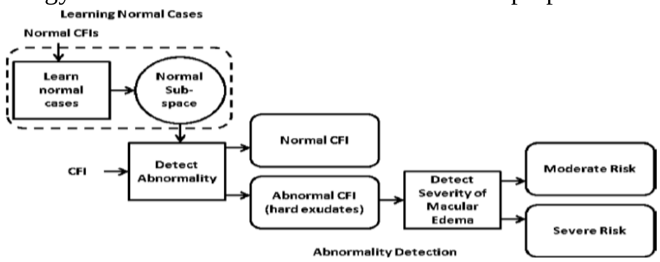


Fig. 2. Processing pipeline for detection and assessment of DME (CFI—color fundus image).

II. PAST WORK

Among recent approaches to direct detection of edema from color fundus images, multiple uncalibrated fundus images have been used to estimate a height map of macula in [2]. The estimated height map is generally noisy. A difference in the mean height is demonstrated between the height maps of normal and edema cases on synthetic images and only four sets of color fundus images. This difference is used to determine normal and abnormal cases. While the proposed method is encouraging, it requires more rigorous validation. Our strategy for detecting macular edema and evaluating its severity is as follows: the image under evaluation is first ascertained to be normal (abnormality detection) (see Fig. 2) by learning the characteristics of normal retinal images. Any deviation from normal characteristics is taken to be indicative of abnormality. For every abnormal image the severity of DME is assessed by determining the location of HE relative to the macula. In the next section, a detail of the proposed method is presented. HE appear as clusters of bright, high contrast lesions and are usually well localized. This observation is used to derive relevant features to describe the normal and abnormal cases. Given a color fundus image, a circular region of interest (ROI) is first extracted and an intermediate representation also known as the motion pattern of the ROI is created. Relevant features are then derived for to classify the given image as normal or abnormal (containing HE).

The significant contributions of this work are: 1) a hierarchical approach to the problem, 2) a novel representation for the first level, to classify an image as normal/abnormal (containing HE), and 3) a rotational asymmetry measure for the second level, to assess the severity of risk of DME. The novel representation captures the global image characteristics. Such global features have not been used successfully earlier for HE detection. In the first level, a supervised technique based on learning the image characteristics of only normal patients is used for detecting the abnormal cases pertaining to HE. This approach has the inherent advantage of reducing the effort of building a CAD system by removing the need for annotated (at the lesion level) abnormal images. Such annotations are required for both supervised and unsupervised classification schemes in order to find suitable system parameters for detection. The approach facilitates separating the normal patients from those showing disease symptoms, as practiced in DR screening [9]. There is no preprocessing the original images or postprocessing the results is done to handle the false alarms due to variability observed across color fundus images. This is due to the proposed global features.

III. PROPOSED WORK

HE appears as clusters of bright, high contrast lesions and are usually well localized. The macula is a dark structure roughly at the center of the retina. In the absence of any HE , there is a rough rotational symmetry about the macula in the circular region of roughly twice the diameter of the optic disc. This observation is used to derive relevant features to describe the normal and abnormal case: 1) Region of Interest Extractions, 2) Preprocessing, 3) Feature Extraction, 4) Determining the Severity of Macular Edema.

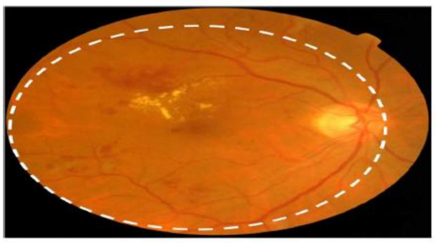


Fig. 3. Sample fundus image and the circular region of interest centered on macula.

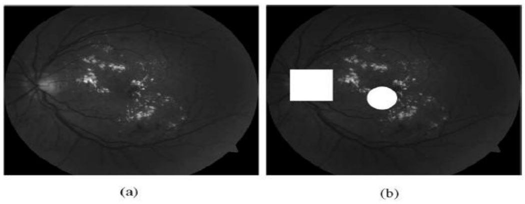


Fig. 4. Sample images (green channel) and result of macula and optic disk detection. OD is indicated by a bright rectangular mask and the macula location by a circular mask. (a) Sample image A (b) Detected macula and OD for sample image A.

[1] Region of Interest Extractions:

Since the severity of DME is determined based on the location of HE clusters relative to the macula, the images acquired for DME detection usually focus around the macular region. We consider the best fit circle within the fundus image with macula at the center, for a given image. The region within this circle is the desired ROI denoted as (see Fig. 3 for an example). The green channel of forms the input for all subsequent processing. The acquired images for DME detection are macula centric. The OD shares a brightness characteristic similar to HE, The macula is shown as a circular patch and the OD is shown as a rectangular patch.

[2]Preprocessing

Applying a green component to the histogram equalization and a grayscale closing operator (<p) on the histogram image 1 will help eliminate the vessels which may remain in the optic disc region.

12 = <p (B 1) (1) (6)

Where B1 is the morphological structuring element. The resulting image 12 is binarized by thresholding (a1). After, we remove from the binary image all connected components that have fewer than P pixels, producing another binary image; P is chosen such that it is smaller than the maximum size of the optic disc centre in the fundus image. The resulting image optic disc and border removal is obtained which is AND operated with the dark features for obtaining the exudates.

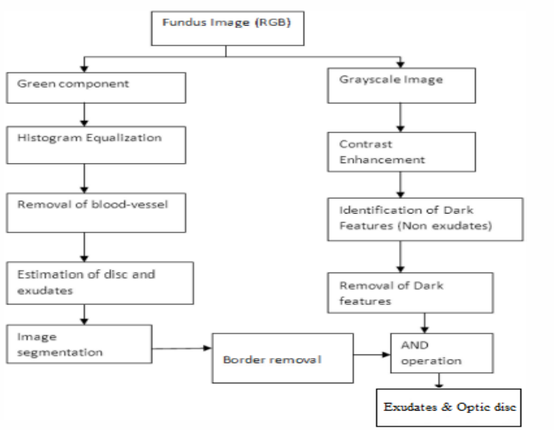
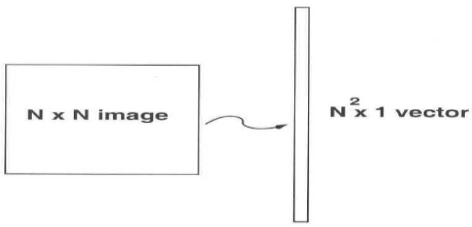


Fig 5: Block diagram for preprocessing

[3] Feature Extraction

PCA is used for feature extraction. It is based on the assumption that high information corresponds to high variance. After the extraction of PCA features, original data is projected to a new coordinate space, and each coordinate axis in the new coordinate space represents a principal component vector. Principal component analysis (PCA) was performed for reducing dimensions in feature data processing. PCA is to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables using an orthogonal transformation. The simplest approach is to think of it as a template matching problem:



Problems arise when performing recognition in a high-dimensional space. - Significant improvements can be achieved by first mapping the data into a *lower dimensionality* space.

Computation of the eigenvalues:
Step 1: obtain fundus images of eyes (training data).
(**Very important:** the fundus images must be of the same *size*)

Step 2: represent every image as a vector A.

Step 3: compute the average vector:
```
avg = ((sum (A))/counter);
```

Step 4: subtract the mean value:
```
   B=double (A);
for i=1:counter
   B (i,:) = B(i,:) - avg;
end
```

Step 5: compute the covariance matrix *C*:
```
C=B*B';
cmax=max(max(C));
C=C/cmax;
```

Step 6: compute the eigenvectors
```
[E,D] = eig(C);
clear D;
E=fliplr(E);
egneye=E*B;
```

Step 7:Weight vector calculation: calculates weight factors of a eye image based on eigen eyes.
```
function [wv]=itw(I1,egneye,cnt,avg)
   Iv=double(reshape(I1,1,size(I1,1)*size(I1,2)));
   Iv=Iv-avg;
for k=1:cnt
   wv(k)=dot(egneye(k,:),Iv);
end
```

[4] Determining the Severity of Macular Edema.

Neural network models attempt to simulate the information processing that occurs in the brain and are widely used in a variety of applications, including automated pattern recognition. We define a neural network with one input layer, 16(database contains 15 images) hidden layer and one output layer. Neural network is trained using target and pattern obtained from PCA and gives severity as output.

IV DESIGN METHODOLOGY

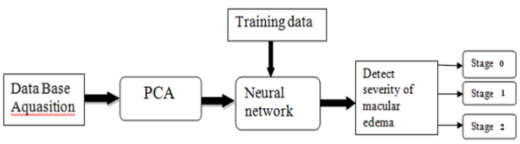


Fig 6: Design model

Data Base Acquisition: This DB contains fundus images that are to be tested for presence of Hard exudates. It is taken as input for the PCA.

PCA (Principal component analysis): PCA is used for feature recognition .The feature vector or eigenvector is the output of PCA.

Training data: In this DB the images of known severity levels are stored. This DB is required for training the neural network.

Neural Network: Neural network is used as classifier. It takes the output vector from PCA and does classification. It gives the severity as output.

V RESULT AND SNAPSHOTS

Database contains 15 images, five from each severity level and there are three severity levels- level 0 (normal), level 1 (moderate) and levels 2 (severe).

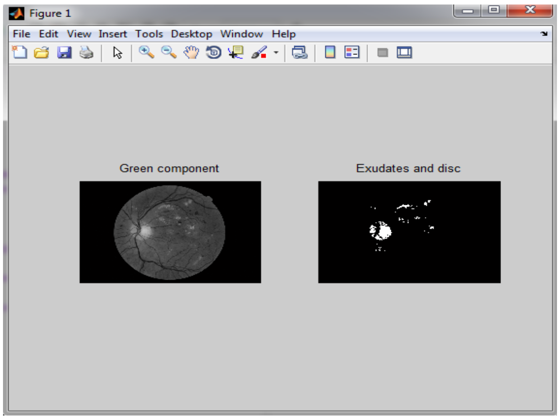


Fig 7: Preprocessed image to obtain exudates and optic disc.

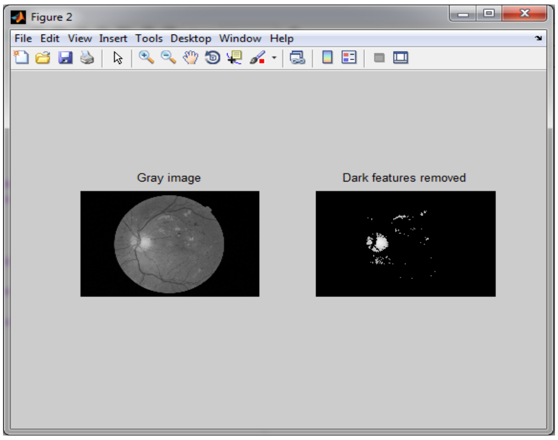


Fig 8: Preprocessed image to remove dark features.

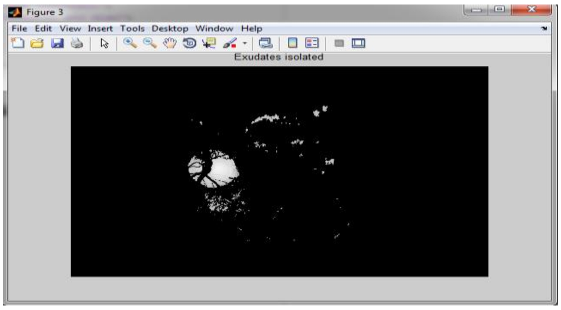


Fig 9: Preprocessed image obtain after performing AND operation for Fig 6 and 7.

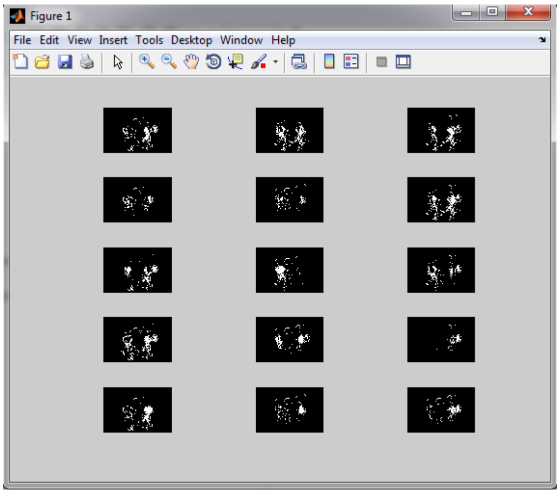


Fig 10: Eigen images obtained after applying PCA to database.

0.2643	-0.1101	-0.0239	-0.0448	-0.0614	-0.0334	0.1407	-0.3813
-0.2983	0.0106	0.2342	0.0860	0.0281	0.2820	-0.0704	0.6492
-0.1515	0.0232	-0.0040	-0.0320	-0.1732	-0.1771	-0.0277	0.3658
0.1295	0.0552	0.0730	0.0022	-0.0867	0.0926	-0.0600	-0.1552
-0.1130	0.0570	-0.0477	0.0429	-0.2042	0.1010	-0.0670	0.2363
0.1742	0.3654	-0.0118	0.0387	-0.0751	-0.0990	-0.0775	-0.1883
0.2650	-0.1638	0.0027	-0.0500	-0.0634	-0.0551	0.2078	-0.4332
0.1429	-0.0452	0.0294	-0.0817	-0.0583	-0.0895	0.3243	-0.6508
0.2337	0.1122	0.0042	-0.1043	0.0108	-0.0062	0.1984	-0.5576
1.0073	-0.0464	-0.5662	0.2232	0.6416	-0.2244	-0.3537	-0.5357
-1.3923	-0.1717	-0.1161	0.2456	0.4175	-0.0394	-0.0615	1.0569
-0.2675	0.1190	0.2784	0.0592	-0.0373	0.1874	-0.0636	1.0922
-0.0332	-0.0360	0.1310	-0.2469	0.0535	0.2307	-0.0498	0.1104
-0.0517	0.0182	0.1074	0.0273	-0.2626	0.0962	-0.0674	0.1751
0.0906	-0.1876	-0.0905	-0.1654	-0.1292	-0.2659	0.0273	-0.7838

Columns 9 through 15

0.1433	0.2936	-0.2966	-0.1662	-0.2604	-0.2128	-0.0603
-0.1064	-0.5962	-0.0380	0.2556	0.3704	0.1648	0.2527
0.1565	-0.1669	0.4496	0.1294	0.1751	-0.0532	0.3753
0.0787	0.0978	0.1822	-0.3265	0.2391	-0.0319	-0.0625
0.0457	-0.0828	0.2454	0.1319	0.2255	-0.0202	0.2074
0.1247	0.1185	0.1230	-0.5576	0.5490	0.0228	-0.2092
0.2264	0.1831	-0.1456	0.0057	-0.2299	-0.2659	-0.4052
-0.0510	0.2238	-0.2342	-0.0941	-0.3095	-0.2685	-0.1278
0.1209	0.2504	-0.2371	-0.1035	-0.5500	-0.1918	-0.2003
-0.3039	0.2921	-0.0947	0.0552	-0.8673	0.5681	-0.0749
0.1044	-0.2984	0.2093	0.4707	0.3543	0.5096	0.3637
-0.5219	-0.2730	0.0793	0.3141	0.2755	-0.0269	0.0863
0.0199	-0.0810	0.0228	0.0140	0.3026	0.1108	0.0635
0.0407	-0.1086	0.1522	0.0871	0.2128	0.1341	0.1520
-0.0780	0.1476	-0.4174	-0.2159	-0.4870	-0.4394	-0.3605

Fig 11: weight matrix (15X15) required to train neural network.

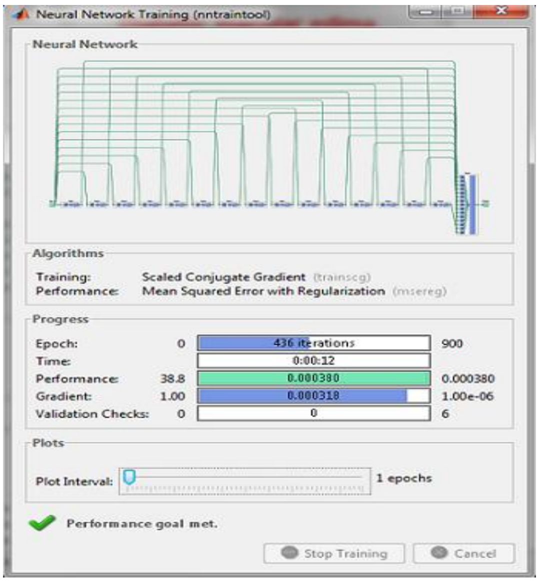


Fig 12: Training of Neural Network with one input layer, 16 output layer and one output Layer.

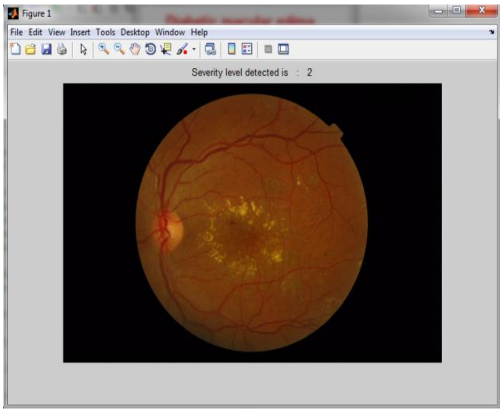


Fig 13: outcome of this project-After training neural network we can select the test image and this image shows the severity level as 2(severe).

VI CONCLUSION

This project has proposed and evaluated a method for DME detection and assessment. The significant contributions of this work are: 1) a hierarchical approach to the problem, 2) In first level PCA is applied for feature extraction.3) Neural network for the second level, to assess the severity of risk of DME. The approach facilitates separating the normal patients from those showing disease symptoms. The proposed method is shown to be effective in detecting DME for challenging cases.

In the second level, the severity of the is assessed analyzing the output of neural network. This level facilitates the decision to recommend a patient to a medical expert, based on the proximity of HE to the center of macula. The proposed methodology enhances the existing DR screening infrastructure by helping automate the detection and assessment of DME.

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Intrusion Detection in Virtualized Environment

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ABSTRACT

Server Virtualization is one of the concepts driving current enterprise infrastructure design and setup. It ensures business continuity and agility through on demand resource sharing and optimum resource utilization. At the same time it has raised concerns over new trends of security breaches and attacks on virtual machines. Traditional Intrusion Detection systems have their own limitations and they are less effective when used in virtual environment. Concept of Virtual Machine Introspection can be considered as an effective mechanism to do intrusion detection in virtual machine. This paper studies approaches of intrusion detection in virtual machines from higher privileged level than virtual machine operating system and presents a framework to detect network based as well as host based attacks on virtual machine.

KEYWORDS: *Hypervisor, Intrusion Detection, Security, Virtual Machine Introspection, Virtualization.*

I. INTRODUCTION

Server Virtualization deals with consolidation of server based applications running on different physical servers on a single host machine using virtual machine (VM). Virtual Machines can run different operating systems and consider that they own and have complete control over the hardware dedicated to them. In reality physical host hardware is shared by virtual machines running on the host and this resource allocation and sharing is monitored and managed by another layer called Virtual Machine Monitor (VMM) or hypervisor. Figure1 shows difference between traditional model and virtualized model of application deployment.

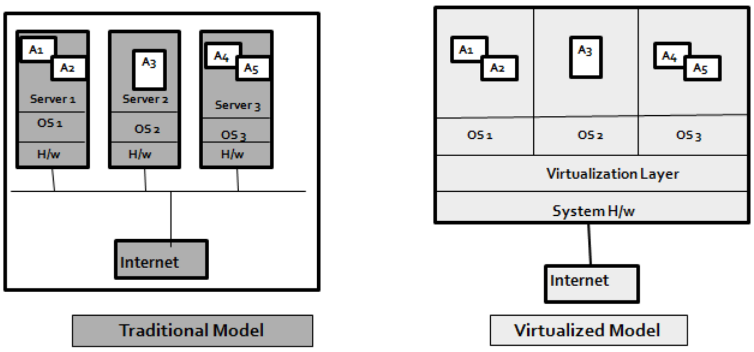

Figure.1 Server Virtualization Model vs. Traditional Model

1.1 Security Concerns in Virtualized Environment

1. As can be seen from Figure.1, Physical host hardware resources (CPU, clock, network port, memory, hard disk) are shared between virtual machines without their knowledge. Though Hypervisor is responsible to ensure isolation among virtual machines, certain business needs demand inter VM communication, achieved by means of clipboard sharing, sharing memory etc. This gives more attacking surface for an intruder to compromise a virtual machine from another virtual machine.

2. If the virtual machines are connected in bridged mode, they are easily accessible on internet for external clients. So all networking related attacks are applicable to virtual machines.

3. Furthermore kernel rootkits which are more hazardous since they acquire root privileges and directly attack Operating System, are also a big threat like any other host system

It is difficult to detect these attacks with traditional intrusion detection systems since virtual machine deals with virtual resources and thus information gathered by IDS deployed on such machines might be inconsistent.

II. MOTIVATION

Intrusion Detection System (IDS) mainly monitors network and system activities for any abnormal behavior or policy violations and produces reports.

Intrusion Detection Systems are mainly classified as

- Host Based IDS – Host Based IDS captures information from system log files, OS data structures, file system details and checks for any unintended, untimely changes in these objects.
- Network IDS – Network based IDS is mainly deployed on routers, gateways. It mainly monitors network traffic and checks for any malicious activity by analyzing packet data with reference to network protocols and identifies any misbehavior.

There are certain Pitfalls of traditional IDS in virtualized environment

1. Host based IDS mainly depends on information extracted from Operating System components and system log files. In virtualized environment virtual machine runs on emulated hardware resources. So information available with guest OS about the resources like memory addresses is not realistic.

2. Network based IDS if deployed on external router cannot monitor inter VM communication if virtual machines are connected in user mode (based on NAT). Also in case of VLAN there can be multiple software bridges / switches in same host connecting virtual machines, which all should be monitored to provide secure network communication.

3. Another shortcoming of HIDS is it has to be deployed on each system which needs to be protected. So in case of virtualized system, its an additional effort and consumption of resources to deploy HIDS on each VM

4. Virtual Machines should own resources sufficient to run the services deployed in them so it is not effective utilization of resources if they are being used by security system.

5. HIDS being part of system under attack, it itself is susceptible to get compromised by the attacker.

Therefore it is required to design a framework that can provide a secure mechanism to detect intrusion into virtual machines running on a host system.

III. VIRTUAL MACHINE INTROSPECTION

Virtual Machine Introspection is a way of getting Virtual Machine state information by monitoring it from a privilege level higher than that of guest Operating System. The concept was first introduced by Tal Garfinkel in 2004[1]. And can be used effectively to monitor virtual machine from outside and detect any intruding activity. A virtual machine state mainly involves CPU registers, volatile and non volatile memory and I/O data. Virtual Machine Introspection relies on the fact that Virtual Machine Monitor (VMM) runs at a privileged level higher than guest operating system and thus has realistic information about guest system and has more control over the guest. Therefore VMM APIs can be used to extract details about guest. The main complexity of this approach lies in the fact that, the data provided by VMM is raw data i.e. in the form of string of 0s and 1s (binary data) Its up to the VMI application to use knowledge about guest operating system and decode this data. This discrepancy is called semantic gap. Virtual Machine Introspection still provides advantage in terms of keeping monitoring system out of guest machine and thus out off insight of attacker. This method is passive control and thus data is pulled by the monitoring system rather than pushed by the monitored system (as in case of active monitoring).

IV. SOLUTION DESIGN

The work done to design and implement an Intrusion Detection System for virtual machines was based on following consideration.

- Reliability – The system should be able to do its designed activities (like data extraction, analysis) under normal workload of the host machine and VM.
- Attack-safe –If the virtual machine is compromised, it should not adversely affect the detection system.
- Not interfering – The system should not intervene with normal operations of the service providing VM.
- Provide security to all Virtual Machines running on the same physical host.
- Detect intrusion initiated from within vlan.

While designing the solution main assumption considered is Hypervisor as a trusted component base. Since virtualized environment is a new target for attackers, it is decided to go ahead with Anomaly based intrusion detection, in which normal system behaviour is first monitored and any deviation from such behaviour is detected and reported. Signature based intrusion detection which particularly checks for a known attack is not advisable due to newly emerging attacking mechanisms.In virtualized environment since guest OS runs in ring 3 or user application level it does not provide realistic hardware state information to the intrusion detection system. Therefore concept of virtual machine introspection as discussed in section III is used to get the state information of guest system from hypervisor. The approach of active monitoring, which includes placing hooks into guest OS [8] to capture events, or placing monitoring code in guest system [9] can put the system at risk and has additional task of changing OS of each guest. Considering the pros and cons of both the approaches, the solution proposed considers two types of interfaces with the ID system, the prototype named as VM-ID (Virtual Machine Intrusion Detection). Interfacing with the hypervisor to get external view of the system and interfacing with the guest to get internal view of the system.

V. PROPOSED FRAMEWORK AND IMPLEMENTATION
VI.

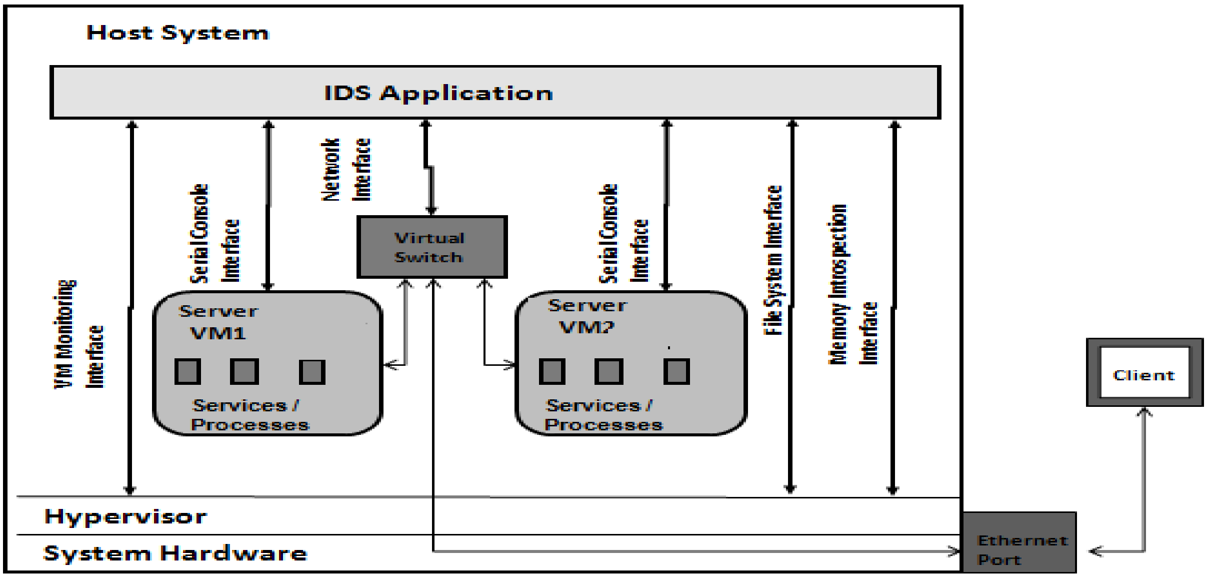

Figure.2 VM-ID system Proposed Framework

As shown in Figure.2 the system consists of following components.

1. Host system - It is high configuration physical machine which hosts different virtual machines running different services,
2. Hypervisor – The intermediate layer supporting server virtualization on the host system
3. Network port – Connecting virtual machines with the network.
4. IDS application (VM-ID) is user level process running on the host system.

The IDS application interfaces with hypervisor in the following ways -

- **Memory Introspection interface** – This interface captures real time memory data from hypervisor. With the help of knowledge about guest OS, it interprets the data and gathers information about important entities like processes, system calls, file system etc. The prototype used libvmi [11] [12] that is data extraction tool by memory introspection developed as extension of xen-access module. It facilitates to reduce semantic gap by configuring system for each Virtual Machine to be introspected.

- **File system mapping interface** – Memory introspection does not give information about static data available on storage disk. The same can be obtained by getting access to the guest file system from outside. Libvirt based guestmount[14] is used to map guest file system in the host in read-only mode using following command

guestmount -o allow_other -d domain_name -i --ro mount_point

- **Virtual Machine Management interface** – The system needs to interact with virtual machines and hence should have control mechanism to start / stop / pause / resume them. Libvirt based virsh [17] tool is used to provide this interface.

The interfaces with the guest are

- **Serial Console** – Serial console is used to extract information from guest system which cannot be easily deciphered from raw data available through introspection interface and which can be cross checked with the information available from introspection interface and can act as lie detector. Serial Console to Virtual Machines is identified using Virsh tool command

  virsh ttyconsole guest_name

5.1 VM-ID Stages
The solution is divided into three stages

- Configuration – To facilitate VM introspection, it is required to configure certain parameters of each virtual machine in the Intrusion Detection application.
- Monitoring – In this stage, original guest OS details are captured and saved for further cross checking.
- Detection – In this stage the guest OS details are re-captured and cross checked with the information collected during monitoring stage to detect any deviation. Detection can be initiated by administrator and it also runs periodically.
- Reporting – If any deviation from normal system behaviour is detected an alert is sent to the administrator and important information is logged for future reference.

5.2 VM-ID Modules
The Intrusion Detection System is designed to be based on anomaly based intrusion detection method involving following modules

1. **Process Validation** – This module is based on principle of lie detection. It gets process details by two ways. One using Memory Introspection APIs (using libvmi) and Second through serial console. It checks for any discrepancy between the two results and accordingly detects intrusion activities. It can be used to detect rootkits like adore-ng, itf, knark [13], which hide processes from administrator. The processes do not appear in serial console view. But they appear through memory introspection. The algorithm is as shown in Figure.3

Process Validation

1.Map init_task in memory for guest Operating System.
2.Traverse through tasklist starting at memory location of init_task
  For each task_struct in tasklist
    get process details
    save process details in temp structure.
3.Connect to guest serial console using qemu serial console
  connected to the guest
4.Get list of processes running in the guest using console commands.
5. Identify discrepancy in the processes identified in step 2 and step 4.

Figure.3 Process Validation

2. **System Call Validation** – This module checks for any stealthy attacks by modifying system call pointers and thus invoking attackers function before proceeding with normal system call behaviour. Using memory introspection it detects the change in system call function pointer. The Algorithm is as shown in Figure.4

System Call Validation

Monitoring
1. Map system_call_table in memory for guest Operating System.
2. Find out memory offset of system_call to be monitored.
3. Get function pointer saved at memory location from step 2.
4. Save mapping of System Call and function pointer.

Detection
1. In Detection stage repeat step 3
2. Identify discrepancy in the function pointer identified in step 3 and step 5.

Figure.4 System Call Validation

3. **File system integrity checking** – This module is a two phase process. In the Monitoring phase, it captures SHA hash of important files, as defined in vmid configuration file. In Detection module, it recalculates the hash and checks with the previous one. If there is any change, it alerts the administrator about intrusion detection. Figure.5 gives steps for checking file integrity in guest.

File System Integrity Checking

Monitoring
1. Mount guest File System (FS) on Host using guestmount utility.
2. Find out hash of important file on guest FS.

Detection
1. Unmount any guest FS if exists
2. Mount guest File System (FS) on Host using guestmount utility.
3. Find out hash of important files on guest FS.
4. Identify discrepancy in the file hash for each file as identified in step 2 (Monitoring) and step 3 (Detection).

Figure.5 File System Integrity Checking

4. **Network traffic Validation** – When multiple virtual machines are deployed on same physical host as in case of server virtualization, an attacker residing on one VM can infect another VM on same host by manipulating its network traffic with the external world. ARP spoofing, SYN flooding are common threats to co-hosted virtual machines. Validating network traffic by monitoring bridge interface, can detect such kind of attacks. Figure.6 gives steps for ARP Spoofing attack from one VM on another in the same VLAN.

ARP spoofing Detection

Monitoring Stage

1. Find out MAC of each VM from metadata xml file of each VM
2. Connect to each VM through serial console and get IP address
3. Save mapping of MAC and IP for each VM

Detection Stage

1. Sniff packets on bridge connecting virtual Machines
2. For each ICMP packet
   get MAC and IP in response packet
3. Check for discrepancy in step 3 (Monitoring) and step 2 (Detection)

Figure.6 ARP Spoofing Detection

5. **User Interface and Notification** – User interface provides front end to the intrusion detection system and facilitates the administrator to check VM sanity. As a part of prototype it is developed in Java and integrated with other intrusion detection modules through Java Native Interface (JNI) [10]. The system keeps the details logged in log files which can be referred by administrator to decide further actions. Additionally a scheduler runs all validation modules on all configured virtual machines and provides Alert messages in case of any intrusion detected.

VII. EXPERIMENTAL RESULTS

As a part of prototype and testing, the setup considered is as shown in Figure.7 Host is ubuntu 12.04 system (4 GB RAM) with KVM, libvirt and qemu installed. Guest machines have ubuntu 12.04 as guest os with 512 MB RAM each. They are connected to each other and external network through KVM, bridgeutils bridge br0. Attacks are carried out by invoking LKM based rootkits run on VM from client.

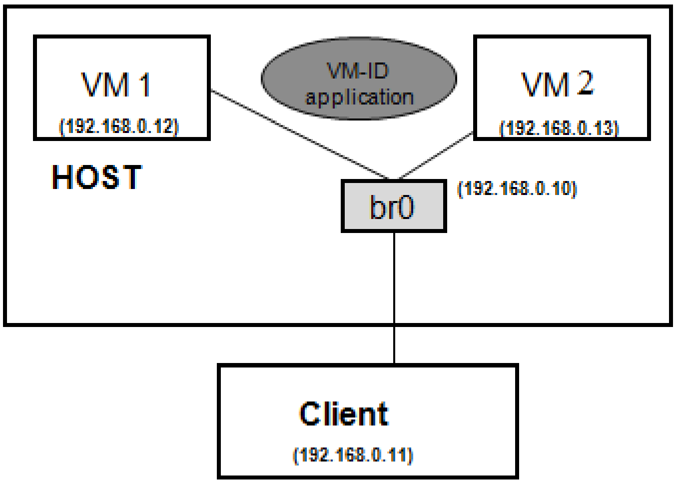

Figure.7 VM-ID Prototype setup

The system is able to detect intrusion through

- Process verification – tested with adore-ng based process hiding rootkit [15]
- System call interception – tested with Linux Kernel Module hijacking system call [16]
- ARP spoofing- tested by running arp poisoning tool arp-sk [18] from one VM targeting another VM on same VLAN.

VIII. RELATED WORK

Security of virtual machines is highly under consideration in academic as well as industry research circle. There are many research projects conducted to address security concerns of virtualized system. The pioneer project on memory introspection was done by Tal Garfinkel and group with Livewire prototype at Stanford University [1]. Kenichi Kourai developed a distributed Intrusion Detection System "Hyperspector" for LAN machines leveraging concept of virtualization [2]. A project by Marcose Laureano [3] traces processes from guest VM to identify suspicious activities. Lares [8] project by Bryan Pane (developer of libvmi) uses a different approach of active monitoring of virtual machines by placing hooks within VM guest OS. The advantage of active monitoring over memory introspection is that we need not bother about semantic gap. And it can give realtime information about activities going on in guest VM. On the other side, it has an overhead of protecting it from an intruder attacking the VM.

Compared to the approaches previously taken, the prototype discussed in this paper differs in following ways

1. It provides a single application to monitor multiple virtual machines.
2. It integrates functionalities of HIDS as well as NIDS.
3. The system is not integrated into the Hypervisor.
4. The system does not need any changes in the guest operating system

IX. CONCLUSION AND FUTURE SCOPE

Virtualization is very promising technology which is deployed to achieve compact and high efficiency data centers. Since it involves multi component stack, security measures have to be incorporated at each level.The current prototype proposed, addresses intrusion detection based on memory introspection, file integrity checking and network traffic sniffing. It leverages functionality of hypervisor to extract data related to virtual machine. It can be further enhanced to integrate with VM active monitoring so that it can provide intrusion prevention functionality as well. The Intrusion detection system can be enhanced further by deploying on different machines which are part of a cluster and provide distributed intrusion detection mechanism.

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Maximum Likelihood for Land-Use/Land-Cover Mapping and Change Detection Using Landsat Satellite Images: A Case Study "South Of Johor"

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ABSTRACT:

Land cover change has become a central component in current strategies for managing natural resources and monitoring environmental changes. Urban expansion has brought serious losses of agriculture land, vegetation land and water bodies. Urban sprawl is responsible for a variety of urban environmental issues like decreased air quality, increased local temperature and deterioration of water quality. In this study we have taken South of Johor as a case study to study the urban expansion and land cover change that took place in a period of time about of 16 years from 1995 to 2011. Remote sensing methodology is adopted to study the geographical land cover changes occur during the study period. Landsat TM and 7 ETM+ images of Johor are collected from the USGS Earth Explorer website. After image pre-processing, supervised classification has been performed to classify the images in different land cover categories. The study area classified into five classes: urban area, water bodies, vegetative area, barren land and unknown area (clouds). Classification accuracy is also estimated using the field knowledge obtained from using a topographic map and Google earth. The obtained accuracy is about 90.11% and 94.14%. Change detection analysis shows that built-up area has been increased by 3%, in the other side the vegetative area has been decreased by 12%. Information on urban growth, land use and land cover change is very useful to local government and urban planners for the betterment of future plans of sustainable development of the city.

KEYWORDS: *Remote sensing, Maximum likelihood classification, Change detection, land use/land cover, Landsat TM and 7 ETM+ images, Urban growth.*

I. INTRODUCTION

There are many factors should care about that relate to social and environmental problems in omega cities, and the growth of population, economic and urbanization development are the most affects factors. Urbanization area going to expand over the time [7], [13]. Most of these problems related to the expansion of urban area [6], these problems for instance: water and air pollution, climate change, decrease the vegetation productions, harm the animals and reduce the resources of human being (wood and food). These factors to gather will reduce the quality of life in different kind of societies. On the other hand the human being should care and protect about their natural resource [28]. Nowadays remote sensing sensors provide mass of geo-spatial data covers wide areas and it has the capability to update all these information temporally and low cost if compare with other techniques, with using the satellites imageries for manage and monitor the sprawl of the urban area and the negative effects of that expansion [9], [10], [11].

II. LITERATURE REVIEW

The environment and human health, and quality of life standards, all could be affected by poor urban planning developments, or urban sprawl. After providing several alternative definitions of sprawl, we conclude that there is no single definition that would satisfy the person's in charge. According to Jaeger, Bertiller, Schwick, and Kienast (in press) Urban Sprawl shows the extent to which the built area (urban area) and the amount of dispersion in the scene. Almost majority of the cities occupied by buildings, structures and higher degree of urban sprawl spread. The Term "urban sprawl" can be used to describe (sprawl degree in landscape) and the process (spread out in the landscape over time).

Characteristics, causes and consequences are discriminated. from the phenomenon of urban area. According to [14], [27] remote sensing based on multiple times for land-use, change data can be used to evaluate the structural variation of land cover/use patterns. The results are useful for planners who are looking for avoid cumulative effects of urbanization and promoting the allocation of urban services [3]. What is more, such information are essential to assess and evaluate strategies for sustainable environmental and urban planning [1].

Recently, many researches have been done based on the use of satellite data and geographic information systems to measure the growth of the city and development of sprawl patterns. Herold [7], [8] carried out an extensive study on the dynamics of ground cover in urban areas using remote sensing data to develop landscape measurement analysis and interpretation in conjunction with spatial modeling results for urban growth. Their study showed that the approach combines remote sensing measurements and analysis of landscape and urban modeling could be a promising way to understanding spatiotemporal patterns of urbanization.

Built up area generally is accepted as a key feature to estimate urban sprawl [4], [5], [24]. Cover urban area can be obtained from surveys of physical ground or remotely sensed data. [19] Confirms that economic and population growth on the natural and human resources are the main causes of urban sprawl. The study covered the period 1972-1999 and used aerial photographs and maps available, and IRS (Indian remote sensing satellite) images Mangalore, India. Researchers showed that while built area has increased by 145%, the population grew by 55%. This is due to unplanned development and renovation of low population density. Similarly [25] using SPOT (Satellite pour observation de la Terre) imageries from the period between 1986 and 1996, identified the amount and the patterns of expansion of the city of Tunis. They discussed the benefit of remote sensing is the ability to find out the city limits and illegal settlements around cities, which are often the main cause of damage to environmental resources. [15] The statistical model designed to assist planning and decision-making process is part of Beijing with using Landsat images of five dates between 1986 and 1997 concluded that the images provide a reliable solution for quantitative studies of the city.

There are few studies or research for the Middle East and Iraq. One that is [26], which focused on the Al-Ain in the U.A.E. In another study, [3] used available maps, aerial photographs, and satellite images for the period (1950 – 2003) to study city of Muscat in the Sultanate of Oman. The results of the study showed that the 1970-2003, accumulated by the region has grown 650%, or an annual growth rate of 20%. Findings revealed that although the built-up by nine times and population increased seven times its original size, a large amount of farmland was constructed land. According to [4] growth occurs when the amount of construction in urban areas in excess of population growth rates. Therefore, studies [19], [20], [16] to provide concrete examples of the land growth. From all previous studies there are many techniques have been used for detection of urban sprawl some of these studies used classification approaches and other used statistical models. In this paper we try to identify the patterns of urban growth in south of Johor using Maximum likelihood classification with using the Landsat TM and 7 ETM+ images.

III. MATERIALS AND MATHODS

3.1. STUDY AREA

Johor is a Malaysian state, located in the southern portion of West Malaysia. Johor is one of the higheat developed states in Peninsular Malaysia. The state royal city and capital city of Johor is Johor Bahru, formerly known as Tanjung Puteri (Malay for Princess's Cape). The old state capital is Johor Lama. Johor boundaries are surrounded by Pahang from the north, Malacca and Negeri Sembilan from Northwest and the straits of Johor separates Johor and the Republic of Singapore in the south. Johor is also known by its Arabic honorific, Darul Ta'zim, or "Abode of Dignity", and as Johore in English. Geography Districts of Johor is the 5th largest state by land area and 3rd most populated state in Malaysia, with a total land area of 19,210 km^2 (7,420 sq. Mi) and a population about 3,233,434 as of 2010 based on the census of 2000 and 2.75 million was the population of Johor with 54% Malays, 35% Chinese, 7% Indians and 4% others. It is the most southern state in Peninsular Malaysia, and is located between the 1°20"N and 2°35"N latitudes. Gunung Ledang is known as the highest point in Johor (1276 m) over mean sea level. Gunung Ledang is also known as Mount Ophir. Johor also has 400 km shoreline in the both of east and the eest coast. It has 8 large islands with numerous smaller ones, namely Pulau Besar, Pulau Aur, Pulau Lima, Pulau Dayang, Pulau Pemanggil, Pulau Sibu, Pulau Tengah, Pulau Rawa and Pulau Tinggi. REFERENCESFigure (1) shows the study area in southern of Johor state.

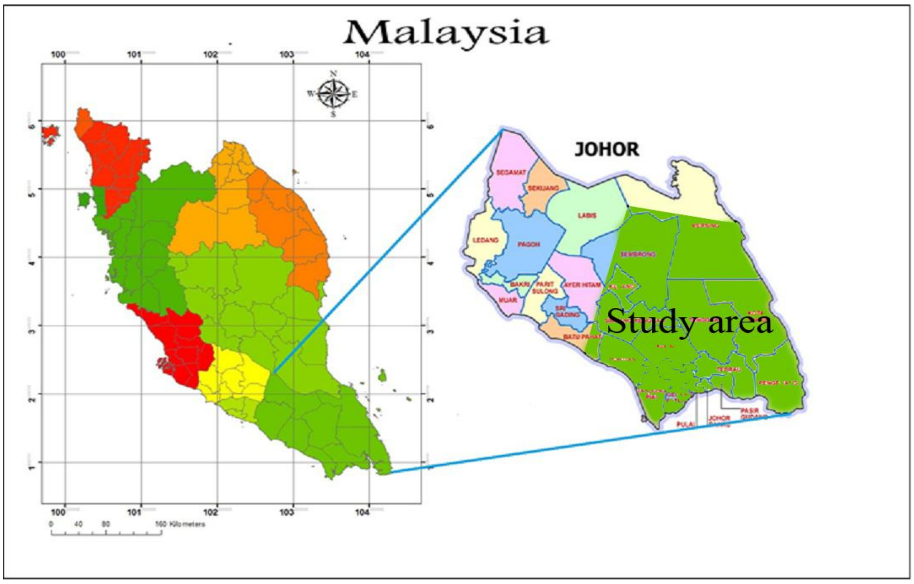

Fig. 1. The study area in south of Johor state, Malaysia

The methodology that follows to achieve our result as indicates in flow chart below in figure 2.

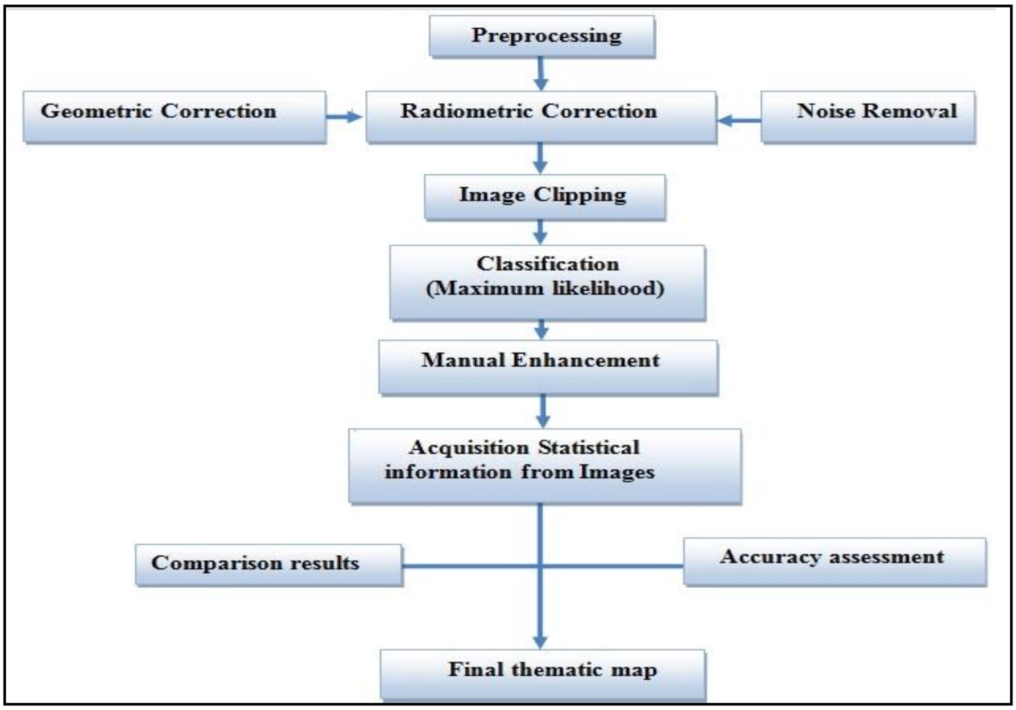

Fig. 2. Flow chart of methodology

3.2. DATA

Multi- temporal satellite data have been applied for this research. The data that has been used was Landsat data from different sensors (TM for 1995 and Landsat7 ETM+ for 2011) and it was from level 1and the datum was WGS84 for the acquisition date. Both images have spatial resolution of 30m. Then by using the topographic map of Johor to be familiar with the land cover in the study area and to collect some testing sites to use in the next stages to perform the accuracy assessment of the classification of (1995 and 2011) years, the scale of the topographic map is 1:50,000.

3.3 Training and Testing Sites Selection

The training sites collected from both imageries by selecting the region of interest (ROIs) using Envi software, the study area classified into five categories: urban area, vegetation area, bare land, water bodies and unknown area (cloud), therefore, five ROIs were collected for Landsat data and the testing sites collecting using the topographic map and Google earth from the historical database of Google earth (archive), testing sites selected and it represented the truth samples that represent these classes. Selection testing sites very important to do the accuracy assessment of classification result, then study area was classified into five classes using maximum likelihood classifier (MLC) to conduct the land cover thematic map of each Landsat data of the study area.

IV. RESULT AND DISCUSSION

4.1. IMAGE PROCESSING

The main goal of this study is to detect the urban area and vegetation changes from 1995 until 2011 using multi- temporal satellite data, in order to monitoring the changes. ENVI software has been used for performing the digital image processing and analyzing such as geometric correction, radiometric correction, atmospheric, noise removal, image clipping, classification and enhancement. Figure 3 shows the result of radiometric correction histogram. For image classification, maximum likelihood algorithm was applied to classify the area of interest into five classes including vegetation area, water bodies, urban area, bare land and unknown area which is considered as cloud. In this study Landsat images were used satisfactorily for the identification of area.The pre-processing for this case study start with radiometric correction, after that remove the noise (Stripped lines) from both of the Landsat images. The geometric correction of the images was perform using the topographic map of south Johor with help of Ground control points (GCPs) which obtained using topographic map and then the images were rectified with GCPs to remove the distortion from the images, which come from differences in orientation sensor parameters and noise from the platform itself. According to the rectification process the total RMS errors for 1995 and 2011 images were 0.44 and 0.50 respectively. The next stage was clipping the images to make the processing inside the area of interest in our imageries.Figure 3 shows the result of radiometric correction of Landsat TM that was captured in 1995 and it is obvious the different from compare the data value in x-axis in both of the histograms. Figure 4 demonstrates the result of remove the noise from the image, and from read the Cursor location/ value we can see the difference between the two images before and after removing the striped lines.

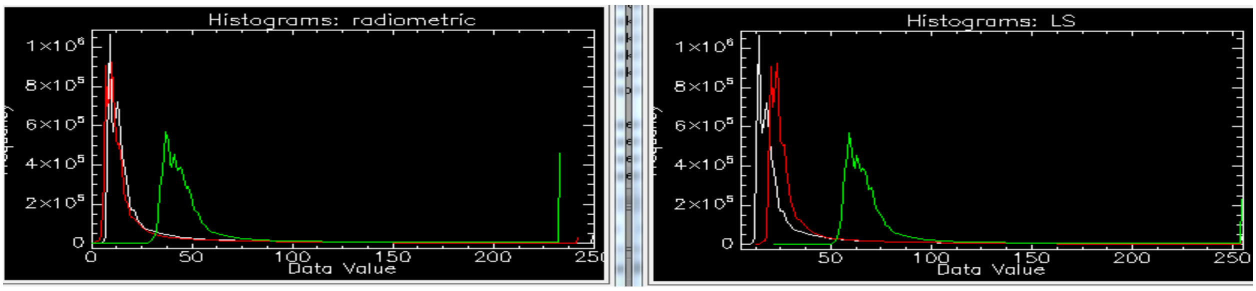

Fig. 1. Radiometric correction for image of 1995.

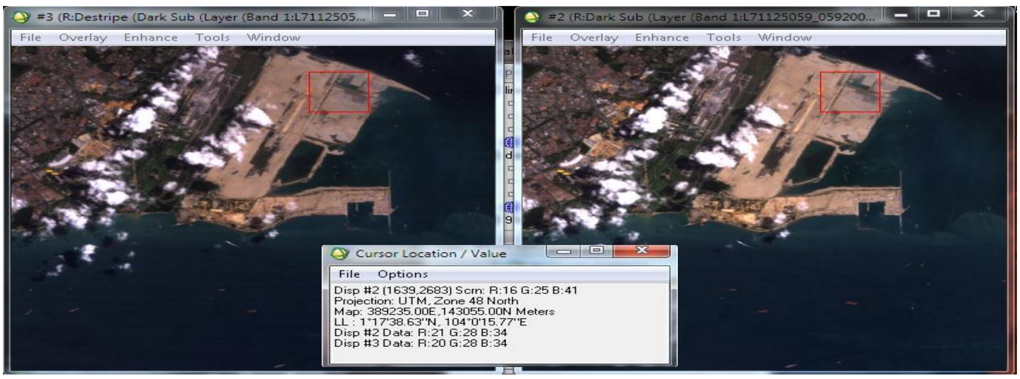

Fig. 4. Stripped line correction

4.2. CLASSIFICATION

Five classes of region of interest (ROIs) for the two images were generated; we applied Maximum likelihood approach for classification stage for each imagery to generate the thematic map of Land cover and to find out the changing that occurred between (1995-2011). The classification conducted with Envi software. There are more than 50 training sites collected for each class. For post classification stage the confusion matrix was used to find out the accuracy assessment of the classifications selecting, truth samples sites have been collected to use in the accuracy assessment. Here below figure 5 reveals the thematic maps of land cover for both years 1995 and 2011.

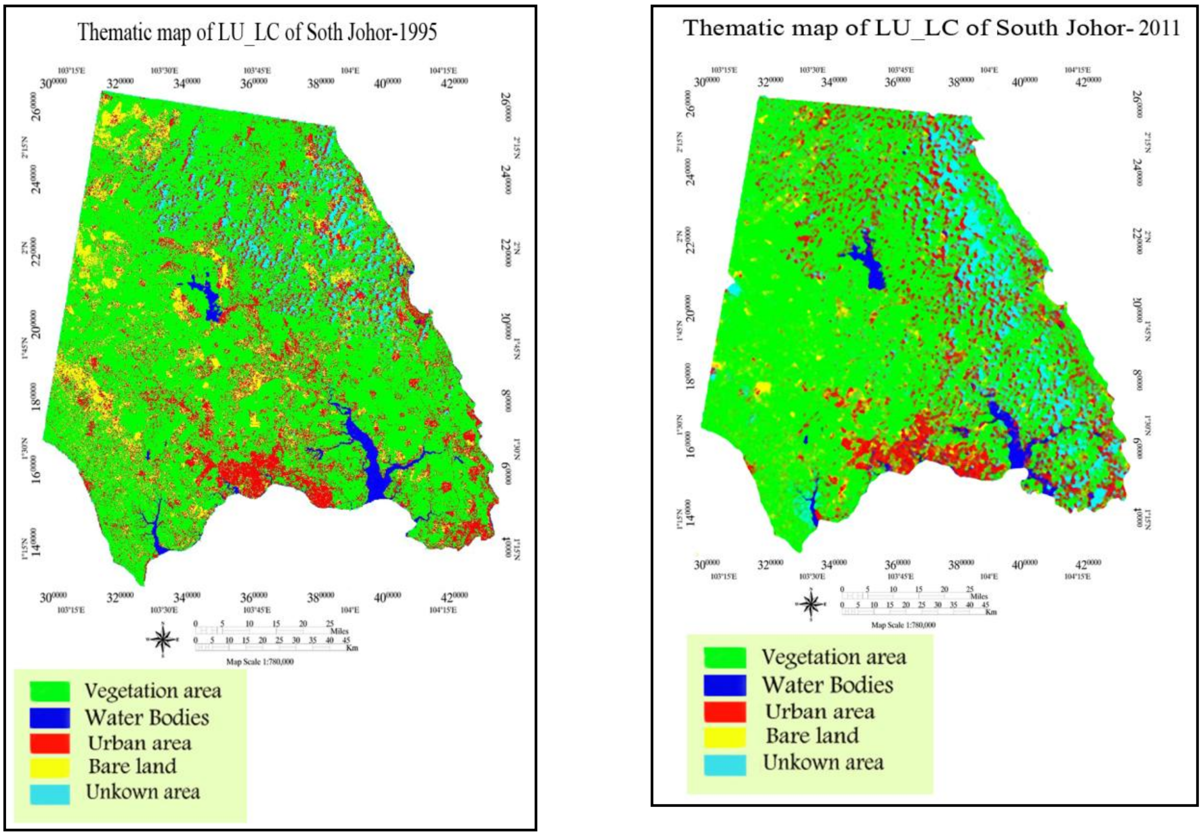

Fig. 5. Thematic maps of Land use/land cove between 1995 and 2011 in south part of Johor

4.3 ACCURACY ASSESSMENT OF CLASSIFICATION

Each of the land use / land cover map was compared to the reference data to assess the accuracy of the classification. The reference data was prepared by considering random sample points from the topographic map and historical data of Google earth. So, the ground truth samples were used to verify the classification accuracy. Over all classification accuracy for 1995, 2011 are 90.11% and 94.14% respectively. It is obvious that the accuracy assessment of Landsat TM images less than that for 2011 and that may be because the need of collecting more of reference samples to get better result than what we have and, on the other hand, it could be the area that covered with cloud reduce this accuracy, simply because no one can predict the types of features that covered these area, fortunately that area that covered with cloud less that 14% and that allow to us to use the image with acceptance results.

4.4. IMAGE ANALYZING

The changes in urban area presented in this paper were based on the statistics extracted from the two land use / land cover thematic maps of the South Johor city. The changes in land cover during the study period (1995 to 2011) can be observed clearly from the pie diagrams shown in figure 6.

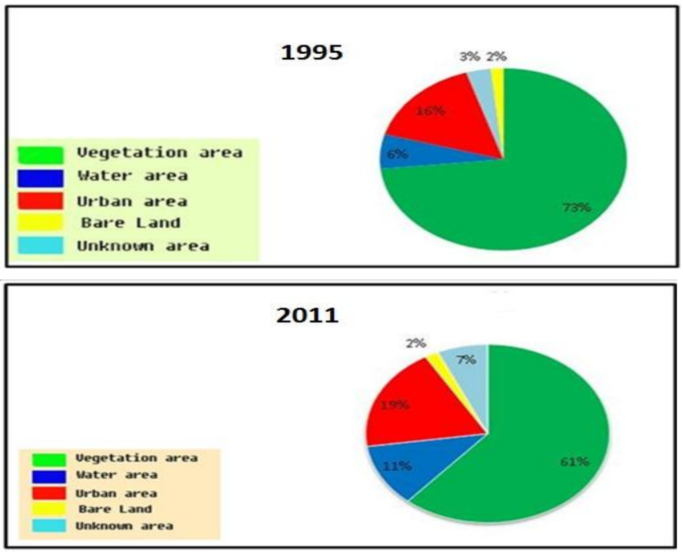

Fig. 6. Pie charts of land use/land cover for 1995 and 2011

The urban area as well as vegetation area has been changed from 1995 to 2011. Urban area has been increased by 3% (from 16% to 19%), however, the vegetation area has been witnessed decreasing by 12% (from 73% to 61%) and that reflect that the population of people increased in study area. The increase in urban area has many reasons. Johor has large borders with Singapore republic and that help to increase the commercial relationship and increase the population of people means new building and housing area, commercial area should be built to the new people. For barren area still remains 2%. The results of monitoring change detection analysis are presented in the Table1, and from figure 7 we can see the thematic maps for each year for land use/land cover and the pie charts that reflect the difference in covered area.

Table-1 the area of study area for period (1995-2011)

1995		2011	
Area	%	Area	%
Vegetation area	61.34	Vegetation area	73.34
Water bodies	11.37	Water bodies	6.13
Urban area	18.78	Urban area	15.67
Bare land	1.82	Bare land	1.67
Unknown area	6.69	Unknown area	3.24

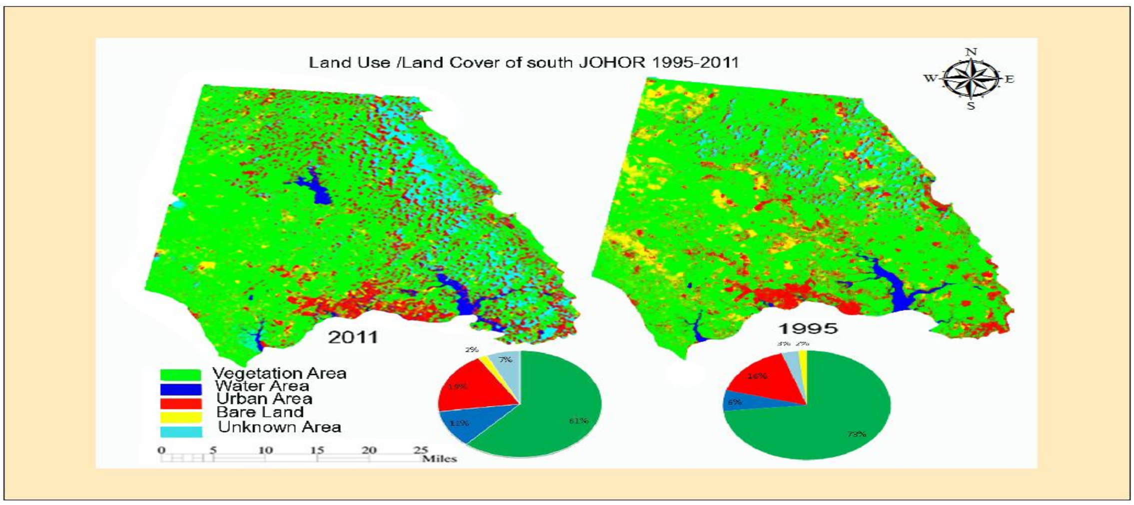

Fig. 7. Land cover/land use for south Johor in between (1995-2011)

V. PREDECTION FOR FUTURE

1. Urban area increased because increase in the population of people that lead to infer that the quality of standards of life in Johor will be improved and our prediction, that the increase of urban area will continue for the coming couple of decades in the south of Johor.
2. Bare area: will decrease to the same reasons above.

VI. CONCLUSION

Johor Bahru is the fifth largest city in Malaysia and commercial capital for the state. This study attempted to identify such urban changes for 1995 to 2011. Remote sensing has the capability of monitoring such changes, extracting the changes information from satellite data. For this research, we have taken Landsat images of southern part of Johor collected from USGS earth explorer website. The images were related to 1995 TM, and 2011 ETM+ respectively. The land use/land cover maps of the study area are developed by supervised classification of the images. Five classes have been identified as urban, water body, vegetation land, barren land and unknown (clouds). Over all classification accuracy for 1995 and 2011 are 84.14% and 89.11% respectively. Monitoring Change detection analysis shows that urban area has been increased by 3%, vegetative area has been decreased by 12% and barren area remained constant. Information on land use/land cover and possibilities for their optimal use essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare.

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K-RANGE SYMMETRIC INCLINE MATRICES

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ABSTRACT

The concept of generalized k-symmetric incline matrices is introduced as a development of the complex k - EP matrix and k -EP fuzzy matrix. A set of necessary and sufficient conditions are determined for a incline matrix to be k-range symmetric. Further equivalent characterization of k-range symmetric matrices are established for incline matrices and also the existence of various g-inverses of a matrix in $£_n$ has been determined. Equivalent conditions for various g-inverses of a k-range symmetric matrix to be k-range symmetric are determined. Generalized inverses belonging to the sets A {1,2} , A{1,2,3} and A{1,2,4} of a k-range symmetric matrix A are characterized.
***MS classification**: 16Y60, 15B33.*

***KEY WORDS**: Incline matrix, k-range symmetric, G-inverse.*

I. INTRODUCTION:

Incline is an algebraic structure and is a special type of a semiring. Inclines are additively idempotent semirings in which products are less than or equal to either factor. The notion of inclines and their applications are described comprehensively in Cao, Kim and Roush [2]. Kim and Roush [3] have studied the existence and construction of various g-inverses for matrices over the Fuzzy algebra analogous to that for complex matrices [1]. In [5], the authors have discussed the existence and construction of various g-inverses and Moore-Penrose inverse associated with a matrix over an incline whose idempotent elements are linearly ordered. In [4], the equivalent conditions for EP-elements over an incline are determined. In [6], the equivalent conditions for EP matrix are discussed.

II. PRELIMINARIES:

In this section, some basic definition and required results are given.

Definition 2.1: A non empty set £ with two binary operations '+' and '·' is called an incline if it satisfy the following conditions.

1) (£,+) is a semilattice.
2) (£,·) is a semigroup.
3) x(y+z) = xy+xz for all x,y,z϶£
4) x+xy = x and y+xy=y for x,y ϵ£

Definition 2.2: For a matrix A ϵ $£_{nm}$. Consider the following 4 equations

1) AXA=A 2) XAX=X 3) $(AX)^T$=AX 4) $(XA)^T$ =XA.

Here , A^T is the transpose of A. X is said to be a inverse of A and X ϵA{1} if X satisfies λ-equation , where λ is a subset of {1,2,3,4}.In particular, if λ = {1,2,3,4} then X is called the Moore-Penrose inverse of A and it denoted as $A^†$.

Definition 2.3[6]: A ϵ $£_n$ is range symmetric incline matrix if and only if R(A)=R(A^T).

Lemma 2.4 [5]: Let A ϵ $£_{mn}$ be a regular matrix. $AA^TA \Leftrightarrow A^†$ exists and $A^†=A^T$.

III. K-RANGE SYMMETRIC INCLINE MATRICES

Definition 3.1: A matrix A ϵ $£_n$ is said to be k-symmetric if $A=KA^TK$.

Note 3.2: Throughout, let 'k' be a fixed product of disjoint transpositions in S_n = {1,2,,…,n} and K be the associated permutation matrix. We know that

$KK^T = K^TK=I_n$, $K=K^T$,K^2=I —> 3.1

R(A) =R(KA), C(A)=C(AK) —> 3.2

Definition 3.3: A matrix A ϵ $£_n$ is said to be k-range symmetric if $R(A)=R(KA^TK)$,where R(A)={x ϵ $£_n$ / x = yA for some y ϵ $£_n$}.
Lemma 3.4: Let A ϵ $£_{mn}$ be a regular matrix. For $A^†$ exists then $(KA)^†$ exists.
Proof
$A^†$ exists ⇔$AA^TA=A$ [By Lemma 2.4]
⇔$KAA^TA=KA$
⇔ $(KA)(KA^T)(KA)=KA$
⇔KA^T ϵ (KA){1} [By Defn.2.2]
⇔ $(KA)^†$ exists.

Theorem 3.5: Let A ϵ $£_n$, the following are equivalent
(i) A is k- range symmetric
(ii)KA is range symmetric
(iii)AK is range symmetric
(iv)A^T is k-range symmetric
(v)$C(KA)=C((KA)^T)$
(vi)$R(A)=R(A^TK)$
(vii)$R(A^T)=R(AK)$
(viii)$A=HKA^TK$ for H ϵ $£_n$
(ix)$A=KA^TKH$ for H ϵ $£_n$
(x)$A^T=KAKH_1$ for H_1 ϵ $£_n$
(xi)$A^T=H_1AK$ for H_1 ϵ $£_n$

Proof
(i) ⇔ (ii) ⇔ (iii)
A is k-range symmetric⇔ $R(A)=R(KA^TK)$
⇔$R(KA)=R((KA)^T)$
⇔KA is range symmetric
⇔$KKAK^T$ is range symmetric [By 3.1.]
⇔AK is range symmetric
Thus (i) ⇔ (ii) ⇔ (iii) hold.
(i) ⇔ (iv)
A is k-range symmetric ⇔ KA is range symmetric
⇔ $(KA)^T$ is range symmetric
⇔A^TK is range symmetric
⇔A^T is k-range symmetric
Thus (i) ⇔ (iv) hold.
(ii) ⇔ (v)
KA is range symmetric ⇔ $R(KA)=R((KA)^T)$
⇔$C((KA)^T)=C(KA)$
Thus (ii) ⇔ (v) hold.
(ii) ⇔ (vi)
KA is range symmetric ⇔$R(KA)=R((KA)^T)$
⇔$R(A)=R(A^TK)$
Thus (ii) ⇔ (vi) hold.
(iii) ⇔ (vii)
AK is range symmetric ⇔$R(AK)=R((AK)^T)$
⇔$R(AK)=R(A^T)$
Thus (iii) ⇔ (vii) hold.
(i) ⇔ (viii) ⇔ (x)
A is k-range symmetric⇔$R(A)=R(KA^TK)$
⇔$A=HKA^TK$ for H ϵ $£_n$
⇔$A^T=KAKH_1$ [where $H_1=H^T$]
Thus (i) ⇔ (viii) ⇔ (x) hold.
(iii) ⇔ (ix) ⇔ (xi)
AK is range symmetric ⇔$R(AK)=R((AK)^T)$
⇔$R(AK)=R(A^T)$
⇔$C((AK)^T)=C(A)$
⇔$A=KA^TH$ for H ϵ $£_n$

$\Leftrightarrow A^T=H_1AK$ [by taking transpose]
Thus (iii) $\Leftrightarrow$ (ix) $\Leftrightarrow$ (xi) hold.

Lemma 3.6: For $A \in £_{mn,}$ $A^\dagger$ exists then the following are equivalent:
(i) A is k-range symmetric
(ii) $(KA)(KA)^\dagger=(KA)^\dagger(KA)$
(iii) $A^\dagger$ is k-range symmetric
(iv) KA is normal.

Proof

Since $A^\dagger$ exists by Lemma (2.4) $A^\dagger=A^T$ and by using Lemma (3.3), $(KA)^\dagger=A^\dagger K$ exists. Then the proof directly follows from Theorem (3.5).

Lemma 3.7: For $A \in £_n$, $A^\dagger$ exists then the following are equivalent:
(i) A is k-range symmetric
(ii) $AA^\dagger K=KA^\dagger A$
(iii) $KAA^\dagger=A^\dagger AK$

Proof

Since $A^\dagger$ exists by Lemma(2.4)
A is k-range symmetric$\Leftrightarrow$KA is normal
$\Leftrightarrow (KA)(KA)^T=(KA)^T(KA)$
$\Leftrightarrow KAA^TK=A^TKKA$
$\Leftrightarrow KAA^TK=A^TA$ (by 3.1)
$\Leftrightarrow AA^TK=KA^TA$
$\Leftrightarrow AA^\dagger K=KA^\dagger A$ [By Lemma 2.4]
$\Leftrightarrow AA^\dagger K=KA^\dagger A$
Thus (i) $\Leftrightarrow$ (ii) holds.

Since by (3.1) ,$K^2=I$, the equivalence follows by pre and post multiplying $AA^\dagger K=KA^\dagger A$ by K. Thus (ii) $\Leftrightarrow$ (iii) holds.

Lemma 3.8: A^T is a g-inverse of A implies $R(A) =R(A^TA)$.

Proof

A^T is a g-inverse of A $\Rightarrow A =AA^TA \Rightarrow R(A)=RAA^TA) \subseteq R(A^TA) \subseteq R(A)$
Therefore $R(A)=R(AA^T)$

Theorem 3.9: Let $A \in £_n$. Then any two of the following conditions imply the other one:
(i) A is range symmetric
(ii) A is k-range symmetric
(iii) $R(A)=R(KA)^T$

Proof

(i)and (ii) => (iii)
A is k-range symmetric => $R(A)=R(KA^TK) \Rightarrow R(A)=R(A^TK)$
Hence (i) and (ii) => $R(A^T)=R(KA)^T$
Thus (iii) holds.
(i)and (iii) => (ii)
A is range symmetric => $R(A)=R(A^T)$
From (i) and (ii) => $R(A)=R(KA)^T \Rightarrow R(KA)=R(KA)^T$
=> KA is range symmetric => A is k-range symmetric
Thus (ii) holds.
(i)and (iii) => (i)
A is k-range symmetric => $R(A) =R(KA^TK) \Rightarrow R(A)=R((KA)^T) \Rightarrow R(A)=R(A^T)$
Thus (i) hold.

Theorem 3.10: Let $A \in £_n$, $X \in A\{1,2\}$ and AX and XA are k-range symmetric. Then A is k-range symmetric $\Leftrightarrow$X is k-range symmetric.

Proof

$R(KA)=R(KAXA) \subseteq R(XA) =R(XKKA) \subseteq R(KA)$
Hence,
$R(KA) =R(XA) =R(K(XA)^TKK)$ [XA is k-range symmetric]
$=R(A^TX^TK) =R(X^TK)=R((KX)^T)$
$R((KA)^T)=R(A^TK)=R(X^TA^TK)=R((KAX)^T)$

$=R(KAX)$ [AX is k-range symmetric]
$=R(KX)$
KA is range symmetric $\Leftrightarrow R(KA)=R(KA)^T$
$\Leftrightarrow R((KX)^T)=R(KX)$
$\Leftrightarrow$KX is range symmetric
$\Leftrightarrow$X is k-range symmetric

Theorem 3.11: Let $A \in £_n$, $X \in A\{1,2,3\}, R(KA)=R((KX)^T)$. Then A is k-range symmetric $\Leftrightarrow$ X is k-range symmetric.

Proof

Since $X \in A\{1,2,3\}$ we have $AXA=A, XAX=X, (AX)^T=AX$

$$R((KA)^T) = R(X^TA^TK) = R(K(AX)^T) = R((AX)^T) = R(AX) \quad [(AX)^T=AX]$$
$$= R(X) = R(KX)$$

KA is range symmetric $\Leftrightarrow R(KA)=R((KA)^T) \Leftrightarrow R((KX)^T)=R(KX)$
$\Leftrightarrow$KX is range symmetric$\Leftrightarrow$X is k-range symmetric.

Theorem 3.12: Let $A \in £_n$, $X \in A\{1,2,4\}, R((KA)^T)=R(KX)$.Then A is k-range symmetric $\Leftrightarrow$X is k-range symmetric.

Proof

Since $X \in A\{1,2,4\}$,we have $AXA=A, XAX=X, (XA)^T=XA$

$$R(KA) = R(A) = R(XA)= R((XA)^T)= R(A^TX^T)= R(X^T) = R((KX)^T).$$

KA is range symmetric $\Leftrightarrow R(KA) =R((KA)^T) \Leftrightarrow R((KX)^T)=R(KX)$
$\Leftrightarrow$KX is range symmetric$\Leftrightarrow$X is k-range symmetric.

ACKNOWLEDGEMENT

This work was supported by Grants-in-Aid of Women's Of Scientists-A, Department of Science and Technology, New Delhi.

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An Automated Combined Microwave and Electric-Element Fish Dryer

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ABSTRACT

This work provides an improvement in the efficiency and economics of the drying process by combining an electric hot air flow and microwave drying unit. It is intended to improve the nutritional qualities for the dried fish market and its shelf life. We fabricated a drying Kiln having combined 1.6KW twin microwave gun and 4KW quad electric element, volume 897,000cm^3 and wet fish cargo capacity up to 80Kg. The characteristics of electric drying (ED) and combined microwave-electric drying (MED) of *Clarias Gariepinus* tissues were studied experimentally. Results show that the moisture ratio decreases with an increase in microwave drying time when microwave power is fixed. The drying rate is fast initially and then falls slowly. Finally, the curve of MED was steeper than that of ED alone during the initial drying period. The data of the percentage of water and volatile oil loss by drying with respect to time follows a logarithmic relationship. The taste panels evaluations and sample results of organoleptic assessment of the dried *Clarias Gariepinus* was found to range from excellent quality for appearance, taste and odour, good quality for fragmentation and texture. The addition of microwave to the electric heater has saved about 28 hours in drying time and reduced the product cost by energy consumption to 38%. In conclusion this method provides rapid dehydration (shorter drying time), improved product quality and flexibility in drying a wide variety of products.

KEYWORDS: Microwave Electric Drying, Internal Moisture, Nutritional Qualities

I. INTRODUCTION

There is enormous waste through spoilage of both fresh and dried fish. Preservation of fish therefore generally slows down spoilage. Preservation methods are applied with an intention to making the fish safer and extend its shelf-life [1], [2]. Drying is a complex process that causes physical, chemical and bio-chemical changes in fish products. Hence there is no guarantee on the appearance and taste of dried fish products. The method of drying and drying condition determines the qualities and shelf life for preservation and export standards In Nigeria the quality of the taste of dried fish sold in the markets vary widely since there are no quality standards for the products. Productions are done using local methods which are neither hygienic nor standardized. Presently there is lack of information in the literature about change in quality in the taste of fish after drying and such information is necessary for the development of standards and for quality control purpose.
Drying is a mass transfer process resulting in the removal of water or moisture by evaporation. To achieve this, there must be a source of heat. This work utilizes the conventional electric heater combined with the microwave dryer as the source of heat.

II. MATERIALS

A combined electric hot air flow and microwave drying unit was designed to have the following parameters; Combined 1.6kW twin microwave gun, 4kW quad electric element. The oven cavity has a total volume equal to 897,000cm^3 and can contain wet fish cargo capacity of 80kg at once. The guns and heaters are automatically controlled with microcontrollers. The microwave generated by the Magnetron is focused with a WR-340 D-Band rectangular waveguide and a pyramidal aperture horn antenna (figure 1). The waveguide operates at 2.45GHz frequency [20 percent higher than cut-off frequency] propagation in TE_{10} mode.

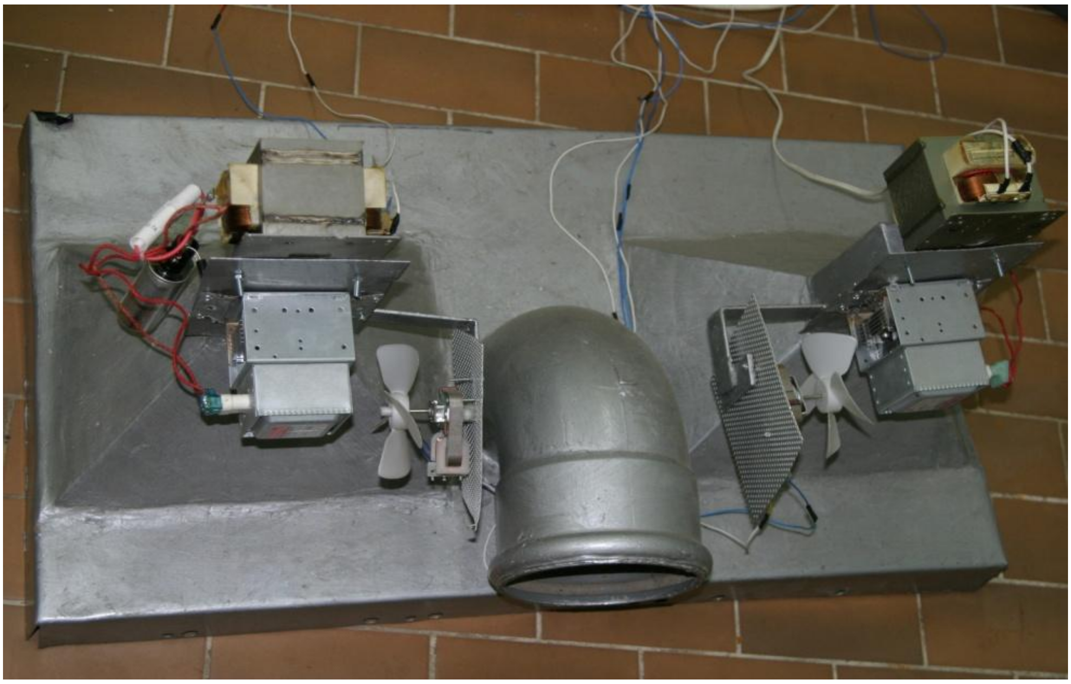

Figure 1: The twin microwave guns with Magnetrons and cooling fans.

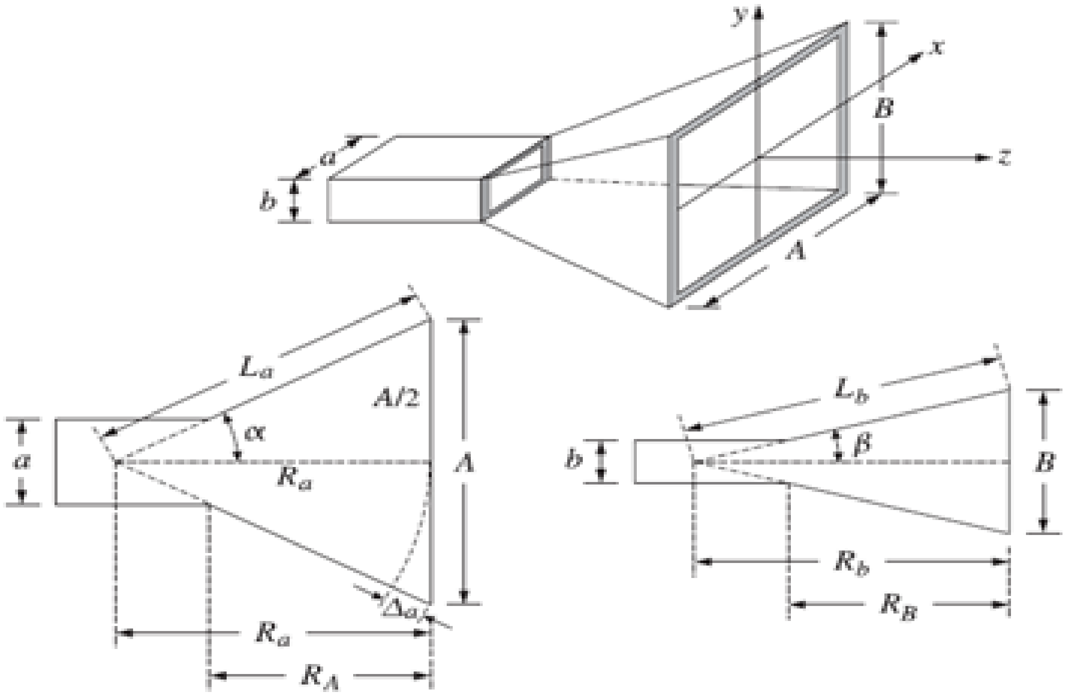

Figure 2: Geometry of the Pyramidal Horn Antenna.

III. METHODS

The geometry of pyramidal horn in figure 1 is shown in figure 2 and is related by the following expressions.

$$G = e\frac{4\pi}{\lambda^2}A.B$$

Where, G=directivity; e=aperture efficiency; A, B=dimensions of the face of horn.
For optimum directivity [3], standard horn radiator parameters are;
The aperture efficiency, e=0.49;
a=1.2593; b=1.0246;

$$2a = \frac{A^2}{2\Delta R_a} \qquad\qquad 2b = \frac{B^2}{2\Delta R_b}$$

Given the constraints of the available space and other factors, we obtained the following as the suitable radiator dimensions;
a=86.36mm; b=43.18mm; A=300mm; B=228.69mm; Directivity =14.53dB.
The pyramidal horn antenna was adopted to increase the directivity [4] of microwave (figure 3).

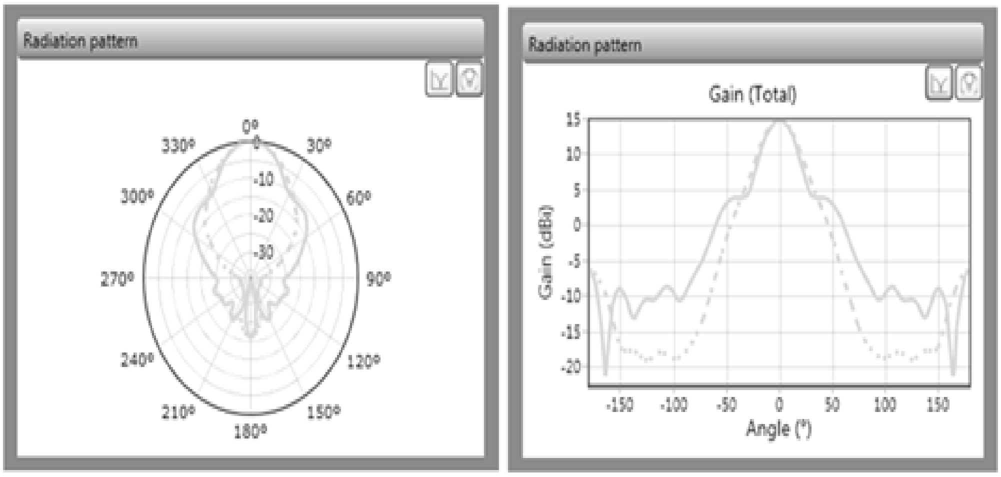

Figure 3: Radiation Pattern plot for the horn antenna.

After drying the fish, the samples were tasted by a trained panel of (10) ten people. The panel assess the color of the fish, taste, fragmentation, texture, odor and flavor and general appearance of the fish on (5) five points hedonic scale. Individual closets were used by each panelist in order to eradicate distraction and thwart communication among panelists. Sensory evaluation score cards were distributed among the panelists. Data were subjected to One-way Analysis of Variances (ANOVA), and their significant differences were indicated, means were tested using least significant differences (LSD) at 5% level of significance.

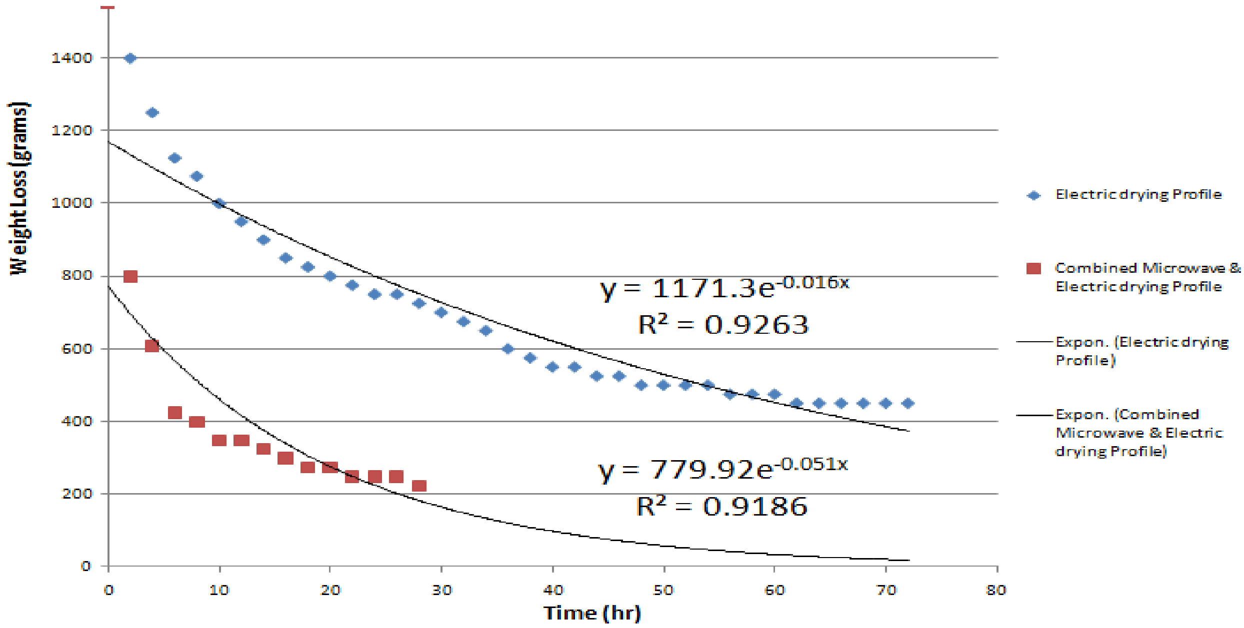

Figure 4: A comparison between only electric drying and a combined microwave and electric drying profile.

IV. RESULTS

Moisture ratio decreases with an increase in microwave drying time when microwave power is fixed. Drying rate is fast initially and then falls slowly (figure 4). Curve of microwave electric heating is steeper than that of electric heating alone. Data of percentage water and oil loss follows an exponential relationship. Microwave heating increases rate of moisture transfer towards surface significantly when compared with electric heater. Method provides rapid dehydration, improved product quality and flexibility in drying a wide variety of products.The taste panels evaluations and sample results of organoleptic assessment of the dried *Clarias Gariepinus* was found to range from excellent quality for appearance, taste and odour, good quality for fragmentation and texture. The addition of microwave to the electric heater has saved about 28 hours in drying time and reduced the product cost by energy consumption to 38%.

V. DISCUSSION

It was observed that the electric heater was relatively efficient at removing free water near the surface whereas the internal moisture takes time to move to the surface. It was evident that the mechanism of microwave heating resulted in internal vapor regeneration which led to development of a positive vapor pressure gradient that increases the rate of moisture transfer towards the surface significantly when compared with the electric heater.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Hetero-Sonic Methanolysis of Palm Kernel Oil To Produce Biodiesel Fuel

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ABSTRACT

The valuable oil obtained from the kernel of the African oil palm, Elaeis guineensis was used for the production of biodiesel fuel (BDF). A prototype production plant based on hetero-sonic agitation was designed, fabricated and tested in the Hardware Development Laboratory. The produced plant was used to investigate the effect of hetero-sonic mixing on the methanolysis of palm kernel oil (PKO) in comparison to its absence in the conventional catalysis method. The susceptibility of commercial stocks of PKO to mesophilic and thermophilic fungi was investigated at the Molecular Systematic Laboratory. Its effect on the breakdown of PKO into free fatty acid (FFA) resulting into unpredictable quality of produced BDF was also investigated. Results showed that; Acoustic cavitations condition created by hetero-sonic agitation produced high speed mixing and mass transfer between methanol and oil. The net effect was a higher yield of biodiesel fuel within a shorter time frame. It proved to reduce the transesterification time. Rancidity of Palm kernel oil was facilitated by moisture, light exposure and atmospheric oxygen resulting to changes in odour and pH. Due to the biodegradation conditions, a pH change of 5±10% was observed on a 3 month average storage at the University of Lagos. This project provides the clue for sustainable and economic growth of the Nigerian energy sector which requires; a stock pile preservation of raw materials (PKO) and fast production plant (hetero-sonic mixer) to meet potential market quality and demands.

KEYWORDS: *Hetero-sonic Agitator (HA), Acoustic Spectral Control (ASC), virtual instrument (VI), Biodegradation, Biodiesel fuel (BDF).*

1. INTRODUCTION

1.1 IMPORTANCE

Biodiesel fuel (BDF) is a biodegradable and non-polluting fuel which has proved to be eco-friendly far more than fossil fuels. Biodiesel fuel made from natural ingredients is much better for the environment “reduces green house effect” since it produces fewer carbon emissions than conventional diesel fuel (FDF), the major contributor to global warming by about 75%. It also produces very little sulfur when burned, thereby reducing the risk of acid rain [1]. In Nigeria the use of fossil diesel fuel engines for domestic and industrial generation of electricity or automobiles could result to environmental issues, concerned with the exhaust gases emission. One big advantage is that BDF can favorably replace FDF since it can be used in any diesel engine [4] without modification.

1.2 PRODUCTION TIME

Making biodiesel is a complicated and time consuming process [3] which makes it necessary for the study of the production process based on the raw materials, palm kernel oil (PKO), lye (NaOH) and methanol (CH_3OH) to optimize production time and reduce cost. The convectional (batch) production process of making BDF is quite slow and phase separation of the glycerin is time-consuming, often takes eighteen (18) hours or more. It involves mixing oil with an alcohol, usually methanol (CH_3OH) or ethanol (C_2H_5OH) and an alkali catalyst. A reduction in production time would translate to a relative reduction in the end cost of BDF. It was shown that ultrasonic agitation reduces production time by ninety seven point five percent (97.5%) thus favoring continuous production process. In the ultrasonic production process; ultrasonic waves cause the reaction mixture to produce and collapse bubbles constantly. This phenomenon is termed acoustic cavitations which mimics simultaneously the mixing and heating required to carry out transesterification process [5].

1.3 STORAGE

There has also been a report of involvement of microbial activity in the break down of PKO into free fatty acids [2]. In Nigeria today we continue to enjoy subside in fossil fuel prices with rocket shoot-up prices during scarcity. To ensure reasonable price stability for BDF, so as not to be subjected to unexpected shortage, we need long term storage of raw material. Specific to this project, Palm kernel oil (PKO) is the raw material which displays 3rd order biotic activity. It belongs to the class of goods in which respiration processes are suspended, but in which biochemical, microbial and other decomposition processes still proceed. Oils and fats spoil by readily becoming rancid. Rancidity is promoted by light, atmospheric oxygen and moisture and leads to changes in odor, pH, and taste. The acid value of oil may be used as a measure of quality. The high acid value of the oil denotes an excessively high content of free fatty acids, which causes the oil to turn sour. Discoloration may also occur.

1.4 CHALLANGES

More challenging is to determine suitable acoustic frequencies and amplitudes necessary to facilitate fast production of BDF. It would require designing a reactor tank capable of producing such waves and a spectral display of the same signals. This project aims to fabricate the mentioned equipment using locally sourced materials. We hope that a reduction in production time would translate to a relative reduction in the end cost of BDF; even if complete reduction cannot be attained a possible mixture of both BDF and FFD could reduce the environmental consequences of using only fossil fuel. In the near future, we also intend to evaluate the production potential for other non edible oils.

II. MATERIALS AND METHOD

Materials used include;

- palm kernel oil (PKO), Lye (NaOH) and Methanol (CH_3OH)
- Hetero-sonic mixer (designed and constructed)
- Laptop Computer configured as a Virtual Instrument

The hetero-sonic mixer and agitator were constructed with tunable acoustic frequencies between 5 KHz and 45 KHz (Figure 1A and 1B). A Virtual Instrument was built into a laptop using its sound card and associated transducers as a spectrum analyzer. The sound spectrum code was developed on a National Instruments LabView G-programming platform. For a start palm kernel oil (PKO) mixed in the alcohol (with base catalyst NaOH) was separated into two equal halves, one is left to separate naturally (conventional method) and the other half was sonicated with the built hetero-sonic mixer. The virtual instrument spectrum analyzer was used to tune the sonicator to the same frequency peaks and spectral power (Figure 2). Colour changes during the chemical reactions (transesterification) and total BDF produced were used to identify how the reaction progressed. Colonizing microbes were isolated from the PKO using relevant media. This was done using fresh and three month stored PKO. The effect of the Palm kernel oil on the growth of some thermophilic and mesophilic microbes was also investigated *in vivo* as described by Adekunle and Ozonweke (2001).

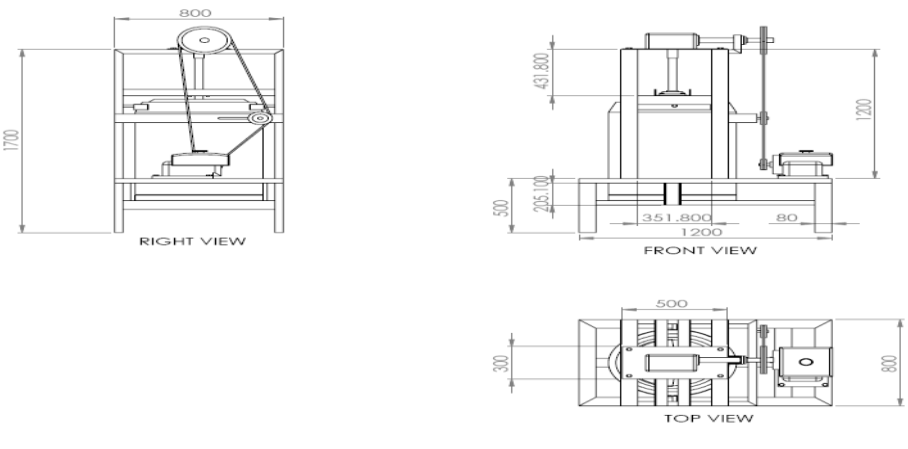


Figure 1A: Projections of the heterosonic mixer.

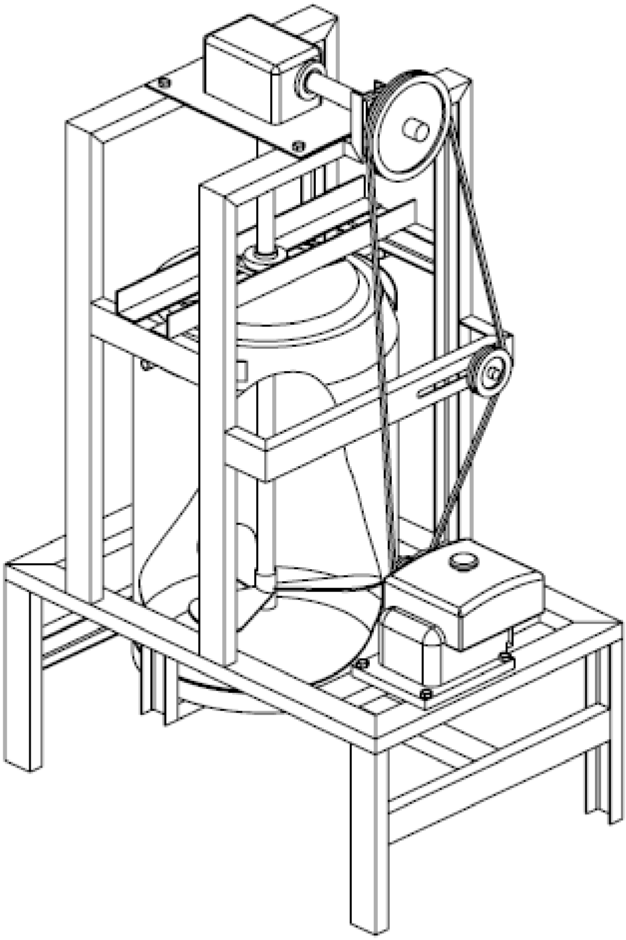


Figure 1B: Isometric view of the heterosonic mixer.

III. THEORY

Multiple frequency waves are generated using the built Hetero-sonic mixer. The spectral waves with characteristic frequencies cause the reaction mixture, to produce and collapse bubbles constantly. These cavitations provided simultaneously the mixing and heating required accelerating the transesterification process [5]. Production can be maximized by determining the appropriate frequencies where the peak power resides. Its location is aided with the built Power Spectrum Analyzer and tunable hetero-sonic mixer. The Virtual Instrument codes are based on the Fast Fourier transform and Lomb's periodogram. Since the sampler is software based, it is subjected to uneven sampling space due to priority interrupts from the Laptop microprocessor. The Lomb's periodogram defined as below yields an approximate Power spectrum.

$$P_N(\omega) = \frac{1}{2S^2}\left\{\frac{\left[\sum(h_j - \bar{h})\cos\omega(t_j - t)\right]^2}{\sum cos^2\omega(t_j - t)} + \frac{\left[\sum(h_j - \bar{h})\sin\omega(t_j - t)\right]^2}{\sum sin^2\omega(t_j - t)}\right\}$$

$$\tan 2\omega t = \frac{\sum \sin 2\omega t_j}{\sum \cos 2\omega t_j}$$

Where

$$\bar{h} = \frac{1}{N}\sum h_j, \quad s^2 = \frac{1}{N-1}\sum(h_j - \bar{h})^2, \omega = 2\pi f$$

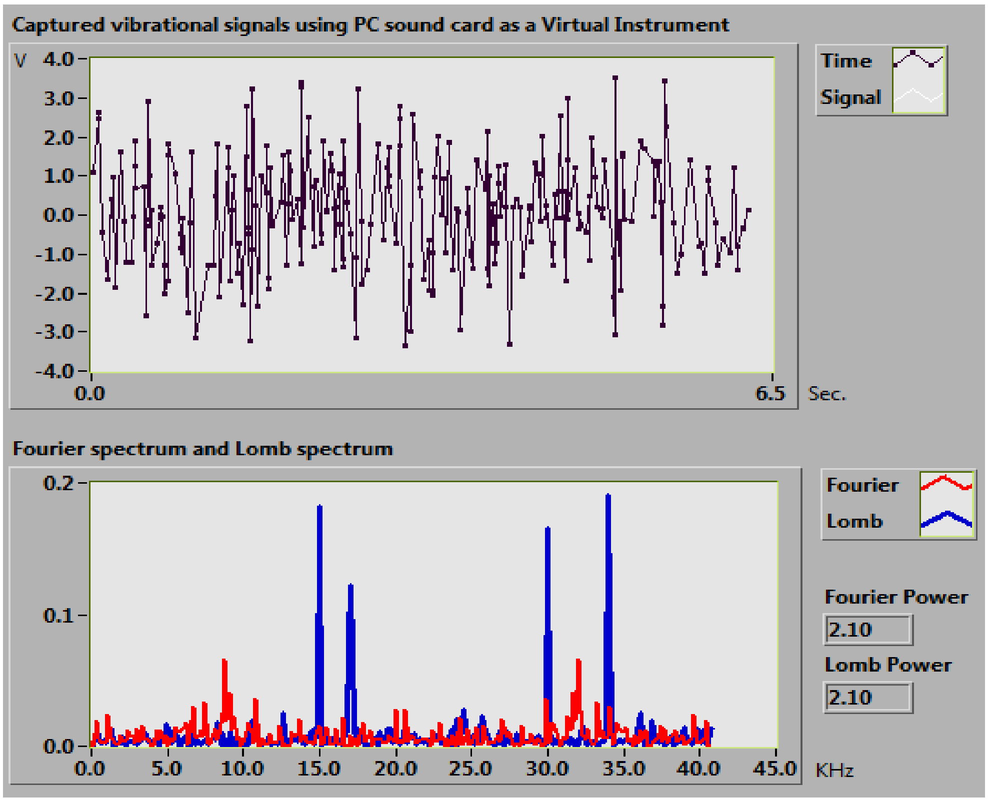
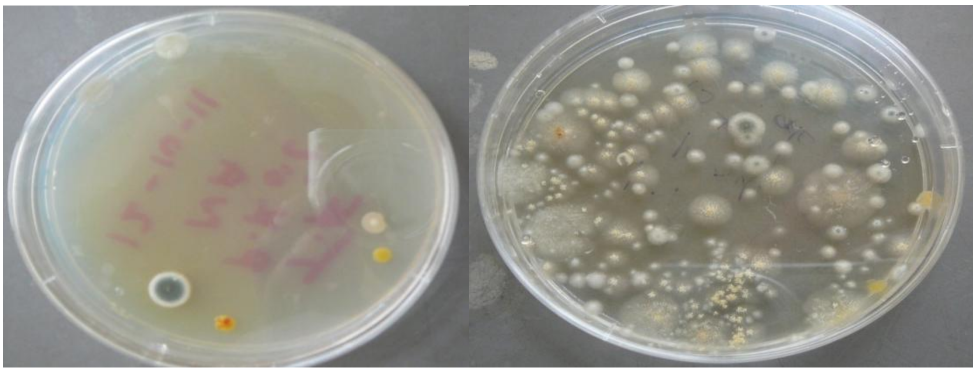


Figure 2: The spectrogram to peak the power for cavitation frequencies with a virtual instrument.

IV. RESULTS

Results by relative colour changes in the reaction of sonicating the transesterifcation process appears completed compared to the conventional (without sonication). The hetero-sonic waves agitated the alcoxy solution mixed with oil which resulted in cavitations, thereby increasing the mixing ratio of the two liquids; consequently the time for transesterification was drastically reduced to 30 minutes as we found the BDF golden-yellowish floating on top the creamy yellow glycerol after 30 minutes.It was also observed that when the hetero-sonic irradiation power or spectral power was reduced by half, the transesterification time extended from thirty minutes (30 min.) to one hour (1 hr.). It is therefore evident that the processing and separation time is related to the effect of sonification. Hetero-sonic agitations reduce the processing time and the separation time significantly to achieve a biodiesel yield in excess of 98.1%.More microbial growth were observed (figure 3) in the cultured three month stored PKO as compared to the fresh PKO (30-300 and 7 respectively). PKO was found to preferentially promote the cultured mesophilic fungi (*Aspergillus flavus*, *Aspergillus niger*) as compared to the thermophilic fungi (*Penicillium spp*, *Aspergillus terreus*) as seen in table 1.



A B

Figure 3: A- isolated microbes from fresh PKO, B- isolated microbes from 3 months stored PKO.

Table 1: shows effect of PKO on the growth of some fungi.

	THERMOPHILE						**MESOPHILE**					
	Penicillium spp			***Aspergillus terreus***			***Aspergillus flavus***			***Aspergillus niger***		
	24hrs	48hrs	72hrs	24hrs	48hrs	72hrs	24hrs	48hrs	72hrs	24hrs	48hrs	72hrs
PDA with oil 1	00 00	10 05	12 07	00 00	08 05	10 08	10 10	12 12	14 14	14 13	18 16	22 20
PDA with oil 2	00 00	10 05	12 07	00 00	08 05	10 08	10 10	12 12	14 14	14 12	18 15	22 28
PDA with oil 3	00 00	10 05	12 07	00 00	08 05	10 08	10 10	12 12	14 14	14 12	18 16	22 19
PDA without oil 1	11 08	13 10	15 12	08 06	11 08	14 11	12 10	16 14	20 18	10 08	12 10	14 12
PDA without oil 2	10 08	12 10	14 12	08 06	11 08	14 11	12 10	16 14	20 18	10 08	12 10	14 12
PDA without oil 3	11 09	13 11	15 12	08 06	11 08	14 11	12 10	16 14	20 18	10 08	12 10	14 12

IV. DISCUSSION

Thus the effect of using an ultrasonic agitator for biodiesel production drastically reduces the reaction time, reaction temperatures, and energy input. Hence the process of transesterification can run continuously inline rather than using the time consuming batch process convectional method. An estimated production cost is ₦250 Naira per liter of BDF using the hetero-sonic agitator relative to ₦145 Naira per liter of FDF. While the conventional BDF production still stands at ₦400 Naira per liter.

V. CONCLUSION

In this project we have constructed (Figure 4) a Hetero-sonic Agitator (HA) with Acoustic Spectral Control (ASC) virtual instrument (VI) and used it to catalyze the production of Biodiesel fuel (BDF). We also showed that Ultrasonic agitation reduced the production time by 98.1 % which favors continuous production line. It therefore proved to be a promising and an effective method for industrial production of fatty acid methyl esters (FAME). The 98.1% reduction in production time compared to 18hours with the conventional production process translates to reduced cost and economic advantages.

Figure 4: The Hetero-sonic Agitator (HA) with Acoustic Spectral Control (ASC).

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An Efficient Comparison Ofmimo-Ofdm Detection Using Spatial Multiplexingtechniques

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ABSTRACT

Multiple Input Multiple Output (MIMO) systems have recently emerged as a key technology in wireless communication systems for increasing both data rates and system performance. There are many schemes that can be applied to MIMO systems such as space time block codes, space time trellis codes, and the Vertical Bell Labs Space-Time Architecture (V-BLAST). This paper proposes a novel signal detector scheme called MIMO detectors to enhance the performance in MIMO channels. , we study the general MIMO system, the general V-BLAST architecture with Maximum Likelihood (ML), Zero- Forcing (ZF), Minimum Mean-Square Error (MMSE), and Ordered Successive Interference Cancellation (SIC) detectors and simulate this structure in Rayleigh fading channel. Also compares the performances of MIMO system with different modulation techniques in Fading and AWGN channels. Base on frame error rates and bit error rates, we compare the performance and the computational complexity of these schemes with other existence model. Simulations shown that V-BLAST implements a detection technique, i.e. SIC receiver, based on ZF or MMSE combined with symbol cancellation and optimal ordering to improve the performance with lower complexity, although ML receiver appears to have the best SER performance-BLAST achieves symbol error rates close to the ML scheme while retaining the low-complexity nature of the V-BLAST.

Indexterms: *MIMO, V-BLAST, ZF, MMSE SIC and ML.*

I. INTRODUCTION

Future wireless communication networks will need tosupport extremely high data rates in order to meet the rapidly growing demand for broadband applications such as high quality audio and video. Existing wireless communication technologies cannot efficiently support broadband data rates, due to their sensitivity to fading.
Recent research on wireless communication systems has shown that using MIMO at both transmitter and receiver offers the possibility of wireless communication at higher data rates, enormous increase in performance and spectral efficiency compared to single antenna systems. The information-theoretic capacity of MIMO channels was shown to grow linearly with the smaller of the numbers of transmit and receiver antennas in rich scattering environments, and at sufficiently high signal-to-noise (SNR) ratios [1].MIMO wireless systems are motivated by two ultimate goals of wireless communications: high-data-rate and high-performance [2],[3].During recent years, various space-time (ST) coding schemes have been proposed to collect spatial diversity and/orachieve high rates. Among them, V-BLAST (Vertical Bell Labs Layered Space-Time) transmission has been widely adopted for its high spectral efficiency and low implementation complexity [4]. When maximum-likelihood (ML) detector is employed, V-BLAST systems also enjoy receives diversity, but the decoding complexity is exponentially increased by the number of transmit antennas.

Although some (near-) ML schemes (e.g., sphere decoding (SD), semi-definite programming (SDP)) can be used to reduce the decoding complexity, at low signal to noise ratio (SNR) or when a large number of transmit antennas and/or high signal constellations are employed, the complexity of near-ML schemes is still high. Some suboptimal detectors have been developed, e.g., successive interference cancellations (SIC), decision feedback equalizer (DFE), which are unable to collect receive diversity [5]. To further reduce the complexity, one may apply linear detectors such as zero-forcing (ZF) and minimum mean square error (MMSE) equalizers. It is well-known that linear detectors have inferior performance relative to that of ML detector. However, unlike ML detector, the expected performance (e.g., diversity order) of linear equalizers has not been quantified directly. The mutual information of ZF equalizer has been studied in [6] with channel state information at the transmitter.
In this paper, we propose a modified V-BLAST system, which introduces different delay offsets for each substreme in the transmitter. At the receiver, we can employ ZF strategy to recover information and the introduction of delay offsets enables the requirement of Nr to be relaxed to Nr ≥ 1 (in the conventional V-BLAST, Nr ≥ Nt. Where, Nr and Nt are the receiver and transmitter antennas respectively. We will verify the performance improvement by theoretical analysis and simulation results. From our analysis, with ZF decoding,

the diversity order can reach Mr in the modified V-BLAST system. But the increase of the diversity order is at the cost of the multiplexing gain.The main goal of our paper is to study the MIMO detectors schemes and quantify the diversity orders collected by linear equalizers for V-BLAST. Also optimize the ultimate detector and modulation technique that yields a better error performance than general V-BLAST. The rest of this paper is organized as follows. In Section 2, the MIMO system model is introduced. Section 3 gives the performances of MIMO system with different modulation techniques in Fading and AWGN channels and Section 4 gives the performance analysis of the linear equalizers optimize the ultimate detector.

II. MIMO SYSTEM MODEL

In this paper, we consider a conventional MIMO SM system with transmitNttransmit antennas and Nr receive antennas where Nt≤Nr as shown in Figure 1.5. Independent data streams *a*, *b*, and *c*, are encoded and modulated before being transmitted. Herein, consider a transmitted vector $x=[x_1, x_{2\ldots}xNt]^T$ whose elements are drawn independently from a complex constellation set Ω, e.g. Quadrature Amplitude Modulation (QAM) constellation. The vector is then transmitted via a MIMO channel characterized by the channel matrix Hwhose element is the $h_{i,j}$ CN $(0,1)^1$ complex channel coefficient between the *j*th transmit and *i*th receive antennas. The received vector $r=[r, r\ldots rNr_]^T$ can then be given as following,

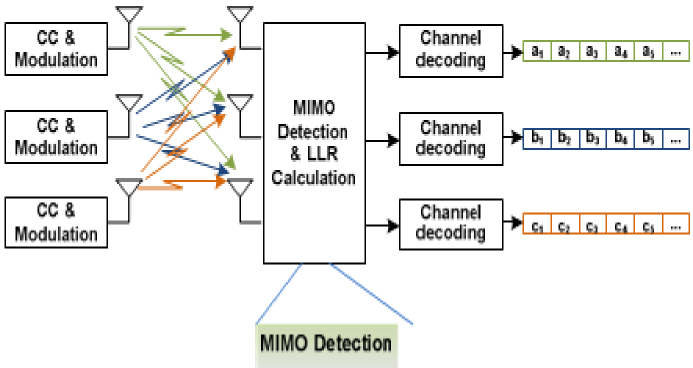

Fig. 1.SMsystemmodelincludingboth transmitterandreceiver main functionalblocks

$$r=Hx+n, \qquad (1.1)$$

Where the elements of the vector $n=[n_1, n_{2,}\ldots,n_{Nr]}]^T$ are drawn from independent and identically distributed (i.i.d.) circular symmetric Gaussian random variables. The system model of(2.1) is then given in the matrix form as following.

$$= \qquad \begin{bmatrix} h_{11} \\ \vdots \\ h_{N_r1} \end{bmatrix}$$

I. SPATIAL MULTIPLEXING AND DETECTION PROBLEM

Spatialmultiplexing(SM)Seemstobetheultimatesolutiontoincreasethesystemcapacitywithouttheneedtoaddítionalspectralresources.Thebasicideaehindsmisthatadatastreamisdemultiplexedintontindependentsubstreamsashowninfigure1,Andeachsubstreamisthenmappedintoconstellationsymbolsandfedtoitsrespectiveantenna.Thesymbolsaretakenfromaqamconstellation.Theencodingprocessissimplyabittosymbolmappingforeachsubstream,Andallsubstreamsaremappedindependently.Thetotaltransmitpowerisequallydividedamongthenttransmitantennas.Atthereceiverside,Themainchallengeresidesindesigningpowerfulsignalprocessingtechniques,I.E.,Detectiontechniques,Capableofseparatingthosetransmittedsignalswithacceptablecomplexityandachievedperformance.Givenperfectchannelknowledgeatthereceiver,Avarietyoftechniquesincludinglinear,Successive,Treesearchandmaximumlikelihooddecodingcanbeusedtoremovetheeffectofthechannelandrecoverthetransmittedsubstreams,Seeforexample.Differentresearchactivitieshavebeencarriedouttoshowthatthespatialmultiplexingconcepthasthepotentialtosignificantlyincreasespectralefficiency,.Furtherresearchhasbeencarriedoutoncreatingandevaluatingenhancementstothespatialmultiplexingconcepts,Suchascombiningwithothermodulationschemeslikeofdm(OrthogonalFrequencyDivisionMultiplexing).Ingeneral,thistechniqueassumeschannelknowledgeatthereceiverandtheperformancecanbefurtherimproved when theknowledge ofthechannelresponseis available at the transmitter. However, SM does not work well in low

SNRenvironmentsasitismoredifficultforthereceivertorecognizethemultipleuncorrelatedpathsofthesignals.ThemainchallengeinthepracticalrealizationofMIMOwirelesssystemsliesintheefficientimplementationofthedetect orwhichneedstoseparatethespatiallymultiplexeddatastreams.Sofar,severalalgorithmsofferingvarioustradeoffsbetweenperformanceandcomputationalcomplexityhavebeendeveloped.Lineardetection(lowcomplexity,lowperformance)constitutesoneextremeofthecomplexity/performanceregion,whileMaximumLikelihoodDetector(MLD)detectionalgorithmhasanoppositeextreme(highcomplexity,optimumperformance).Maximum Likelihood Detector (MLD) is considered as theoptimum detector for the system of (1.1) that could effectively recover the transmitted signal at thereceiver based on the following minimum distance criterion,

$$\tilde{x} = arg_{x_k \in \{x_1, x_2, \ldots, x_n\}} min\|r - Hx_k\|^2$$

Where x is the estimated symbol vector. Using the above criterion, MLD compares thereceivedsignal with all possible transmitted signal vector which is modified by channel matrix *H* and estimates transmit symbol vector *x*. Although MLD achieves the best performance and diversity order, it requires a brute-force search which has an exponential complexity in the number of transmit antennas and constellation set size. For example, if the modulation scheme is 64-QAM and 4 transmit antenna, a totalof 644 = 16777216 comparisons per symbol are required to be performed for eachtransmitted symbol. Thus, for high problem size, i.e. high modulation order and high transmit antenna (*Nt*), MLD becomes infeasible.The computational complexity of a MIMO detection algorithm depends on the symbol constellation size and the number of spatially multiplexed data streams, but often on the instantaneous MIMO channel realization and the signal-to-noise ratio. On the other hand, the overall decoding effort is typically constrained by system bandwidth, latency requirements, and limitations on power consumption. In order to solve the detection problem in MIMO systems, research has been focused on sub-optimal detection techniques which are powerful in terms of error performance and are practical for implementation purposes as well that are efficient in terms of both performance and computational complexity. Two such techniques are Sphere Decoding (SD) and QR Decomposition with M-algorithm (QRD-M) which utilize restrict tree search mechanisms.

III. AVERAGE BER-ANALYSIS

A. V-BLAST Zero Forcing (ZF) ZF characteristic:

The Zero-Forcing V-BLAST algorithm (ZF-VBLAST) is based on detecting the components of *x* one by one. For the first decision, the pseudo-inverse, i.e., *G* equals *H* † , of the matrix *H* is obtained. Assume that the noise components are *i.i.d*. and that the noise is independent of *x* . Then, the row of *G*, with the least Euclideannorm, corresponds to the required component of *x* . That is,

$$k_1 = argmin(\|g\|^2)$$
$$\tilde{x}_{k_1} = g_{k_1} r^1$$
$$\tilde{x}_{k_1} = Q(\tilde{x}_{k_1})$$

Obviously, incorrect symbol detection in the early stages will create errors in the following stages; i.e. error propagation. This is a severe problem with cancellation based detection techniques particularly when the number of transmit and receive antennas are the same. The first detected symbol's performance is quite poor as it has no diversity. To reduce the effect of error propagation and to optimize theperformance of VBLAST technique, it has been shown in that the order of detection can increase the performance considerably. By detecting the symbols withlargest channel coefficient magnitude first, the effect of the noise vector producing an incorrect symbol can be reduced, and reducing error propagation as result.

B. MinimumMeanSquareError

Minimum Mean Square Error (MMSE) approach alleviates the noise enhancement problem by taking into consideration the noise power when constructing the filtering matrix using the MMSE performance-base criterion. The vector estimates produced by an MMSE filtering matrix becomes

$$x = [[(H^H H + (\sigma^2 I))^{-1}] H^H] r,$$

The MMSE detector converges to the ZF detector, but at low SNR it prevents the worst Eigen values from being inverted.At low SNR, MMSE becomes Matched Filter.

C. Ml Scheme

A detector that always returns an optimal solution satisfying is called a Maximum Likelihood (ML) detector.

$$s_* = argmax\, P(V \text{ is observed } / \text{ } S \text{ was sent})$$

If we further assume that the additive noise n is white and Gaussian, then we can express the ML detection the minimization of the squared Euclidean distance metric to a target vector v over an M-dimensional infinite discrete search set:

=

where borrowing terminology from the optimization literature we call the elements of s optimization variables and
the objective function.

II. Observation & Results

SNR	BER(QPSK)	
	MMSE-SIC	ML
0	0.2252	0.2252
2	0.18	0.1782
4	0.1326	0.1326
6	0.957	0.08895
8	0.0594	0.0533
10	0.03575	0.0301
12	0.0209	0.0165
14	0.0119	0.0075
16	0.0075	0.0036

Zero Forcing equaliser performs well only in theoretical assumptions that are when noise is zero. Its performance degrades in mobile fading environment.

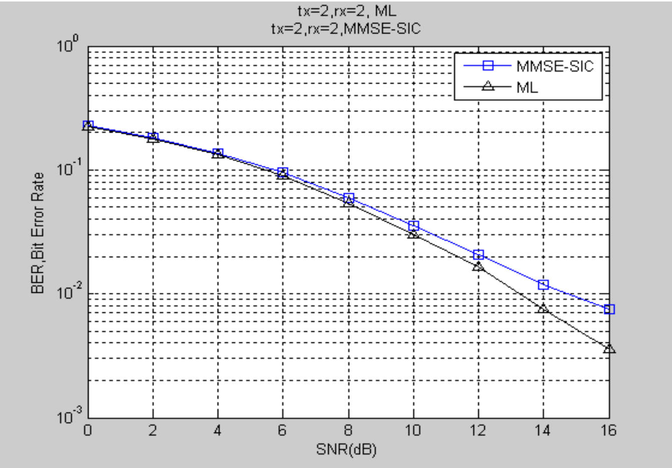

Figure 2 Comparison between ML and MMSE-SIC

SNR	Bit Error Rate (BPSK)			
In dB	**ZF**	**ZF-SIC**	**MMSE**	**MMSE-SIC**
2	0.1643	0.1264	0.1081	0.08975
4	0.1238	0.08513	0.07625	0.05187
6	0.08962	0.05613	0.05325	0.02788
8	0.0625	0.03413	0.03662	0.0155
10	0.03875	0.01988	0.0235	0.005625
12	0.02575	0.01225	0.01487	0.0025
14	0.01775	0.006025	0.0095	0.00125

Zero forcing with Successive interference cancellation improves the performance of equalizer. This process improves the estimator performance on the next component compared to the previous one. Compared to Zero Forcing equalization alone case, addition of successive interference cancellation results in around 1.8 dB of improvement for BER.Minimum Mean Square Equalization with simple successive interference cancellation case, addition ofoptimal ordering results in improvement in the BER as the SNR increases

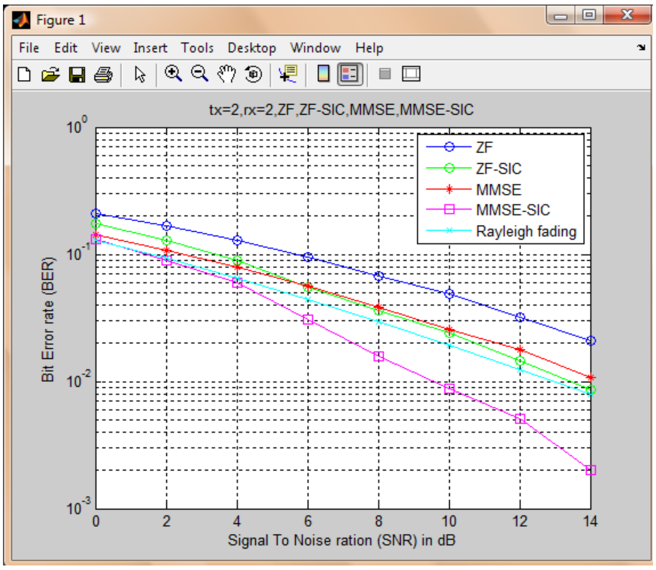

Figure 3Comparison between ZF,ZF-SIC, MMSE andMMSE-SIC

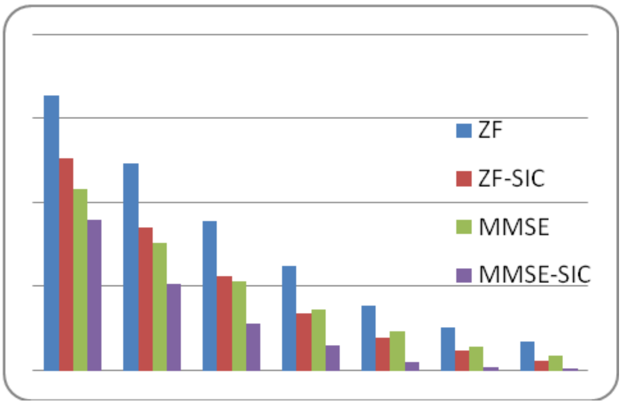

Figure 4Comparison between ZF,ZF-SIC, MMSE andMMSE-SIC

IV. CONCLUSION

Equalisation techniques are of enormous importance in the design of high data rate wireless systems. They can combat for inter symbol interference even in mobile fading Channel with high efficiency.In this paper we analyzed the performance of linear detectors for MIMO Spatial Multiplexing systems in Rayleigh fading channel and AWGN channel for BPSK modulation, which exhibited the best trade-off between performance and complexity among Spatial Multiplexing techniques. We show that conventional linear equalizers can only collect diversity Nr–– Nt +1 for MIMO systems though they have very low complexity and also different equalization techniques has been analysed to find out suitable equaliser for 2x2 MIMO channel in Rayleigh multipath fading environment. Zero-forcing performs well in theoretical assumption but the condition to fulfil is the absent of noise. MMSE uses LMS(Least Mean Square) criteria to compensate ISI. ML improves the system performance as it compares then next or upcoming symbol with the previous received symbol and also offers low error probability compares to that ZF, MMSE & ML. From the simulation models and given input ML shows the best performance.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

A Survey on Security in Multihop Wireless Network

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ABSTRACT:

Multihop wireless networks are the type of networks which require two or more wireless hops to deliver the information from the source to destination. Thus finding an optimal and most secure path to route the data is the major challenge. There are various routing protocols proposed for Multihop wireless networks but most of them are either insecure or informal method of reasoning is used to analyze their security.In this paper, we aim to identify the security measures that could increase the security of routing protocol.

KEYWORDS- *Routing, Routing protocols, Adversary, Security attacks, Authentication, Node disjoint paths.*

I. INTRODUCTION.

Routing is the technique used to move a data packet from the sender to receiver. It enables the messages to pass from one node (computer) to another leading it to finally reach the destination. Every data packet contains within it the set of information including what is it, where it is coming from (sender's IP address) and where it is going (receiver's IP address). The device called as router is used to perform routing in a network. While we consider routing in Multihop wireless networks, it becomes immensely necessary to find the optimal and most secure routing protocols out of the existing ones. The aim of our study is to secure these multihop wireless network protocols. We have tried to first discuss the various routing protocols and various security attacks on these routing protocols. Then after discussing attacks on routing protocols, we have identified the security measures that could help to increase the reliability of the protocols.

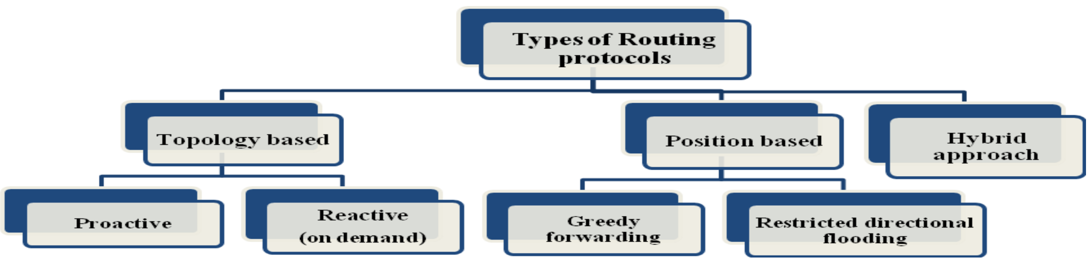
II. LITERATURE REVIEW.

There are various numbers of researchers who proposed several architectures and protocols to secure the Multihop wireless networks.Srdjan Capkun, Levente Buttyan and Jean Pierre Hubaux [1] successfully presented SECTOR which is the mechanism to prevent the wormhole attacks and thus to secure routing protocol. SECTOR was based on distance bounding technique, on one-way hash claims and on Merkle hash trees.A new protocol called as BSMR was proposed by Reza Curtmola and Cristina Nita-Rotaru [2] that can withstand insider attacks from colluding adversaries.Douglas, Daniel, Benjamin and Robert [3] concluded in their work that the shortest path algorithm id not enough to increase the performance of multihop wireless networks.Jorjeta G. Jetcheva and David B. Joshnson [4] presented the informal design and they evaluated ADMR protocol.Yauchao Zhang and Yuguang Fang [5] successfully addressed the multihop wireless mesh network security. They also proposed ARSA which is an attack resilient security architecture for multihop wireless mesh networks.

III. ROUTING PROTOCOLS FOR MULTIHOP WIRELESS NETWORKS.

In order to enable the communication between the routers, routing protocols disseminates information about selecting routes between nodes in a network.

3.1 Types of routing protocols.



"Figure 1. Types of Routing Protocols"

3.1.1 Dynamic Source Routing.

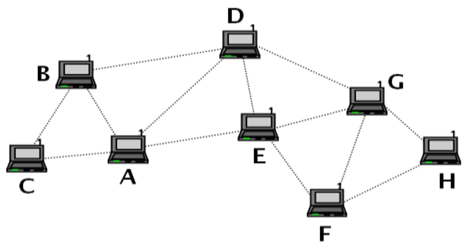
DSR protocol [6] is a type of on-demand routing protocol which is designed for use in multihop wireless network. it is self configuring protocol which eliminates the need for an established network infrastructure.

DSR follows two main mechanisms:

- Route discovery
- Route maintenance

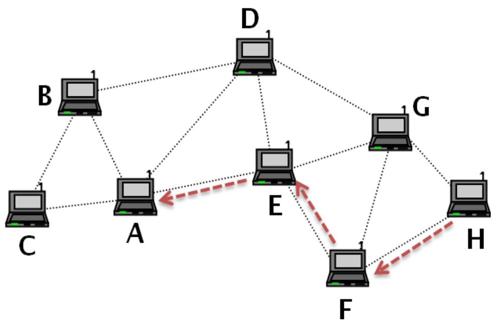
These mechanisms work together to discover and maintain routes in a wireless network. When the ROUTE REQUEST reaches the destination node, the ROUTE REPLY message is generated. The destination requires a route or the route record in the ROUTE REQUEST message header.

Route maintenance phase is initiated whereby the route error packets are generated at a node. Then the erroneous hop is removed from the node's route cache. All routes that contain the erroneous hop are truncated and again route discovery phase is initiated.



A → *: [RREQ, id, A, H; ()]
B → *: [RREQ, id, A, H; (B)]
C → *: [RREQ, id, A, H; (C)]
D → *: [RREQ, id, A, H; (D)]
E → *: [RREQ, id, A, H; (E)]
F → *: [RREQ, id, A, H; (E, F)]
G → *: [RREQ, id, A, H; (D,G)]

"Figure 2. Foot note: DSR route discovery"

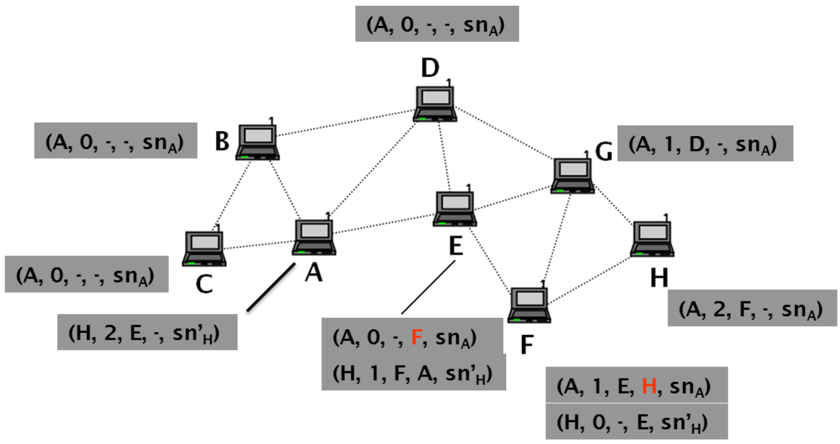


H → A:[RREP, <source route>;(E,F)]
Where;
<source route> is obtained:
• from the route cache of H
• by reversing the route received in the RREQ
• by executing route discovery from H to A

"Figure 3. Foot note: DSR Route Reply path"

3.1.2 Adhoc On-Demand Distance Vector Routing Protocol.

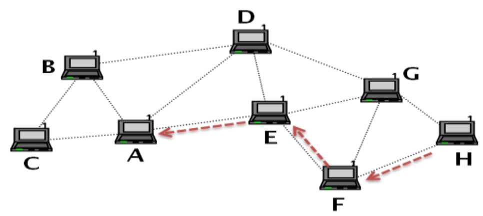
AODV is a reactive routing protocol which is capable of both unicast and multicast routing.



A → *: [RREQ, id, A, H, 0, sn_A, sn_H]
B → *: [RREQ, id, A, H, 1, sn_A, sn_H]
C → *: [RREQ, id, A, H, 1, sn_A, sn_H]
D → *: [RREQ, id, A, H, 1, sn_A, sn_H]
E → *: [RREQ, id, A, H, 1, sn_A, sn_H]
F → *: [RREQ, id, A, H, 2, sn_A, sn_H]
G → *: [RREQ, id, A, H, 2, sn_A, sn_H]

“Figure 4. Foot note: AODV route discovery”

- When source sends data to an unknown destination it broadcasts a Route Request (RREQ) for that destination.
- When intermediate nodes receive Route Request (RREQ) a route to the source node is created.
- When RREQ reaches the destination node it generates a Route Reply (RREP) in a unicast hop by hop mode.
- Each intermediate node creates a route from destination to source during the propagation of RREP.
- Finally when RREP reaches the source, it tracks the route from destination to source and begin sending the data.
- The operation is similar to that of DSR but the nodes maintain routing tables instead of route caches.



H → F: [RREP, A, H, 0, sn'_H]
F → E: [RREP, A, H, 1, sn'_H]
E → A: [RREP, A, H, 2, sn'_H]

“Figure 5. Foot note: AODV Route Reply Path”

3.1.3 Position based Greedy Forwarding.

Position based routing or geographic routing [7] is a type of routing protocol that is based on the information regarding the geographical position. Mainly proposed for wireless network is based on the assumption that:

- Nodes are unaware of their own and their neighbor’s position.
- The information about the position of the destination node is contained in the packet header.

In position based greedy forwarding protocol the packet is forwarded to the neighbor who is closer to the destination than the forwarding node.

IV. ATTACKS ON MULTIHOP WIRELESS NETWORKS.

The multihop wireless networks are wireless are widely accepted and its applications are increasing day by day. But the security of these networks is becoming a major key challenge in the wide-scale deployment of these networks.In simple and general context, an adversary is one's opponent in a contest, conflict or dispute.In the term of wireless network, an adversary is a node that opposes or attacks the security of the network and leading to an insecure communication in the network.These security attacks aim to increase the control of these adversary nodes over the communication between some nodes in the network. These attacks tend to degrade the quality of the network services and also increase the resource consumption.Adversaries are not physically present but aim to corrupt the legitimate nodes by launching attacks from regular devices.

3.2 Types of Attacks.

The various types of security attacks are listed below:

- Route disruption
- Route diversion
- Creation of incorrect routing state
- Generation of extra control traffic
- Creation of a gray hole

3.2.1 Route Disruption.

In the route disruption attack the adversary prevents a route from being discovered between two connected nodes. The main objective of this attack is to degrade the quality of network services. The two connected nodes cannot communicate directly and therefore a route is followed that has the adversarial control.
The attack mechanisms are:

- Dropping of Route Request or Route Reply messages
- Forging route error messages
- The dropping of control packet
- Wormhole attack

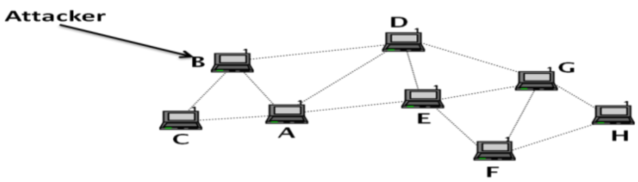
3.2.2 Route Diversion.

Route diversion attack leads to the establishment of the routes which are different from the ones that the protocol would establish due to the interference of the adversary. The adversary aims to achieve that the diverted routes should have its control over the link so that it can eavesdrop or modify the data that is been sent between the victim nodes.
It also has side effects of increase in resource consumption, overloading the network links and delay in the delivery of the data.
The attack mechanisms are:

- Modifying or dropping control messages
- Setting up a wormhole/tunnel

3.2.3 Creation of incorrect routing states.

In this attack, the insecure and adversary nodes are appeared to be secure and the state appears to be correct but in fact they are not. So when the data packets are routed using the infected state they never reach their desired destination because of these corrupted nodes.
This can be achieved by modifying, spoofing, forging or dropping of control packets.



"Figure 6. Creation of incorrect routing state in DSR"

The route specified by protocol is:

A = *: [RREQ, id, A, H ;()]

From the figure it is been clear that the route (A, D, F, H) does not exist.
Node B being an attacker creates an incorrect route:

B → A: [RREP, <src route>, A, H; (D, F)]

3.2.4 Generation of extra control traffic.

This attacks aims at injecting spoofed control packets into the networks. Spoofing is the technique of masquerading others by modifying or falsifying data resulting in gaining illegitimate advantage.

It leads to the increase in consumption of resources by flooding the illegitimate control packets in network.

3.2.5 Setting Up a Gray Hole.

Gray hole [9] attacks the network by leading the nodes to drop the packets selectively. This attack leads to the data to be either malicious or unnecessary by dropping all UDP packets while forwarding TCP packet or by dropping packets by probabilistic distribution.

Gray hole is actually an attacker node but behaves as a correct one. Therefore, it becomes very difficult to identify the attacker node in the network.

V. SECURING MULTIHOP WIRELESS NETWORK ROUTING PROTOCOL.

After discussing several attacks that could degrade the quality of the network, we aim to list out various security countermeasures that could help to increase the security and prevent these attacks.

4.1 Countermeasures.

- Authenticating control packets
- protection of mutable information in control packets
- Reducing gray holes from the network

4.2.1Authentication of control packets.

In the network whenever a packet is transmitted it has two sets of information: control information and user data often called as payload. the control information contains the source and destination addresses, checksums and sequence information. The adversaries often attack the control information of the packet in order to degrade the quality of service. Control packets should be authenticated by the initiators of the packet using Message Authentication Code and the authenticity should be verifiable by the destination node.For example Ariadne which is used to secure the basic version of DSR algorithm.Now when this packet reaches any intermediate node, that node must be able to verify its authenticity before processing the control packet. After the verification, the intermediate nodes update their routing state. A Broadcast Authentication scheme must be employed to verify the authenticity of the nodes.

4.2.2Protection of Mutable Information in Control Packets.

There are certain set of inconstant information that can be altered or changed throughout the network. This mutable information (hop count, node list etc) is added by intermediate nodes to the control packets before forwarding it. Since this information is not protected, the adversary could easily attack and modify making it malicious.To prevent this, each intermediate node before entering or modifying this mutable information should verify its authenticity. If the node is found authenticated to enter or modify the information then only it is liable to alter any information.

4.2.3Combating Gray Holes

Gray holes are very difficult to detect in a network. It is much easier to deal with an attacker rather than detecting it out of the correct nodes. In order to reduce these gray holes, multiple routes should be traced out to deliver a data packet. It would be preferable if these routes are Node Disjoint paths [10]Node Disjoint Paths reduces routing overhead and also provides robustness to mobility. To decrease the resource consumption, the data packet should be coded and then break up into smaller chunks. If a threshold value is set for the number of chunks then it will prove beneficial to the network. Then these chunks of packet are sent over different routes on entire network.

CONCLUSION.

As we all are aware that in Multihop wireless networks several intermediate nodes are present which are also movable. So routing is a major challenge in these networks as it becomes immensely necessary to save the nodes from the attacks. In this paper, we have discussed various routing protocols and a brief description of various attacks is also given which can harm the Multihop wireless networks. After discussing these attacks we have finally discussed several countermeasures that could help to secure the routing protocols from the adversarial attacks by the authentication.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Modeling and Fault Analysis of Canal Type Small Hydro Power Plant

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ABSTRACT:

In this paper, the simulation model of a typical canal type small hydroelectric power plant was developed through interconnection of models of various equipments of the plant under consideration in a MATLAB/Simulink based software environment. The various components of small hydroelectric plant like governor, Semi-Kaplan turbine, synchronous generator, exciter are being considered under modeling and simulation.. The aim is to study its behavior during phase to phase fault. This study helps in verifying costs and safety conditions, in selecting the best alternatives in the early phase of design and to determine the requirements of special protection devices to control over-current and under-voltage.

KEYWORDS *– Mathematical models, small hydro electric power plants, Fault Currents, Fault Voltages, Matlab/Simulink.*

I. INTRODUCTION

In Irrigation canal based Small Hydro plants, utilizing the heads available gives more or less constant power generation. But it is seen that the head available is almost constant whereas there are large variations in the discharge available. The power generation is completely dependent upon irrigation releases season wise through the canal which depends upon the crop pattern in the region. Power generation is for nine months as months of April, May and August are not considered since discharge is less than 1 cumecs.Modeling and simulation of small hydro power plant is valuable tool for planning power plant operations and judging the value of physical improvement by selecting proper system parameters. Earlier this was done for large or small hydro power plants. But for canal type small hydro power plants this study helps in verifying design of windings, costs and safety conditions. It also helps in verifying the parameters of control equipments like water level regulator, governor, exciter etc. and in determining the dynamic forces acting on the system which must be considered in structural analysis of the penstock and their support.

II. MATHEMATICAL MODELING

Generally differential equations are used to describe the various power system components. Study of the dynamic behavior of the system depends upon the nature of the differential equations.

Small System: If the system equations are linear, the techniques of linear system analysis are used to study dynamic behavior. Each component is simulated by transfer function and these transfer functions blocks are connected to represent the system under study.

Large System: Here state-space model will be used for system studies described by linear differential equations. However for transient stability study the nonlinear differential equations are used.

III. METHODS USED FOR MODELING FOR CANAL TYPE SMALL HYDRO POWER PLANT.

1.1 The generator model is derived starting from the basic circuit equations and the use of Park's transformation.
1.2 Hydraulic turbine model includes both linear and nonlinear control methods. Nonlinear models are required where speed and power changes are large.
1.3 For governor, mathematical equations of ordinary differential equations representing the dynamic behavior are used. Here the regulator consists of two parts electrical (PID Controller) and electro-hydraulic parts
1.4 For exciters ordinary differential equations are used.

3.1.Mathematical Modeling of a Synchronous Machine:

The synchronous machine under consideration is assumed to have three stator windings, one field winding and two damper windings.

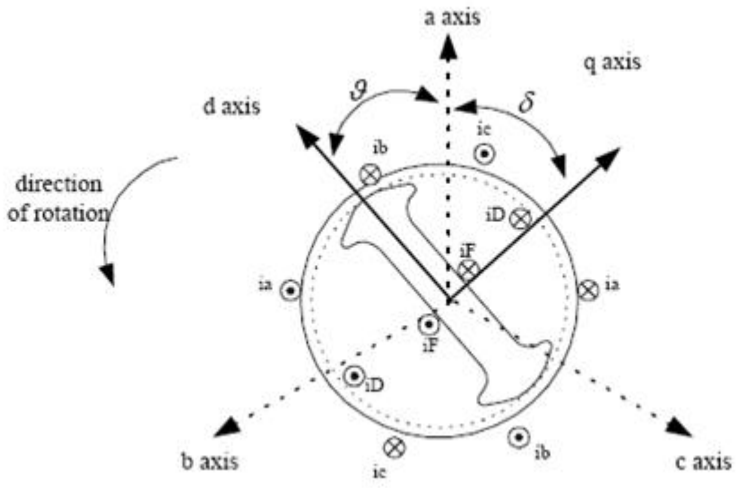

Fig. 1: Representation of a synchronous machine

Equation (1) is the generator voltage equation in the rotor frame of reference is described in Per-unit. The machine equation in the rotor frame of reference becomes.

$$\begin{bmatrix} v_d \\ -v_F \\ 0 \\ v_q \\ 0 \end{bmatrix} = \begin{bmatrix} r & 0 & 0 & \omega L_q & \omega kM_Q \\ 0 & r_F & 0 & 0 & 0 \\ 0 & 0 & r_D & 0 & 0 \\ -\omega L_d & -\omega kM_F & -\omega kM_D & r & 0 \\ 0 & 0 & 0 & 0 & r_Q \end{bmatrix} \begin{bmatrix} i_d \\ i_F \\ i_D \\ i_q \\ i_Q \end{bmatrix} - \begin{bmatrix} L_d & kM_F & kM_D & 0 & 0 \\ kM_F & L_F & M_R & 0 & 0 \\ kM_D & M_R & L_D & 0 & 0 \\ 0 & 0 & 0 & L_q & kM_Q \\ 0 & 0 & 0 & kM_Q & L_Q \end{bmatrix} \begin{bmatrix} \dot{i}_d \\ \dot{i}_F \\ \dot{i}_D \\ \dot{i}_q \\ \dot{i}_Q \end{bmatrix} \tag{1}$$

Where,

= Equivalent direct-axis Reactance

= Filed winding Self –inductance

= Self-inductance damper winding

= Equivalent quadrature axis reactance

= Self inductance of quadrature reactance

= Stator to damper winding resistance

=Stator to quadrature winding resistance

r = Stator winding current

= Field winding resistance

= resistance of d axis damper winding

= resistance of q axis damper winding

= armature current in the q direction

= Field current

= d axis damper winding current

= q axis damper winding current

IV. MODELING OF HYDRAULIC TURBINE AND GOVERNING SYSTEM.

4.1.Hydraulic Turbine Modeling

The representation of the hydraulic turbine and water column in stability studies is usually based on the following assumptions:

1. The hydraulic resistance is negligible.
2. The penstock pipe is inelastic and the water is incompressible.

3. The velocity of the water varies directly with the gate opening and with square root of the net head. The turbine output power is proportional to the product of head and volume flow.

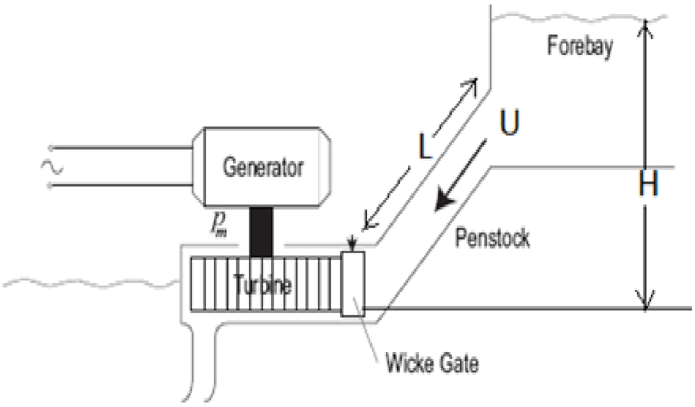

Fig. 2: A Typical Control System of Hydroelectric Plant

The velocity of the water in the penstock is given by

$$U = \quad G \quad H$$

Where

U = water velocity
G = gate position
H = hydraulic head at gate
= a constant of proportionality

$$\frac{\Delta \square m}{\Delta \square} = \frac{1 - T_W s}{1 + 0.5\, T_W s}$$

Above equation represents the classical transfer function of a hydraulic turbine. It shows how the turbine power output changes in response to a change in gate opening for an ideal lossless turbine. Fig. 3 shows the mathematical model.

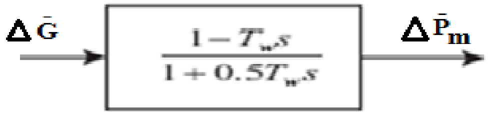

Fig. 3: Mathematical model of hydraulic turbine

4.2 Governor Modeling:

The basic function of a governor is to control speed and/or load. The primary speed/load control function involves feeding back speed error to control the gate position. In order to ensure satisfactory and stable parallel operation of multiple units, the speed governor is provided with a droop characteristic. The purpose of the droop is to ensure equitable load sharing between generating units. For stable control performance, a large transient droop with a long resetting time is therefore required. This is accomplished by the provision or a rate feedback or transient gain reduction compensation as shown in the figure.

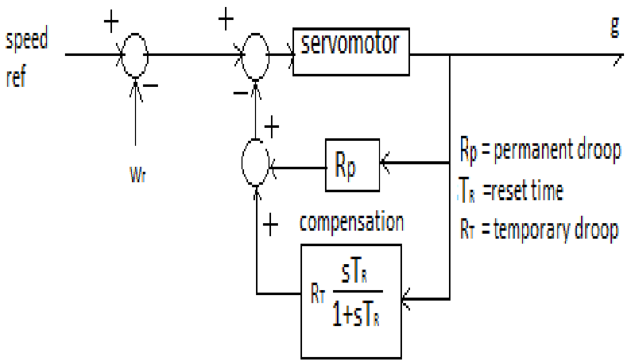

Fig. 4: Governor with transient droop compensation

4.3 Mechanical-hydraulic governor model:

The various components of Mechanical-hydraulic governor are; speed sensing, permanent droop feedback, computing functions, relay valve, gate servomotor and a dashpot used to provide transient droop compensation.

The transfer function of the relay valve and gate servomotor is

=

The transfer function of the pilot valve and pilot servo is

=

Where is determined by the feedback lever ratio; by port areas of the pilot valve and . Now from above two equations we have

= =

Where is the servo gain.

The transfer function of the dashpot is given by

=

The temporary droop is determined by the lever ratio, and the reset/washout time is determined by needle valve setting.

A block diagram representation of the governing system suitable for system stability studies is shown below.

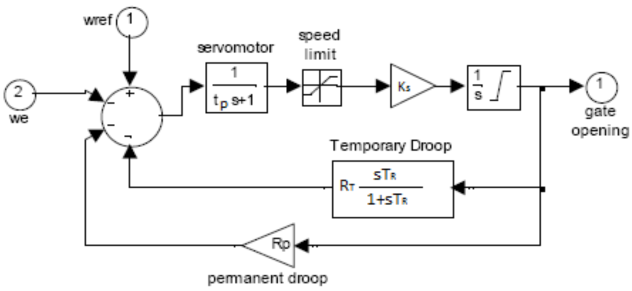

Fig. 5: Shows the Model of governors for hydraulic-turbines

V. EXCITATION SYSTEM MODELING:

The basic elements which form different types of excitation systems are the dc or ac exciters, rectifiers, amplifiers, stabilizing feedback circuits, signal sensing and processing circuits.

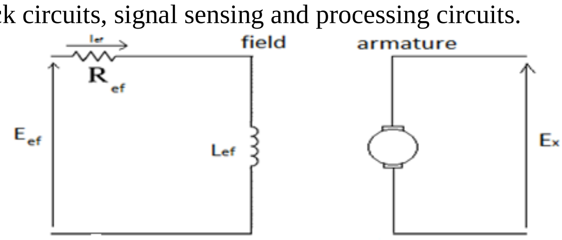

Fig. 6: Separately Excited DC Exciter

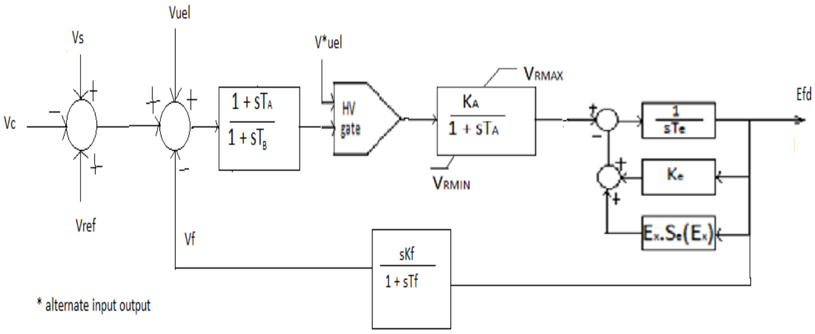

Fig. 7: Excitation system with stabilizing circuit

VI. SIMULATION MODEL DEVELOPED IN A MATLAB/SIMULINK SOFTWARE ENVIRONMENT.

The entire simulation system for the analysis of two-phase fault on canal type small hydroelectric power plant has been developed in a MATLAB/Simulink based software environment. Subsystems have been utilized in the simplification of a system diagram and the creation of reusable systems. Further, a subsystem is a group of blocks that is represented by a subsystem block. The entire simulation system contains three subsystems: first, the speed governor and servomechanism, in which turbine speed, dead zone, valve saturation, and limitation are all considered; second: the hydrodynamics system (HS), which consists of tunnels, penstock, and surge tanks; and third, the turbine generator and network, which has a generator unit operating in isolation. The combinations of three subsystems are shown in Fig. 8.

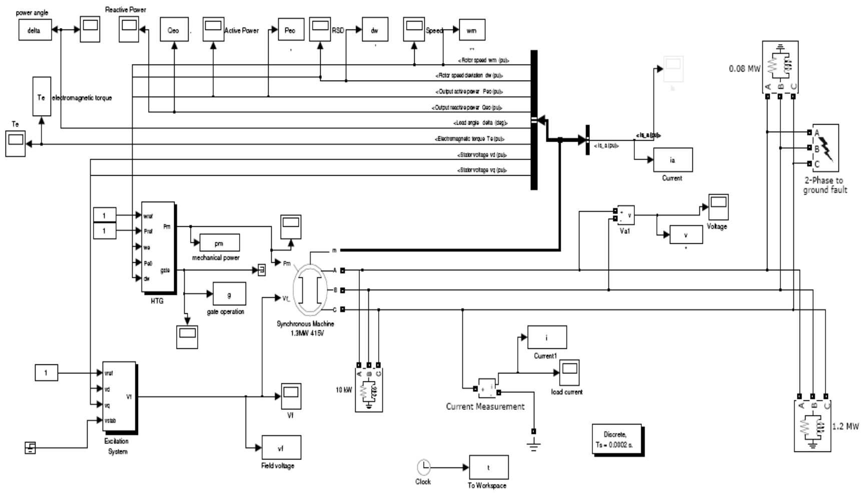

Fig. 8: Working model for canal type hydro power plant

A typical canal based hydroelectric power plant with a Kaplan turbine, as shown in Fig. 7 reflects the Canal Type Small Hydro Power Plant in Bathinda Punjab run under Punjab Energy Development Agency (PEDA), and hence all the data of this plant are used to simulate study the effect of two-phase fault. Therefore, all of these simulations are performed for different time conditions. In addition, the influences of changing different parameters of pressure water supply system, turbine speed governor PID gains, as well as surge tanks were analyzed. The simulation results are all in per unit system and the required data are below

6.1 Turbine and Governor Data

h = 2.10
= 2.74
= 3
ω = 93 rpm
η_t = 91%
= 1p.u.
= 0.07
=0.05
= 3
= 0.10
= 3.26
=0.02
=10/3
=0.01
=0.97518
=-0.1
=0.1

6.2 Exciter

= 1
= 1
= 0.00001, and 0.00001
= 0.08
= -15
= 7.3
=0.87
=200
=0.02
=1
=0.03
=1
=1.2911

6.3 Synchronous Generator

=1.3 MW
=415V
f =50
=0.911
=0.408
=0.329
=0.580
=0.350

=0.3
=0.7
=0.035
=0.033
=0.03
H =1
P =4
=1

VII. CONCLUSION

In this case, synchronous generator is connected to the load through a transmission line as shown in Fig.8. Initially the load is 1.2MW on the generator. At 10.5 seconds, disturbance is created by putting phase-phase fault for 0.2seconds. The values of the governor, exciter, synchronous generator and hydraulic turbine are same as given before. The corresponding results for current and voltage are shown below:

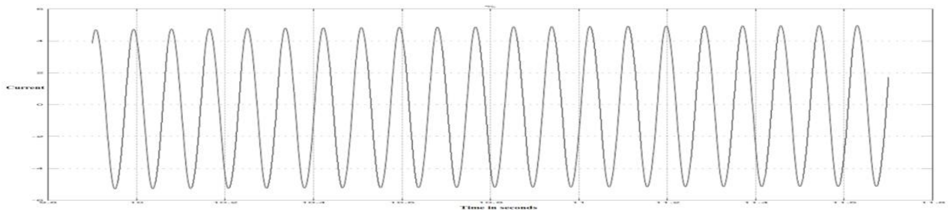

Fig. 9: Current under normal condition

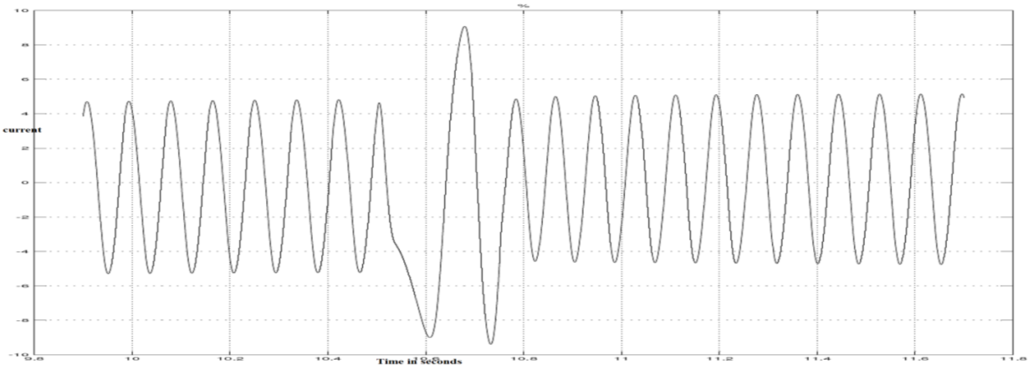

Fig. 10: Current under fault condition

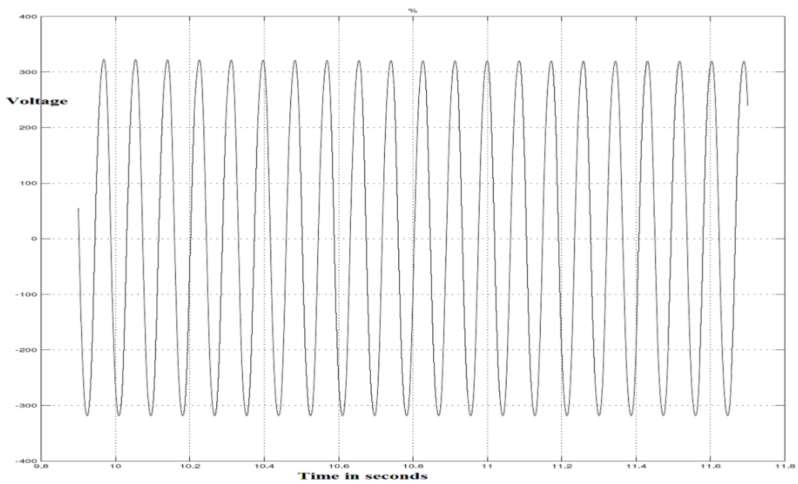

Fig. 11: Voltage under normal condition

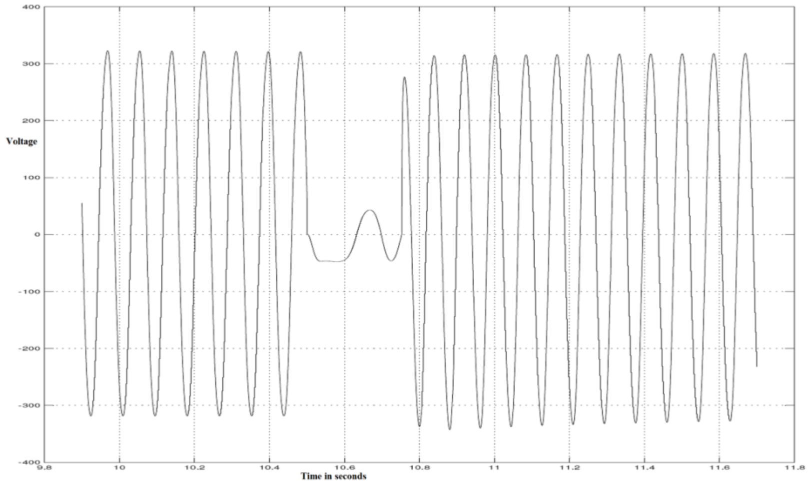

Fig. 12: Voltage under fault condition

Table -1 Experiment Result

Quantity	Without fault	With fault
Current (amp)	5	9
Voltage (V)	325	40

When the plant was connected to its load, there has been an immense change in current and voltage during the fault, armature current increases sharply and terminal voltage reduces drastically. as it is convenient from the table. The peak overshoot has raised from 5 to 9 amperes. While the voltage has been dropped from 325V to 40V. After fault clearing, the variations of terminal voltage and armature current characteristics are very similar. Finally, due to increase in armature current and terminal voltage, electrical power increases and becomes constant after approximate 2.5 seconds after the fault clearing. So from these results we come to the point that the generator winding should be of such a design so that it can bear this current. Also steps should must be taken to avoid under-voltage which will otherwise cause a lot of problems while being in parallel operation with other generators. At last results were handled to Punjab Energy Development Agnecies (PEDA) Chandigarh to take the corrective measures from the results if there will be such type of frequent faults.

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Analysis of Performance Standard ABNT NBR 15575:2008 with Emphasis on the Luminic Performance, in the Context of Brasilia.

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ABSTRACT

This study is a review based on the theoretical analysis of the Performance Standard ABNT NBR 15575:2008 focused lighting and in the performance standards or other national and international sources relevant to the topic, as well as discussion of possible applications or difficulties of implementation in accordance with the criteria of the standard and its likely consequences, especially for users and professional construction of Brasilia, Brazil. Aims to produce a consultation document, the undergraduate and graduate students on luminous performance, based on the ABNT NBR 15575:2008, emphasizing the reality brasiliense through examples of buildings that have some type of control element for natural lighting. Ramble on possible impacts of implementing the standard in the professional, the market and for customers.

KEYWORDS: *Performance Standard ABNT NBR:15575, luminic performance, the control element.*

I. INTRODUCTION

The performance of Brazilian buildings as well as their constituents have been the subject of discussions by experts in the areas of construction and the like, so long ago, having a focus from mid-2002 when there was the first attempt to create a standard that contained evaluative parameters appropriate to the Brazilian reality. Since then, the documents and work done from these meetings resulted in the Performance Standard ABNT NBR 15575:2008 that through requirements (qualitative) criteria (quantitative) evaluation methods and includes topics such as: acoustic performance, thermal performance, performance luminic, leak, fire safety, functionality / accessibility and others. This article has emphasis on the luminic performance, highlighting the requirements, criteria and evaluation methods applied in a generalized, since the standard does not cover the use of that item for individual systems as structural systems, systems of internal floors, fencing systems and internal external roofing systems and hydro-sanitary systems. The article also seeks to make a merge between what is stated in the standard elsewhere on this kind of performance and the reality of Brasilia focused on the use and control of natural lighting.

II. OBJECTIVES

- Produce a consultation document to undergraduates and graduate on luminic performance, based on standard ABNT NBR 15575:2008, emphasizing the reality brasiliense through examples of buildings that have some kind of control element for day lighting;
- Ramble on possible impacts of the application of the standard in the professional, the market and the customers.

III. LITERATURE REVIEW

The pursuit of energy efficiency in the world is a consequence of the reality in which there is a shortage of material and energy resources available. According Galasiu and Veitch (7) in 2006, the literature shows a strong preference for the use of daylight with wide acceptance by users and professionals, as has been recognized by the research community building, eg in the creation of Subtask a: perspectives and user requirements, under the IEA Task 31,"Daylighting Buildings in the 21st century", according to the International

Energy Agency - IEA (9).According to the Department of Energy, as part of efforts to reduce the production of greenhouse gases and preserve the natural environment, office buildings should consume less energy. Share of commercial buildings in the U.S. electricity consumption in 2002 was reported by 35%, according to the U.S. Department of Energy (13). And in Canada, offices and other institutional buildings, consumption values were collected in 30% (12). The lighting in these buildings represents about 15% of the total energy consumed and can be reduced with the adoption of elements of lighting control and designed to take advantage of the natural light available. Ideally, these elements fostering a correct level of light transmission relative to solar orientation in order that these vents affect the minimum thermal performance increasing energy avoiding the need to increase cooling or heating systems. Cuttlefish (4) questionnaires applied in England and New Zealand to investigate the users' perception regarding the importance of openings that take advantage of natural lighting. Were asked whether they considered the windows an important feature of a workplace and, if so, how it was important to them and why. Almost all respondents (99%) thought that the offices should have openings (windows) and 86% considered the natural lighting as their preferred source lumen.

The preference for natural lighting was attributed to the belief that working with daylight results in less stress and discomfort of working with electricity, but as the author noted that this belief does not define the use of artificial lighting is harmful to health. College students surveyed in Canada by Veitch et al. (10) about their knowledge, beliefs and preferences for lighting provided similar data. When Veitch and Gifford (11) refined their questionnaires and examined the issue again through a mixed sample of office workers and college students, once again observed that people believed that the daylight is preferable. In the search for Biner and Butler (5) in 1989 held in Indiana, USA, it was found that users' preference by the size of the openings (windows) varied according to the type of space. Contrary to previous research showed a general preference for large windows, this study provided evidence that large windows were not the preferred choice for most areas. Rubin et al. (1) in 1978 found that most of the occupants of offices equipped with closed shutters prefer settings that had little to do with the position of the sun or the daily and seasonal weather conditions. The experiment was conducted over three periods of 10 days in October, February and July. The results showed that the incidence of closed shutters on the south side was higher (about 80%) than in the U.S. (about 50%), which suggests that its occupants shutters used to prevent penetration of sunlight and superheating their offices. However, most of louvers or shutters have been designed with the flaps open and not closed, which suggests a preference for a view of the outer.

3.1 Energy Efficiency Law in Brazil

Law No. 10.295, of October 17, 2001, discusses the maximum power consumption, or the minimum energy efficiency for machines manufactured or marketed in the country and contributes to combat waste. According to Haddad in 2002 (8), despite the current circumstances, it is important to note that energy efficiency can not be tied to just conjunctural issues, but should be a practical purpose the National Energy Policy, through actions aimed at, for example, add value and develop technology, preserving the environment and introducing, in the domestic market, products with higher energy efficiency. The government's actions have contributed to advances in the field of energy production when they were created regulatory agencies (ANEEL - Brazilian Electricity and ANP - National Petroleum Agency), and forced the public utilities to take steps contractual restraint and combating waste as well as technological development.

3.2 Procel

According Eletrobras in 2011 (6), Procel aims to guide the consumer in the purchase, indicating the products that have the highest levels of energy efficiency within each category, thereby providing savings in your account electricity. It also stimulates the production and marketing of more efficient products, contributing to the technological development and environmental preservation. The seal is voluntary and all products must be analyzed and tested in laboratories recognized and reputable indicated by the PROCEL. The criteria set out in Regulation Procel Energy Saving - 2011.

3.3 Performance Standard ABNT NBR 15575:2008

Performance evaluation of lighting in buildings takes into account the natural and artificial lighting. In both cases, the requirements must be observed human visual comfort, which include factors such as illuminance appropriate to the activity performed and the visual field of glare free. According to ABNT NBR 15575-1:2008 (2) during the day the dependencies of the building housing should receive natural light convenient, arising directly or indirectly from the outside, through adjacent rooms. And at night, the artificial lighting system must provide satisfactory internal conditions for occupancy of the premises and circulation in environments with comfort and security. Defined these two basic conditions of illumination, the standard approach of separately for each of these situations requirements, criteria and evaluation methods.

3.3.1 Natural Lighting

The requirement for natural light provided by the rule is the need for all environments receive amounts of natural light, of course, during the day. As a criterion, the ABNT NBR 15575-1:2008, p. 22 (2), presents minimum satisfactory for ambient light only natural lighting. As the assessment of natural lighting standard has three methods. The first is the analysis of the project through established premises, the second is through the method of calculation and the third by measuring spot.

3.3.2 Artificial Lighting

The requirement for artificial lighting according to ABNT NBR 15575-1:2008 (2) consists of providing artificial lighting conditions satisfactory internal according to other standards generally prevailing for the occupation of premises and movement in environments with comfort and security. As a criterion, the standard states that the minimum, intermediate and superior to artificial lighting environments must be in accordance with the ABNT NBR 15575-1:2008, p. 23 (2).The methods of evaluating compliance with the standard is set at the same applied to natural lighting. Design analysis, method of calculation and measurement in situ. Concern explained by the standard of performance is not the sole intent aimed at prioritizing the quality in construction, as well as meeting the needs and comfort of users. Along the same lines, but directed the use of natural light can cite the Draft Standard ABNT 02:135.02-001 (3) which arose from the requirement, evidenced by the society and building projects that implement the concept of energy efficiency and visual comfort, seeing more and more use of renewable resources and less environmental degradation and its inputs or raw materials. This draft standard has the intention to disseminate and collate existing information, providing professionals related to the field of construction tools to implement mechanisms to monitor and enjoy natural light, increasing the luminal performance without compromising thermal performance.

The scope of this draft standard is divided into:

General terms, which are determined or confirmed the terms used in academia as azimuth, artificial sky, zenith lighting, area or time zone among others. Components that lighting is divided in general and classification. Item is in general informed the penetration of light in the building if it is lateral, overhead, overall, driving, etc. Classifying the item is placed on the element type in which no penetration, for example, windows, skylights, domes, sun products, atrium, etc. Defining the characteristics of each. Control elements which consist of protective feeders or natural lighting to the interior of the building. Typically transmit light diffusely or with less intensity, reducing the thermal impact and therefore the use of artificial cooling. Can cite the shelf light, shutter, eaves, awnings and other element leaked.

IV. BACKGROUND OF THE STANDARD

Brasilia, only 50 years old, considered a symbol of the city architecture and urbanism of the modernist twentieth century, renowned for its organization and planning focused on concern for the well being and quality of life of its inhabitants, has presented problems, common oldest cities, mainly linked to performance in the construction is related to the quality of materials or services, both in the design and execution. One of the great dilemmas has been the adoption, for economic and commercial, architectural typologies from countries with temperate climate that cause disorder in environmental comfort item as well as increase in energy consumption by making the least efficient buildings and loss of free cooling systems. The blame for this can be attributed to the lack of a proper design process and enforce laws that force fiscalizatoria a serious study of the use of artificial light and natural light with the right choice of control elements and pass without any prejudice to the thermal performance.

In order to solve these issues in an objective and based on measurable parameters there is an effort on the part of local and national professional environment, regulate and approve the ABNT NBR 15575-1:2008 (2).
To that end, despite the steady increase in fully glazed facades, in Brasilia, there are examples of applicability of elements of lighting control in older buildings and demonstrate the feasibility of using them without cosmetic damage and executives that actually what notes is just the opposite where these elements are fundamental and integral part of the body and buildable design project.

Examples of such inserts the following architectural works:

a) Esplanade of the Ministries

The control element predominant in the west facade of the ministries, shown in Figure 1, are vertical blinds, commonly called louvers. This type of element is intended to partially or totally block the entry of natural light, and in most cases be adjusted. The concern with the sunlight eventually become intrinsic feature of the building.

Figure 1 - Vertical blinds (louvers), control element in the west facade of Ministries in Brasilia, Distrito Federal (ARAÚJO, SIMÕES & SPOSTO, 2012)

b) SCS (South Commercial Sector) – Building Morro Vermelho in Brasilia, Distrito Federal

The control element prevalent in North facade of the building shown in Figure 2 are movable eaves, but if they are positioned so the perpendicular openings can also perform the function of light shelf, leading to a diffuse light to the interior of the rooms.

On the south facade, Figure 3, to receive less insolation put up just a brise to block or direct the light occasionally, probably in the summer.

Figure 2 - Eaves mobile (ARAÚJO, SIMÕES & SPOSTO, 2012)

Figure 3 - mobile Brises (ARAÚJO, SIMÕES & SPOSTO, 2012)

c) SQN (Super Quadra North) 206 in Brasilia-Distrito Federal

In block are present, two types of control elements made of concrete. The first, Figure 4, is classified as a hollow, popularly called Cobogó, and is at the service facade. The second, Figure 5, and there is the overhang presence of the same both on the façade of service as the main façade. Interestingly, both are in the peculiar way in which they were designed and how to define all perception and composition of facades.

Figure 4 – Cobogó (ARAÚJO, SIMÕES & SPOSTO, 2012)

Figure 5 – Eaves (ARAÚJO, SIMÕES & SPOSTO, 2012)

d) DNIT (National Department of Transport Infrastructure)

The building DNIT in Sector Municipalities in North-Brasilia Federal District, Figures 6 and 7, has made fixed louvered elements in concrete, which were probably leased in accordance with the solar orientation, protecting from direct incidence and allowing natural ventilation.

Figure 6 - Venetian Fixed open view (ARAÚJO, SIMÕES & SPOSTO, 2012)

Figure 7 - View closed fixed venetian (ARAÚJO, SIMÕES & SPOSTO, 2012)

e) W3 North Brasilia Shopping

The Building of Brasilia in Brasilia Shopping-Distrito Federal, Figure 8, is basically composed by a glass skin without any barrier that provides shading to the interior spaces, the only element existing control is smoked tempered glass which is not the most suitable for the climatic profile of Brasilia.

Figure 8 - Tinted tempered glass (ARAÚJO, SIMÕES & SPOSTO, 2012)

From what has been observed in buildings brasilienses, it appears that the market demand is still a major factor for the application of the control elements on the facades, because there was a greater presence of them in older buildings made of concrete, sometimes with metal inserts and typological modernist trends. Unlike the more recent constructions which mostly have smooth translucent facade without any component dosing of sunlight that refer to an aesthetic seen as bold and contemporary technology.

V. CONCLUSION

The issue of energy use worldwide and in Brazil as well as being guided by discussions and conferences, must now be faced considering creative solutions and alternatives. It is necessary that both the construction and the use of this logo is adapted to new paradigms characterized by limited energy sources. Brazil has a climate that enables the reduction of energy consumption of buildings. Due to the existence of a celestial vault among the brightest in the world, allowing to dispense with artificial lighting for most of the day. And because the temperature differences between summer and winter in most parts of Brazil are small, providing a comfortable operation of buildings with minimal energy expenditure. But, it is essential to emphasize that the lighting should be designed for the user of the building. To the right sizing of a day lighting system should pay attention to:

a) Right sizing the openings of buildings, considering the amount and type of light that falls on them, leading to visual comfort;
b) One should be particularly careful with the thermal efficiency of the surface area of the window is limited in luminous efficiency. Thus, the ideal is to use only the illuminating surface required, besides the use of control elements against direct sunlight;
c) The clearer the surrounding surfaces and the interior of the building, the better the performance of the lighting system;
d) Right sizing the lighting system through the establishment of certain visual activities and characteristics of who performs;
e) It should also consider the quality and capacity of energy bulbs, in sizing the artificial lighting system.

Therefore the application of sustainability concepts increasingly widespread throughout the world and the increasing technological development of building components is presumed that the market trend is brasiliense well as global change, although it will take a few years, and value beyond aesthetics, concepts such as functionality, durability, recyclability and performance.

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ACKNOWLEDGEMENTS

The Pós-Graduate Program in Structural and Construction at the University of Brasilia (UNB) for providing the opportunity to discuss the issue in its research.

International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Application of the Artificial Neural Networks of MLP Type for the Prediction of the Levels of Heavy Metals in Moroccan Aquatic Sediments

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ABSTRACT

The present work describes a new approach to the prediction of the concentrations of heavy metals in Moroccan river sediments relying on a number of physico-chemical parameters. The originality of this work lies in the application of neural networks the application of neural networks MLP type (Multilayer Perceptron). During the first step, the parameters of the neurons are determined by the method supervised. In a second step, the weights of output connections are determined using the algorithm of gradient back propagation. The data used as the basis for learning of the neuronal model are those related to the analysis of the sediment samples collected at the level of several stations, distributed in space and time, of the watershed of the river Beht of the region Khemisset in Morocco. The dependent variables (to explain or predict), which are three, are containing heavy metal (Cu, Pb and Cr) of sediments. A comparative study was established between the neuronal model for prediction of MLP type and conventional statistical models namely the MLR (Multiple linear regression).The performance of the predictive model established by the type MLP neural networks are significantly higher than those established by the multiple linear regression.

KEYWORDS *Heavy metals, Prediction, Physico-Chemical Parameters, ANN, Back propagation Gradient, MLP, MLR.*

I. INTRODUCTION

In Morocco, the metal contamination of aquatic ecosystems has attracted the attention of researchers from different backgrounds. It is indeed one of the aspects of pollution the greatest threat to these habitats. By its toxic effects, it can cause critical situations even dangerous. Unlike many toxic elements, heavy metals are not completely eliminated by biological means and consequently are subject to cumulative effect in the sediment. To predict the concentrations of these from a number of physico-chemical parameters, we refer to performing statistical methods, multiple linear regression and artificial neural networks [1], [2] and [3].We find in the literature several prediction methods proposed for the prediction of environmental parameters, we cite as examples some items proposed in the field of prediction using neural networks MLP and RBF type : Ryad et al. have worked on the application of neural network RBF (Radial Basis Function) for the prediction problem of a nonlinear system. The interest of this article lies in two aspects: a contribution at the recurrent network topology to accommodate the dynamic data and the second contribution for the improvement of the learning algorithm [4].

Perez et al. have proposed to provide for the concentration of NO_2 and nitric oxide NO in Santiago based on meteorological variables and using the linear regression method and neural network method. The results showed that the neural network MLP type is the method that achieves the lower prediction error compared to other linear methods [5].In this article, we used these methods to the prediction of the concentrations of heavy metals (Cu, Pb, Cr) in the sediments of the watershed of river Beht located in the north-west of Morocco, from a number of physico-chemical parameters.

II. MATERIAL AND METHODS

2.1. Data base

Our database consists of 104 samples [6] sediment collected at four sampling stations located upstream of the dam El Kansera (Fig.1). The independent variables are the physico-chemical characteristics determined in these samples of sediment organic materials (OM), water content (TE), the fine fraction (FF), pH, organic carbon (C), carbonates ($CaCO_3$), total phosphorus (P), calcium (Ca^{2+}), magnesium (Mg^{2+}), potassium(K^+), sodium (Na^+) and suspended solids (SS). When with dependent variables (to predict), they are three in number. These are the contents of heavy metals (Cu, Pb, and Cr) sediments.

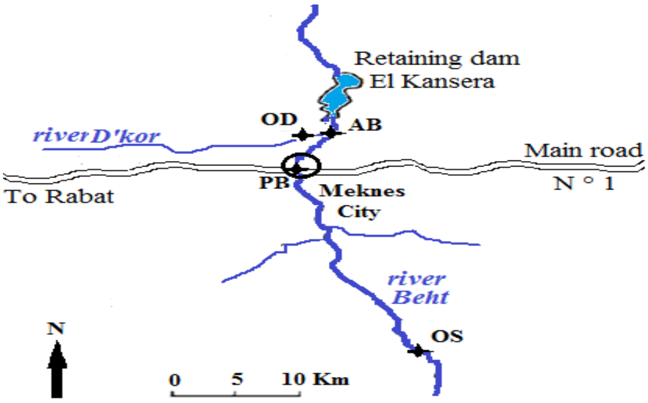

Figure 1. Location of sampling stations in the watershed of the river Beht.

2.2. Data modeling techniques

2.2.1. Methodology

Neural networks, with their parallel processing of information and their mechanisms inspired by nerve cells (neurons), they infer emergent properties to solve problems once described as complex. The mathematical model of an artificial neuron is shown in (Fig.2). A neuron consists essentially of an integrator which performs the weighted sum of its inputs. N the result of this sum is then transformed by a transfer function sigmoid f which produces the output of neuron.

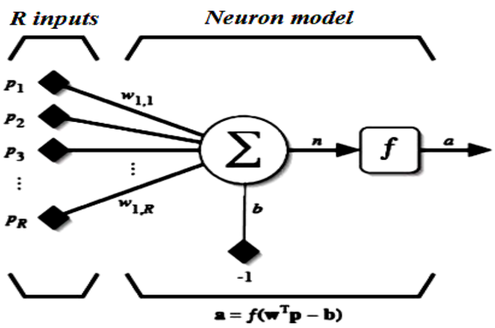

Figure 2. Model of an artificial neuron.

Learning is a phase during which the behavior of the network is changed until the desired behavior. It has several choices: error criterion to be achieved, the optimization algorithm of this criterion parameters of the algorithm and the range of values of random initial weights and thresholds [7]. Validation is the verification of the performance of a neural network-sample and generalization ability. Once the network is calculated, always conduct tests to verify that our system responds correctly. After that, comes the phase of implementation, which aims to demonstrate the performance and utility of this model [8].

2.2.2. Application of the model

Modeling data is performed in two steps. The first step is to compare the results obtained with the methods based on multiple linear regression and artificial neural networks, applying these methods to the data set on 104 samples. The second step is to justify the predictive quality of the models, using the same techniques on a set of data on 74 samples randomly selected among the 104 samples, which were the group for learning a model predictor of the dependent variable. The remaining 30 samples, which were not involved in the learning models, were used to test the validity and performance of the prediction models. Inputs (the physico-chemical parameters) and outputs (the contents of heavy metals) are normalized to a range [0 1] to adapt to the requirements of the transfer function used in this study (sigmoid function). The tool used for modeling, learning and visualization of the results obtained by neural networks is the MATLAB The dependent variable (to explain or predict) is the contents of heavy metals in sediments.

III. RESULTS AND DISCUSSION

3.1. Multiple linear regression (MLR)

We conducted an analysis by the MLR with all independent variables and we obtained the equations (1), (2) and (3) respectively for copper, lead and chromium.

[Cu] = 749.3716 - (22.0209 x MO) - (5.4306 x TE) + (1.8362 x FF) - (58.3936 x pH) + (12.8937 x C) + (0.0737 x P) - (2.2918 x $CaCO_3$) + (0.0014 x MES) - (0.5204 x Ca^{2+}) - (0. 6761 x Mg^{2+}) + (0. 0748 x Na^+) - (3. 4102 x K^+)

N= 74; R^2 = 0. 64; $p < 0.005$ (1)

[Pb] = 258.4691 - (7.1084 x MO) - (2.0632 x TE) + (0.6295 x FF) - (16.0839 x pH) + (6.1819 x C) + (0.0308 x P) – (1.2017 x $CaCO_3$) - (0.0064 x MES) - (0.2109 x Ca^{2+}) - (1. 4860 x Mg^{2+}) + (0. 0261 x Na^+) - (1.4544 x K^+)

N= 74; R^2 = 0. 69; $p < 0.005$ (2)

[Cr] = 22.3011 + (2.4554 x MO) + (0.0590 x TE) - (0.2643 x FF) - (1.3483 x pH) + (2.0420 x C) + (0.0215 x P) + (0.1012 x $CaCO_3$) - (0.0014 x MES) + (0.0386 x Ca^{2+}) - (0. 4798 x Mg^{2+}) - (0.0065 x Na^+) + (0. 7157 x K^+)

N= 74; R^2 = 0.87; $p < 0.005$ (3)

From these equations, we noticed that the three models for copper (1), chromium (3), and lead (2) are significantly important, because their probabilities are less than 0.005 (0.5 %).In fact, the model for chromium (3) is the most efficient, compared to models for copper (1) and lead (2). The correlation coefficient between observed and predicted concentrations of chromium is higher (R^2 = 0.87). Note on one hand, that the signs of the coefficients for the variables in the model (1) of copper, are almost similar to those of the model (2) lead. The coefficients for the variables (MO, TE, pH, $CaCO_3$, Mg^{2+} and K^+) are negative, whereas those for variables (FF, C, P, Na^+, $Ca^{2+)}$ are positive. However, they differ in the variable (MES). This analogy of signs shows the probable existence of a strong correlation between observed and copper levels observed in lead.

3.2. Artificial Neural Networks (ANN)

Since the laws of behavior of the environment are nonlinear and to model this type of problem, we are interested particularly to a typical neural network model known Multilayer Perceptron (MLP). To create the optimal structure of the neural network, we conducted several learning by varying the network parameters such as the activation function, number of hidden layers, and number of neurons in each layer, the learning function, the number of iteration and learning step [9]. However, we programmed the neural network, using the toolbox of Matlab neural network included in the MATLAB software.

3.2.1. Choice of the architecture model

Our choice is focused on a multi-layer non-recurring network, based on the learning algorithm of back propagation [10]. The purpose of this learning algorithm is to minimize the mean square error E (MSE). The network consists of three layers of neurons, called input layer, output layer and hidden layer. To determine the best number of neurons in the hidden layer, we varied the number between two and fifteen choosing the best combination of layer and the best distribution in each case. Based on the error values of MSE test shown in Table 1, we note that the minimum mean squared error is achieved when NHN = 3 and we noticed that increasing the number of hidden layers increases the load calculations without any performance gain. Finally, we can choose 3 neurons in the hidden layer of the network in this study to predict the contents of heavy metals (Fig. 3).

Table 1. Variation of the mean square error (MSE) as a function the number of neurons in the hidden layer on copper, chromium and lead.

Heavy metals	Cu	Pb	Cr
NNC	MSE Test	MSE Test	MSE Test
2	0.06029	0.05062	0.07651
3	**0.00236**	**0.00283**	**0.00246**
4	0.01441	0.01341	0.08665
5	0.01631	0.09103	0.04356
6	0.01759	0.07722	0.05156
7	0.00535	0.07837	0.09467
8	0.01791	0.07098	0.08605
9	0.07321	0.08576	0.07727
10	0.02634	0.09562	0.09471
11	0.05432	0.03452	0.08713
12	0.01944	0.05979	0.06242
13	0.01532	0.09611	0.05848
14	0.07095	0.03381	0.06563
15	0.06549	0.05148	0.07195

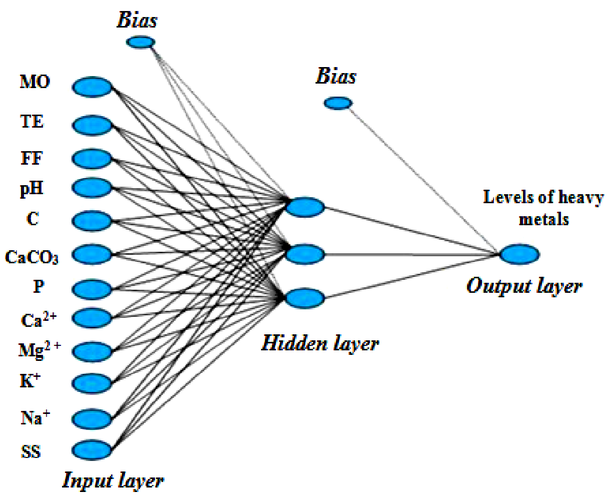

Figure 3. Architecture of ANN of topology [12, 3, 1] used in this study.

The curves shown in Figure 4 represent the evolution of the quadratic error of learning, validation and test according to the number of iterations. We note that the error learning, validation and test are very low and after 64 iterations, we have the stability of the network. Beyond this value it is necessary to stop learning an optimal number of times equal to 64 iterations (MSE = 0.00236). This phase allowed us to determine the optimal structure of our neural network. At the end of 64 iterations, the desired result is achieved with three hidden neurons; the three curves (error learning, validation and test) converge correctly.

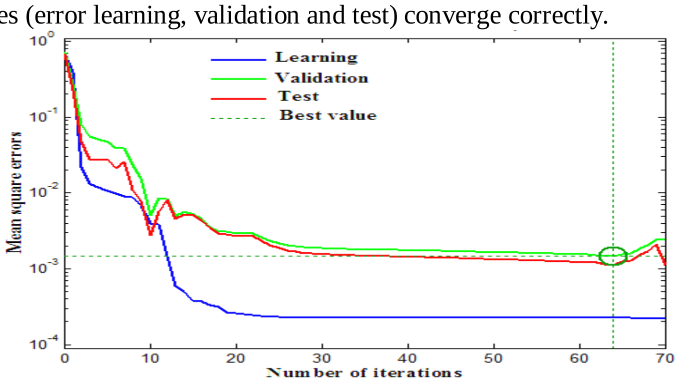

Figure 4. Evolution of the mean square error in the event of the copper during the learning, validation and testing with a network configuration [12- 3- 1].

The network has been driven up to the stage of learning, this has been met after 70 iterations, it is interesting to continue learning until they reach this stage for testing in order to reduce the gradient and therefore more perfect our network (Fig. 5).

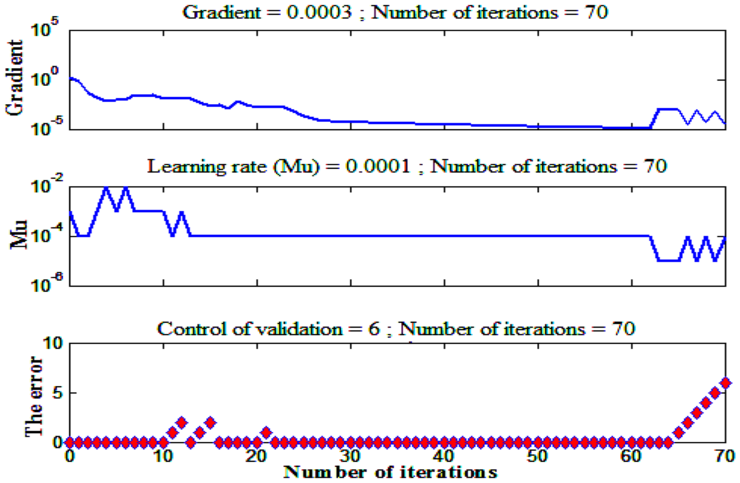

Figure 5. Variations of the gradient of the error, the learning rate and the validation error (for copper) as a function number of iterations.

Based on the results in Figure 5 we can conclude the different values of learning parameters found in this study:

✓The learning parameters are as follows:
- Maximum number of iterations (Epochs) = 70
- Mean square error (MSE) = 0.0023
- Rate of learning (Mu) = 0.0001
- Gradient minimum = 0.0003

To compare results between different numerical methods (Neural and multiple linear regression), two performance indices were calculated for each series: The coefficient of determination (R^2) and mean square error. The correlation coefficient (R^2) is the total error on the dependent variable y (The contents of heavy metals) explained by the model. This coefficient is expressed by [11]:

$$R^2 = 1 - \frac{\sum_{i,j=1}^{N}(Y_j - Y_{aver})}{\sum_{i,j=1}^{N}(Y_i - Y_{moy})}$$

The mean square error E is defined by the following equation) [10]:

$$MSE = E = \frac{1}{2}\sum_{i=1}^{N}(Y_j - Y_i)^2$$

Y_j : The output obtained by the network. Y_i : The target (desired output).

Y_{aver} : The average of measured values. N : Number of samples.

The coefficients of determination, calculated by the ANN were significantly higher (greater than 0.98), whereas the coefficients calculated by the MLR, they are lower (between 0.37 and 0.69). On the other hand, the coefficients of determination obtained by testing the validity of the models established by the ANN are clearly similar to those related to learning. However, the coefficients of determination relating to test the validity of models for the MLR, are widely different from those obtained during learning (Table 2).

Table 2. Coefficients of determinations obtained by MLR and ANN relating to copper and lead.

	Cu		Pb		Cr	
Method	Learning	Test	Learning	Test	Learning	Test
MLR	0.64	0.37	0.68	0.52	0.87	0.42
ANN	0.99	0.98	0.99	0.99	0.99	0.99

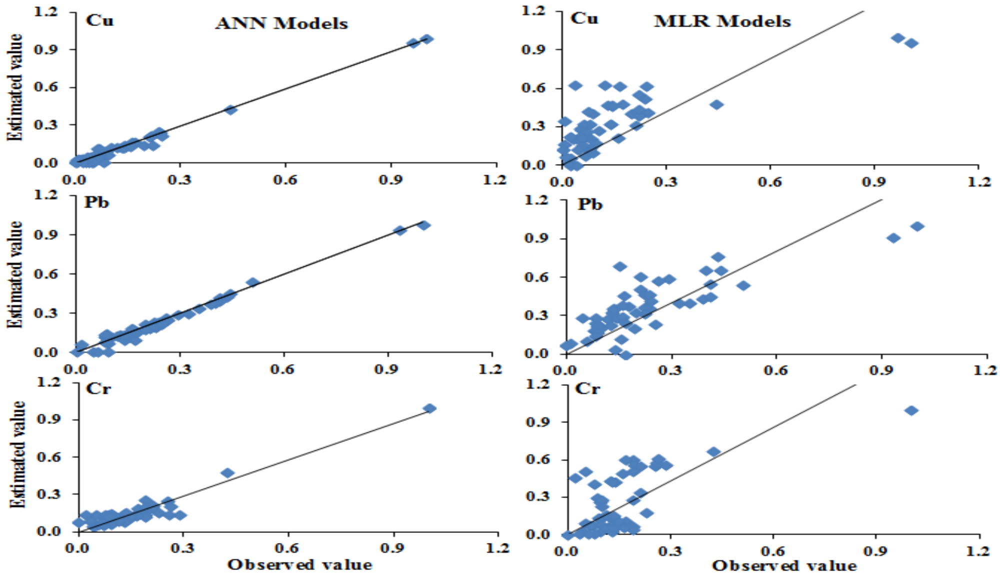

Figure 6. Relations between the observed and estimated levels of Cu, Pb and Cr established by MLR and ANN.

This figure shows, for both heavy metals studied, that the values estimated by the models established by the neural networks are much closer to the observed values, whereas the values estimated by the models established by multiple linear regression are widely further observed values, this shows a very good correlation between simulated and observed values with a very good correlation coefficient. This proves the predictive power of the models established by the neural network in the prediction of contents of heavy metals from the physico-chemical parameters of sediment in the watershed of river Beht. Previous studies have shown that the model developed in this study produced very good results compared with the method of multiple linear regression. For example Bouras and collaborators [8], showed an outstanding performance for the ANN model, this model can give better results compared to the linear method, especially for problems of prediction. Bélanger et al. [12], treat a comparative study of the performance of two modeling methods used to predict the temperature of the water, the results of this study show that artificial neural networks seem to fit the data little better than that offered by the multiple linear regression. The results we obtained from the models developed by ANN proved its accuracy, they are very close to the actual measurements.

3.2.2. Study of residuals

The error committed by the models established by each individual method on a sample of model construction is called residue [13]. Thus the study of the relation between metal contents estimated by mathematical models and their Residues (Yj - Yi) ensures the performance of the model, and it also allows to verify empirically, among other things, the validity of model assumptions.

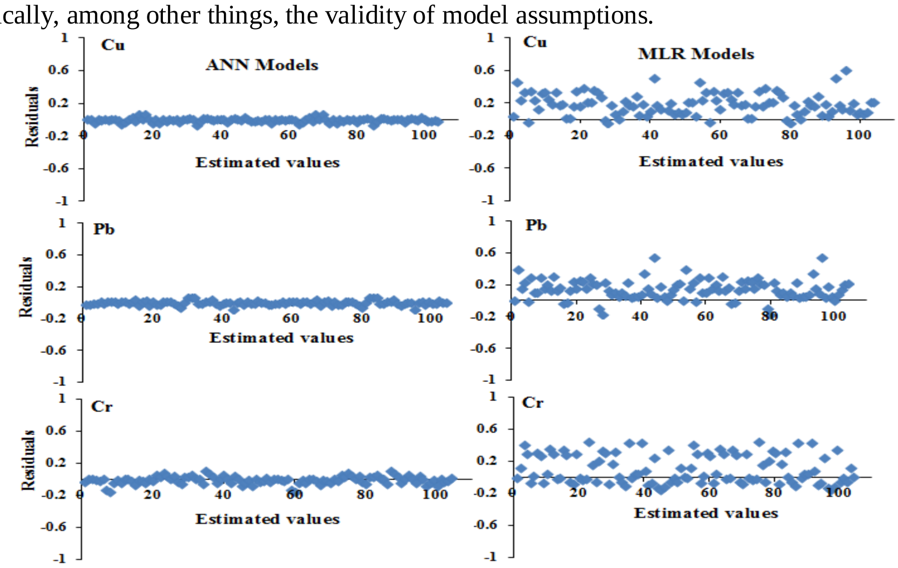

Figure 7. Relations between the estimated levels of Cu, Pb and Cr with the models established by the MLR and ANN and their residues.

Figure 7 presents the relations between the contents of heavy metals estimated using models established by neural networks (ANN) and those of multiple linear regressions (MLR) and their residues.

These figures show for the three heavy metals studied that the residuals obtained by neural networks are clearly less dispersed (closer to zero) and a significant improvement in the distribution of residues compared to those of multiple linear regression. This proves the predictive power of the models established by the neural network in the prediction of contents of heavy metals from the physico-chemical parameters of the sediments of river Beht. In general, the results are very satisfactory and justify the use of the approach by neural networks in the prediction of levels of heavy metals in sediments. This is in accord with the results of some recent studies demonstrated that multiple linear regression models are less efficient compared to those established by model neural network [12], [14] and [15].

IV. CONCLUSION

In this work we used neural networks to demonstrate that the contents of heavy metals in sediments are parameters which does not act alone but is explained by other physicochemical parameters. This study showed that the predictive models established by artificial neural networks are much more efficient compared to those established by the method based on multiple linear regression, of the fact that good correlation was obtained with the parameters from a neural approach, in addition to a better choice of network architecture that has been achieved through preliminary tests. The performance of neural networks demonstrates the existence of a non-linear relationship between the physico-chemical characteristics studied (independent variables) and the contents of heavy metals in sediments of the watershed of river Beht.

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AUGMENTED ZRP AS A ROUTING PROTOCOL FOR MANET

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ABSTRACT

A Wireless ad hoc network is a collection of mobile nodes like Laptop computers and personal digital assistants with no pre-defined infrastructure and has wireless interface and communicate independently with each other via radio or infrared. With the recent advances in infrastructure less network MANET came into existence. MANETs have several salient characteristics such as Dynamic topologies, Bandwidth-constrained, Energy-constrained operation, Limited physical security etc. Routing is an important challenge in wireless adhoc networks. Proactive and Reactive both have some disadvantages therefore we use hybrid routing protocols to enhance the performance of adhoc networks In this paper, an attempt has been made to compare performance of existing ZRP with modified one (Extended ZRP) on basis of their performance in MANETs. While analyzing existing ZRP some undesirable effects as longer delays, higher routing overhead and lower packet delivery are encountered due to increase in congestion. Subsequently, ZRP is extended by introducing some new parameters so that enhanced performance in MANETs can be achieved while using ZRP as a routing protocol.

KEYWORDS: *MANET (Mobile ad hoc Network), ZRP, Modified ZRP*

I. INTRODUCTION

Mobile Adhoc Network (MANET) is an autonomous collection of mobile devices over relatively bandwidth constraint network or wireless link. A mobile adhoc network (MANET) is infrastructure less and self configuring network. Wireless adhoc or on-the-fly networks are those in which nodes are free to move and organize themselves in an arbitrary fashion. An adhoc network is a temporary connection between computers and devices used for emergency/ rescue operations and for sharing documents during a meeting. Wireless ad hoc networks are very easy to implement and cost effective networks as they do not require any pre-existing infrastructure and base stations. The network topology changes rapidly and unpredictably over time since nodes are mobile. In MANETs all network activities including topology discovery and delivering messages must be executed by nodes themselves. Hence it is said that an adhoc network is decentralized. MANET comprises of mobile router. MANETs are able to operate in a stand-alone fashion or could possibly to a larger network such as internet [5]**.** For users of computing systems mobility is becoming increasingly important. Technology has made possible smaller, more powerful and less expensive wireless communicating devices and computers. Due to which users gain flexibility and the ability to exchange information and maintain connectivity while roaming through a large area. By installing base stations and access point’s necessary mobile computing support is being provided in some areas. Mobile users can maintain their connectivity by accessing this infrastructure from office, home, or while on the road.

In all locations where mobile communication is desired this mobility support is not available. Access points may not be set up due to low expected usage, high cost, or poor performance. This may happen in emergency situations like natural disasters and military maneuvers in enemy territory or during outdoor conferences. If mobile users want to communicate in the absence of a support structure, they must form an *adhoc network.* In this chapter, we look at mobile adhoc networking in closer detail.
Application area of MANET is diverse, ranging from small, static networks to large scale mobile, highly dynamic networks. For e.g. mobile adhoc network can be used to provide crisis management service applications where any infrastructure could be setup in hours for example is case of disaster recovery. Also uses of MANETs involve business environment where collaborative computing is more important [12].

II. MANET ROUTING PROTOCOL

Pro-active protocols follow an approach similar to the one used in wired routing protocols. Pro-active or table-driven protocols require constants updates, in order to maintain the

constantly changing network graph due to new, moving or failing nodes, which may consume large amounts of bandwidth. And since the bandwidth is often sparse it is clearly a drawback of the wireless world. Additional to this drawback, much of the accumulated routing information is never used, as routes may be active only for very less amount of time.In contrast, reactive protocols determine the proper route only when it is needed, which means, when a packet needs to be forwarded. When the packet needs to be forwarded, the network is flooded with a route request by the node and builds the route on demand from the responses it got. The drawback of this technique is that's it can causes delays since the routes are not already available but advantage is that it does not require constant broadcasts and discovery. Additionally, the flooding of the network with a route request may lead to additional control traffic, again putting extra effort on the limited bandwidth.
As explained above, both a purely proactive and purely reactive approach to implement a routing protocol for a MANET has their disadvantages. The *Zone Routing Protocol*, or ZRP, combines the advantages of both of these routing protocols into a *hybrid protocol*, using advantage of pro-active discovery within a node's local neighborhood, and taking advantage of communication between these neighborhoods of reactive protocol [4]. But its performance is also not up to the mark. So we use centrality and varying zone radius concept to modify the ZRP to increase its efficiency so that problems like routing overhead, congestion, packet loss, etc can be minimized.Therefore efficient functioning of MANETs requires something extra which can be fulfilled by modifying ZRP.

III. PROPOSED WORK

3.1 Approach used for modification in ZRP:

While comparing original ZRP with we notice that ZRP gives an average performance [4]. For ZRP there are some concerns. Our main idea is to modify ZRP in such a way so that instead of simple hop count a new routing metric decide a route. This new routing metric depends on centrality and varying zone radius. In case of multiple paths from source to destination, a route with lowest centrality is chosen. Proposed Pseudo Code: To determine less loaded routes we make use of two concepts namely Path Rating and Centrality.

A. Computation of Centrality

1. Source node S sends a Route Request (RREQ) message including the size of its routing table as its centrality:
   $E_1 = size(rtable(s))$
2. Upon receipt of this message, neighbor node V_1, not knowing a route to the solicited destination, acquires $p(n) = p(1)$ and $n = 1$ from the received RREQ message and diffuses a modified replica with the novel average centrality:

$$E_2 = \frac{1}{2}E_1 + \frac{1}{2}size(rtable(X_1))$$

3. Iteratively, for an n^{th} intermediate node V_n, the novel average eccentricity:
$$E_{n+1} = \frac{n}{n+1}E_n + \frac{1}{n+1}size(rtable(X_n))$$
4. Finally, when destination node 'D' receives messages from various possible paths to S, it simply chooses the route having smallest average centrality.

Therefore, we will choose the path which is having lowest centrality and will use varying zone radius for ZRP as for highest zone radius performance of ZRP will also be high.

3.2 Performance Metrics used

The metrics which are used to evaluate performance of MANETs routing protocols are as follows:

1. Packet Delivery Fraction: It is defined as the ratio of all received packets at the destinations to all transmitted packets from CBR source. The packet delivery ratio is the fraction of packets that successfully arrive at their destination.
2. Throughput: It is defined as the ratio of data packets received to the destination to those generated by source. Throughput is average rate of packets successfully transferred to their final destination per unit time.
3. End-to-End Delay: It is the average delay time for a data packet travelling from its source to destination. It signifies the amount of time taken by packet from source to destination. The delay time of all successfully received packets is summed, and then the average delay time is calculated.

All the above mentioned performance metrics are quantitatively measured. For a good routing protocol, throughput should be high where as other three parameters value should be less. We used the above performance metrics and quantitatively measured against number of nodes and pause time.

IV. RESULT AND ANALYSIS

Simulation is the imitation of the operation of a real world process over time. Various simulation are available like QualNet ,OPNET and NS2 etc .Here , simulation work is done on NS2.NS2 is an object orient simulation and is extensively used by research community. It consists of C++ core methods and uses Tcl and Object Tcl shell as interface allowing the input file (simulation script) to describe the model to simulate [8].This section will do analysis on ZRP and Modified ZRP .Also performance evolution is done on the basis of different parameters.

Simulation Parameters Used

Parameter	Value
Platform	Linux CentOS 5
NS Version	Ns-2.33
Mobility Model	Random Way Point
Traffic Type	CBR
Area	500 * 500 m
Experiment Duration	150 sec
MAC Layer Protocol	Mac/802_11
Packet Size	512 bytes
Radio Propagation	TwoRayGround
Packet Interval	0.2 second
Protocols	ZRP, Modified ZRP
Antenna Type	OmniAntenna
Packet Size	512 bytes
Pause Time	5, 10, 20, 40, 100
Number of nodes	10, 20, 30, 40, 50

Results are analyzed on the basis of different performance metrics. Graphs shown below shows simulation results are according to network and pause time model i.e. varying number of nodes and changing pause time respectively.

Throughput

Throughput is measured as the ratio of data packets received to the destination to those generated by source. Throughput is average rate of packets successfully transferred to their final destination per unit time. Figure 4.1 illustrates the simulation results of the throughput for number of nodes for ZRP and modified ZRP. It is evident from the graph that throughput is less when number of nodes is lower and it increase when number of node increases. It is clear from the graph that after doing the modification in ZRP it is showing increased throughput as compared to existing ZRP.

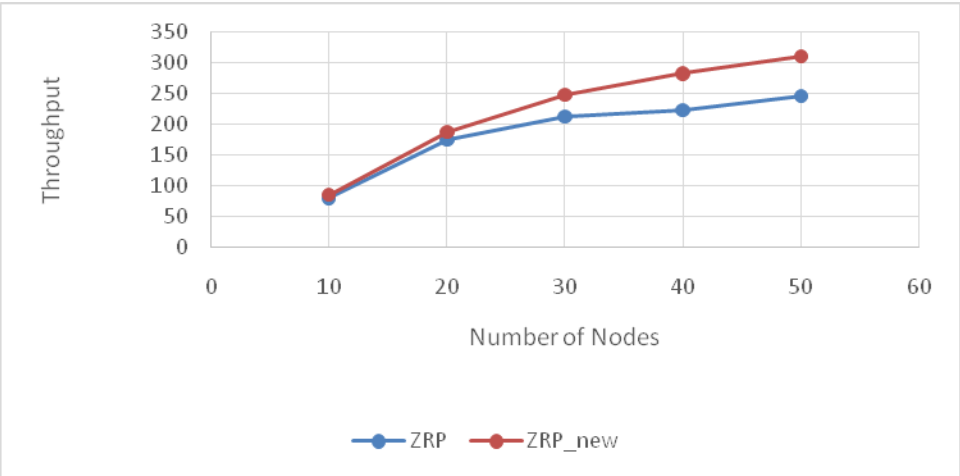

Figure 4.1 Comparison of Throughput v/s Number of Nodes

Figure 4.2 illustrates the simulation results of the throughput against pause time for ZRP and modified ZRP. It is evident from the graph that throughput is less when pause time is lower and it increase when pause time increases. It is clear from the graph that after doing the modification in ZRP it is showing increased throughput as compared to existing ZRP.

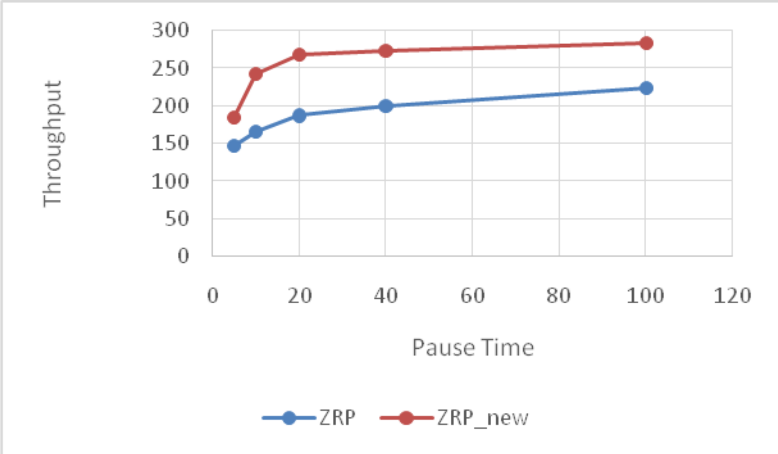

Figure 4.2 Comparison of Throughput v/s Pause Time

V. CONCLUSION

In this study we have concluded that each protocol performs well in some cases while have drawbacks in other cases. We have also incorporates the concept of path metric and centrality in ZRP and shown that it has very good effect on the performance of existing ZRP. Therefore we conclude that by considering concept of zone radius and centrality [3] in ZRP gives better performance as compared to ZRP in almost every the cases. Simulation results demonstrated that the modified ZRP performs lot better as compared to existing ZRP. Simulation result is shown in terms of throughput against number of nodes and pause time.In future work we aim to enhance performance of modified ZRP with the help of 2ACK algorithm which we will use for detection and eliminate of miss behaving nodes that comes in a our path, the path which we adopting for routing (transferring of packet).

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Design and Construction of an Adjustable and Collapsible Natural Convection Solar Food Dryer

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ABSTRACT

A new model of a box type adjustable and collapsible natural convection solar food dryer, capable taking 14,688 pieces equivalent to 16.52kg of fresh groundnut with maximum moisture content of 35%, maximum capacity of 3.39m^2, and 3,672 pieces equivalent to 4.06kg of groundnut at minimum capacity 0.8475m^2, was designed and constructed using locally available materials.

KEY WORDS : *Adjustable, Collapsible, Solar, Food Dryer*

I. INTRODUCTION

Drying is one of the oldest methods of food preservation. For several thousand years, people have been preserving dates, figs, apricots, grapes, herbs, potatoes, corn, milk, meat, and fish by drying. Until canning was developed at the end of the 18th century, drying was virtually the only method of food preservation (Ekechuku & Norton, 1999; Whitefield,2000). The dried fruits and vegetables are lightweight, do not take up much space and do not require refrigerated storage. The food scientist have found that by reducing the moisture content of food to between 10% and 20%, bacteria, yeast, moulds and enzymes are all prevented from spoiling it since micro organisms are effectively killed when the internal temperature of food reaches 14 ^{o}f (Harringshaw,1997). The flavor and most of the food nutritional value of dried food is preserved and concentrated (Scalin,1997). Moreover dried food does not require any special storage equipment and are easy to transport (Scalin1997). In ancient time of alchemy, drying was by natural "sun drying" and today in most rural communities of developing countries it is still being practiced. The diverse crops are spread on the ground and turned regularly until sufficiently dried so that they can be stored safely.

Direct sun drying is associated with numerous shortcomings, as products are affected by ultraviolet radiation, dust, rain showers, morning dews, animal and human interference, to mention but a few. In addition, open sun drying is slow, has no quality control and has a risk of contamination, creating a potential health hazard. The product's quality is seriously degraded, sometimes to the extent that they are inedible (Whitefeild,2000;Diamante & Munro 2004). These caused huge post harvest losses and significantly contributed to non availability of food in some developing countries. Estimation of these losses are generally cited to be order of 40%, but they can be nearly 80% (Bassey,1989; Togrul and Pehlivan,2004). Artificial mechanical drying method such as electric dryers, wood fueled dryers and oil burn dryers were therefore introduced mostly in developing countries (Nejat.1989). However increase in the cost of electricity and fossil fuel has made these dryers very non-attractive. Although the spreading of the crop on the ground or on a platform and drying it directly by sun drying is cheap and successfully employed for many products throughout the world, where solar radiation and other climatic conditions are favorable, because of the disadvantages of open-air sun drying process, high cost of mechanical drying mentioned above and a better understanding of the method of utilizing solar energy to advantage, have given rise to a scientific method called solar drying (Aklilu.2004). In solar drying, solar dryers are specialized device that controls the drying process and protect agricultural produce from damage by insect, pest, dust and rain, and in comparism to the natural sun drying, solar dryers generates higher temperatures lower relative humidity, lower produce moisture content, and reduce spoilage during the drying process, in addition, it takes up less space, take less time and relatively inexpensive compared to artificial mechanical drying method (Geda- Gujurat Energy Development Agency, 2003, www.geda.com). Studies showed that food item dried in a solar dryer were superior to those which are sun dried when evaluated in terms of taste, color and mould contents (Nandi, 2009). According to Oguntola. et,al.(2010), solar dried food are quality products that can be stored for extended periods, easily transported at less cost while still providing excellent nutritive values. Thus solar drying is a better alternative solution to all the drawbacks of natural sun drying and artificial mechanical drying.

II. MATERIALS AND METHOD

2.1. MATERIALS

The materials used for the construction of the solar dryer includes: Wood, paint (black and red), plastic cover, iron sheet, iron rod. Drying material was groundnut.

2.2.Design Considerations

The dryer was design such that it could be adjustable and collapsible, the following factors were taken into consideration; (i) The Dryer's capacity and design dimensions - were such that the dryer has maximum drying chamber area of (2.60m x1.30m) equals to 3.39m^2, and minimum drying chamber area of (0.615m x 1.30m) which is equal to 0.8475m^2. It could be adjusted by (0.615m x 0.23m) which is equal to 0.14145m^2 at each moment to get the maximum or minimum size of the drying chamber. The reasons for these dimensions are because of the adjustable and collapsible nature of the solar dryer, and the fact that according to (Seyed et.al, 2011), the mean length and width of one fresh groundnut with maximum moisture content of 35% taken from four varieties (Goli, Velencia, Iraqi-1 and Iraqi-2) are 20.450mm and 10.575mm respectively. Converting the length and width to metres, the mean length and width are 0.02045m and 0.01058m respectively. This implies that a groundnut has a mean area of (mean length x mean width) which is equal to (0.02045m x 0.01058m) which is equal to 0.000230796m^2. If we divide the maximum area of the drying chamber by the mean area of a groundnut, the dryer is capable to taking 14,688 pieces of fresh ground a maximum moisture content of 35%, at maximum capacity, and 3672 pieces at minimum capacity. Also according to (seyed, et.al, 2011) the mass of one fresh groundnut is 1.125g at maximum moisture content of 35%. This implies that one groundnut has a mass of 0.001125kg. Multiplying 0.001125kg by 14,688 pieces, the dryer can carry 16.52kg of fresh groundnut with maximum moisture content of 35% at maximum capacity, and 4.06kg at minimum capacity.

[1] Temperature – the minimum temperature for drying food is 30^{o}C and maximum temperature is 60^{o}C, 45^{o}C is consider average and normal for drying vegetables, fruits, roots, tuber crop chips and some other crops (Whitefield 2000). According to (Ronoh et.al,2010), if drying temperature is too low at the beginning, micro organism may grow before the grain is adequately dried, that care should be taken to ensure that the temperature is not too high that will affect the color, texture and flavor of the food

[2] Air gap – air gap of 5cm is recommended for hot climate passive solar food dryer (Oguntola et,al 2010). For the purpose of this design, an air inlet and outlet gap or vent of diameter equals to 10.0 cm was created with the view of allowing more air flow into the dryer and decreasing it temperature in order to remove the free water molecules which is important at the initial stage of drying.

[3] The glass cover used for the design of the dryer is 4mm thick and the solar collector is iron sheet, 0.9mm thick. Both the glass cover and solar collector are approximately (130.0 x 61.5) cm x 4. This is because the dryer is made up of four segments integareted into one. Each of the segment is (130.0 x 61.5) cm.

[4] The dryer is a direct and passive dryer in which both the drying chamber and solar collector's chamber are in the same place, it has no drying trays, but could be fixed if desired.

[5] (vi) The solar collector and drying chamber are painted black because black paint is good absorber of heat and poor radiator of heat, so it absorbs the solar energy falling on the solar collector and coverts it to heat energy required for drying of food crops in the drying chamber.

[6] The bottom cover is a plywood of size (61.5 x 130.0 x1.0) cm, multiplied by 4 segments of the dryer. The bottom covers are painted red to prevent water and moisture from spoiling them quickly. Wood is a poor conductor of heat, as such, it will minimize heat lost due to conduction at the bottom of the dryer. The iron sheet which was painted black was used as a solar collector, and placed directly on top of the plywood, to form the solar collector's chamber.

2.3. Design Calculations / Theory

(i) Angle of tilt (β) of solar collector

According to Sukhatme (1996), angle of tilt (β) of solar collectors is

$$\beta = 10 + \text{lat } \phi \qquad (1)$$

Where lat ϕ = latitude of the place that the drier was designed, which is Sokoto. For the purpose of this design, β = lat ϕ , since there was no angle of tilt. The dryer could function satisfactorily without angle of tilt.

(ii)There are three major factors affecting food drying: temperature, humidity and air flow. They are interactive. Increasing the vent area by opening vent covers will decrease the temperature and increase the air flow, without having a great effect on the relative humidity of the inlet air. In general more air flow is desired in the early stages of drying to remove free water or water around the cells and on the surface. Reducing the vent area by partially closing the vent covers will increase the temperature and decrease the relative humidity of the inlet air and the air flow

(Wave Power Plant Inc. 2006). Oguntola et,al (2010) reported that volumetric flow rate of air V_a can be expressed as $V_a = v(m/s) \times h(m) \times w(m)$ Where v is the average air wind speed in(m/s), h is the height of the air gap or vent in(m), w is the width of collection, which implies the width of the air gap or vent in (m). $V_a = v(m/s) \times A(m^2)$, A is the area of air gap or vent in (m^2). For the purpose of this design, the air inlet and outlet gaps or vents are circular in shape, therefore, the formula used to calculate the volumetric flow rate of air is average wind speed (m/s) multiply by the area of the air gaps or vents which are circular in shape. It is expressed as

$$V_a = A \times v \times n \qquad (2)$$

Where V_a = Volumetric flow rate of air (m^3/s)

A = Area of air gap or vent (m^2)
v = average wind speed (m/s)
n = number of air vents
But $A = \pi r^2$, r = radius of air or vent
so that, we obtain

$$V_a = \pi r^2 \times v \times n = \pi v r^2 n \qquad (3)$$

(iii) Mass flow rate of air is expressed (Oguntola, 2010) as

$$m_a = \rho_a V_a \qquad (4)$$

Where m_a = mass flow rate of air, ρ_a = density of air (kg/m^3) and V_a = volumetric flow rate of air (m^3/s)

(iv) Solar insolation is given by Olaloye(2008) as

$$I_c = H \times R \qquad (6)$$

Where I_c = solar insolation (W/m^2)
H = average daily solar radiation on horizontal surface Olaloye (2008)
R = average effective ratio of solar energy on tilt surface to that on the horizontal surface= 1.0035.

For the purpose of this design, I_c = H, because the solar collector was not tilted to any surface hence no any effective energy ratio R.
(v) Energy Balance on the Absorber.
The total heat energy gained by the collector's absorber is equal to the heat lost by heat absorber of the collector (Bukola et,al 2008)

$$I_c A_c = Q_u + Q_{cond} + Q_{convec} + Q_R + Q_p \qquad (7)$$

I_c = rate of total radiation incident on the absorber's surface (W/m^2)

A_c = collector's area (m^2)

Q_u = rate of useful energy collected by the air (W)

Q_{cond} = rate of conduction losses by the absorber (W)

Q_{convec} = rate of convective losses from the absorber (W)

Q_R = rate of long wave re – radiation from absorber (W)

Q_P = rate of reflection losses from the absorber (W)

Putting $Q_l = Q_{cond} + Q_{convec} + Q_R$ (8)

where Q_l is the total heat loses(the three heat losses)

If τ is the transmittance of the top glazing and It is the total solar radiation incident on the top surface, therefore,

$$I_c A_c = \tau I_c t A_c \tag{9}$$

The reflected energy from absorber is given by expression

$$Q_p = \rho \tau I_c t A_c \tag{10}$$

ρ = reflection co- efficient of absorber.

Substituting eqn (8), (9) and (10) into (7), yields

$$\tau I_c t A_c = Q_u + Q_l + \rho \tau I_c t A_c$$

$$Q_u = \tau I_c A_c (1-\rho) - Q_l$$

For an absorber, (1- ρ) = α and hence ,

$$Q_u = (\alpha\tau) I_c t A_c - Q_l \tag{11}$$

Q_l composed of different convection and radiation parts. It is presented in the following form (Bansel et,al. 1990)

$$Q_l = U_l A_c (T_c - T_a) \tag{12}$$

U_l = overall heat transfer co – efficient of the absorber (W/m^2K^{-1})

T_c = temperature of collector's absorber (K)

T_a = ambient air temperature (K).

$$Q_u = (\alpha\tau) I_c t A_c - U_l A_c (T_c - T_a) \tag{13}$$

If the heated air leaving the collector is at the collector's temperature, the heat gained by the air Qg is

$$Q_g = m_a c_{pa} (T_c - T_a) \tag{14}$$

m_a = mass of air leaving the dryer per unit time (kg/s) ≡ mass flow rate of air ≡ $\dot{m}$

c_{pa} = specific heat capacity of air at constant pressure ($jkg^{-1}k$-^{1})

The collector's heat removal factor, F_R, is the quantity that relates the actual useful energy gain of a collector in eqn (13) to the useful energy gained by air in eqn (14) expressed by (Bukola and Ayoola,2008) as

$$F_R = \frac{m_a c_{pa} (T_c - T_a)}{A_c[\tau\alpha I_c t - U_l(T_c - T_a)]} \tag{15}$$

Equation (14) can be re- written in terms of F_R

$$Q_g = A_c F_R [(\alpha\tau) I_c t - U_l A_c (T_c - T_a)] \tag{16}$$

The thermal efficiency of the collector is defined as the ratio of heat output to the heat input or ratio of energy output to energy input, which is the same as the ratio of the energy addition to the air as it passes through the collector to the energy incident on the collector.

$$\eta_c = \frac{Qg}{I_c A_c} \tag{17}$$

(vi) The total energy required for drying a given quantity of food item can be estimated using basic energy balance equation for the evaporation of water (Youcef et,al. 2001, and Bolaji 2005) as in equation 18, where the oil and fat evaporated from groundnut is negligible at that temperature change.

$$m_w L_v = m_a c_{pa} (T_1 - T_2) \tag{18}$$

m_w = mass of water vapour evaporated from the food item (kg)

L_v = latent heat of vaporization of water (kj/kg)

m_a = mass of drying air (kg)

T_1 and T_2 = the initial and final temperatures of drying air respectively (K)

C_p = specific heat capacity of air at constant pressure (kjkg^{-1}k^{-1}

(vii) The dryer's efficiency (ɳd) is expressed as follows

$$n_d = \frac{ML_v}{I_c A_c t} \tag{19}$$

η_d = dryer's efficiency (%)
M = Mass of moisture evaporated (kg)
L_v = Latent heat of vaporization of water (kj/kg)
I_c= Solar insolation (W/m^2)
A_c= Area of solar collector (m²)
t = Time of drying (hrs)
(viii) The collector's efficiency (ɳc) is expressed (Ezekoye et,al.2006) as follows

$$nc = \frac{\rho V_a C_p \Delta T}{I_c A_c} \tag{20}$$

ɳc = Collector's efficiency (%)
Cp = Specific heat capacity of air (kj / kg k)
$\Delta T = (T_c - T_a)$ = Temperature elevation (K)
A_c = Area of solar collector (m^2)
I_c = solar insolation (W/m^2)
ρ = Density of air (kg/m^3)
V_a = Volumetric flow rate of air (m^3/s)
(ix) Moisture content on percentage wet basis is expressed (Senger2009) as follows

$$MC_{wb} = \frac{W_1 - W_2}{W_1} \tag{21}$$

MC (w_b) = Moisture content on percentage wet bases.
W_1 = Weight of sample before drying in kg.
W_2 = Weight of sample after drying in kg.
(x) Moisture content on percentage dry bases is expressed (Senger,2009) as

$$MC_{db} = \frac{W_1 - W_2}{W_2} \tag{22}$$

(xi) Drying rate is expressed (Ceankoplis, 1993) as

$$R_c = \frac{M_d (Q_1 - Q_2)}{A_s t} \tag{23}$$

Where R_c = drying rate (kg/mol), M_d = total weight of dried sample, A_s = surface area of dried solid (m^2), t = drying time (hrs), Q_1 = initial moisture content (% wb) and Q_2 = final moisture content (% wb)

(xi) Relative humidity is the mass of moisture present in air to the mass of moisture the air is capable of holding at that temperature.

III. CONSTRUCTION.

The solar dryer was constructed such that it could be collapsible and adjustable. The sketch and pictorial views are shown in Figure 1 and Figure 2 respectively. It is made of the following component parts: solar collector's chamber, dryer's chamber, air vent or gap. The following parts were assembled to form the component parts Yamma, Zaci, Maik, Kwa, Bosso, Shako, Shiwe, Mawo, Gbaiko, Shanu, Kpi, solar collector and plastic covers. The words in italics are some words in my dialect. They were used in this work because the work is my intellectual property and also to project my dialect. The English meaning of the words are as follows: Yamma is a traditional title in my village, Zaci is also a traditional title in my village, Maik is a short form of Maikunkele which is the headquarters of Bosso Local Government Area of Niger State- Nigeria, Kwa means well done, Bosso is my town and as well the name of my Local Government, Shako is a District in my Local Government Area, Shiwe means look, Mawo means I have heard, Gbaiko is a name of a village in my Local Government Area, Shanu and Kpi are also names of Villages in my Local Government Area Bossos are the two opposite ends that form the part of the box shape of the dryer. Each Bosso is (260.4 x 24.5 x 2.0) cm in size that could be adjusted by 65.1cm at a time, to give a minimum length of 61.5cm and maximum length of 260.4cm depending on the desired length required. A Bosso is made up of four yammas, each of size (61.5 x 24.5 x 2.0) cm. Each Yamma has two maiks and an air vent of 10.0cm in diameter. The four yammas are coupled together with the aid of zaci which are pieces of iron each of length 7cm long, and 20 kwas, ten at the top and ten at the bottom. Each kwa is a bolt about 2.5cm long slotted into two maiks and tied with a nut at the other end to keep the yammas firmly held together.

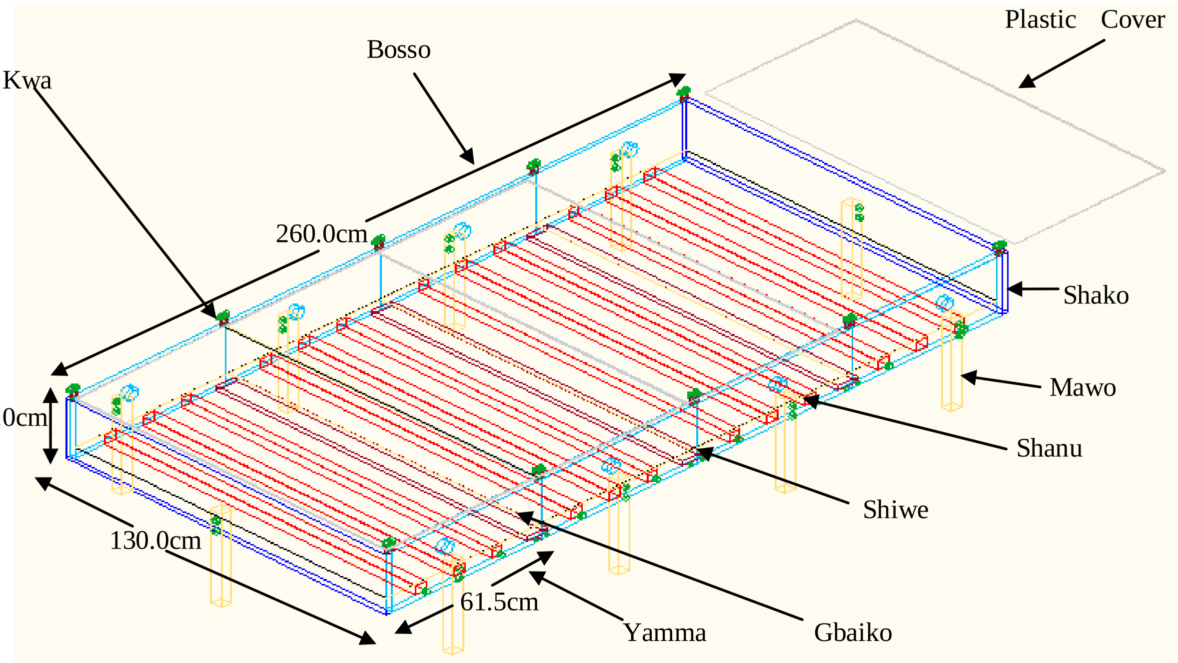

Figure 1, The sketch of the Solar Food Dryer

Shakos are the other two opposite ends of the dryer that gives it a box shape, each *shako* is (134.0 x 24.5 x 2.0) cm. It is none adjustable. This implies that when the two *Bossos* and two *Shakos* are coupled together, a box shape solar dryer is formed which could be (260.4 × 130.0 x 23.0) cm^3 or (184.5× 130.0 x 23.0) cm^3 or (123.0× 130.0 x 23.0)cm^3 and (61.5×130.0) cm^3 in size, depending on the adjustment. The dryer has 10 *Mawos*, which are the legs. Each *Mawo* is (38.0 x 4.0 x 4.0) cm. The solar dryer has a total of 12 *Shanus*, each *Shanu* is (123.0 x 4.0 x 4.0) cm in size, each *Shanu* is supported to the two *Bossos* by two slotted nails at the two ends. The *Shanus* provides the support for the bottom cover, the solar collector and drying chamber. Since the whole dryer has four segments integrated together as one, at each boundary between two segments there is one *Shiwe*. Each *Shiwe* is (123.0 x 8.0 x 2.0) cm in size, and is supported to the two *Bossos* by four slotted nails, two at the opposite ends. *Shanu* provide the base in which two different bottom covers and two different solar collectors overlap to seal any gap that heat could possibly escape from the bottom of the dryer. There are total of three *Shiwes* in the whole dryer, located at the three boundaries between the segments. The dryer also has three *Gbaiko's*, each *Gbaiko* is and iron rod of length 137.2 cm and 1.0cm thick. It has threads at the two ends which nuts are used. *Gbaikos* are located close to the boundaries between the segments, *Gbaikos* helps to straighten any bend at the boundary/joint between segments to ensure that *Bossos* remain straight with the aid of nuts at it two ends, as shown in figure 1. The bottom covers and solar collectors are held very firmly on the *Shiwes* and *Shanus* which are the base support, with the aid of Kpi. There are total number of 8 *Kpis*, and the average size of each *Kpi* (54.0 x 2.5 x 2.5) cm. Each *Kpi* is supported by three screw to the *Bosso*. The four plastic covers are supported to the dryer by four slotted frames, each frame is (123.2 x 61.5) cm in size. The frames are constructed such that they fit and overlap very well into the dryer's frame to ensure that heat does not escape from the sides. The pictorial view of the dryer is shown in figure 2.

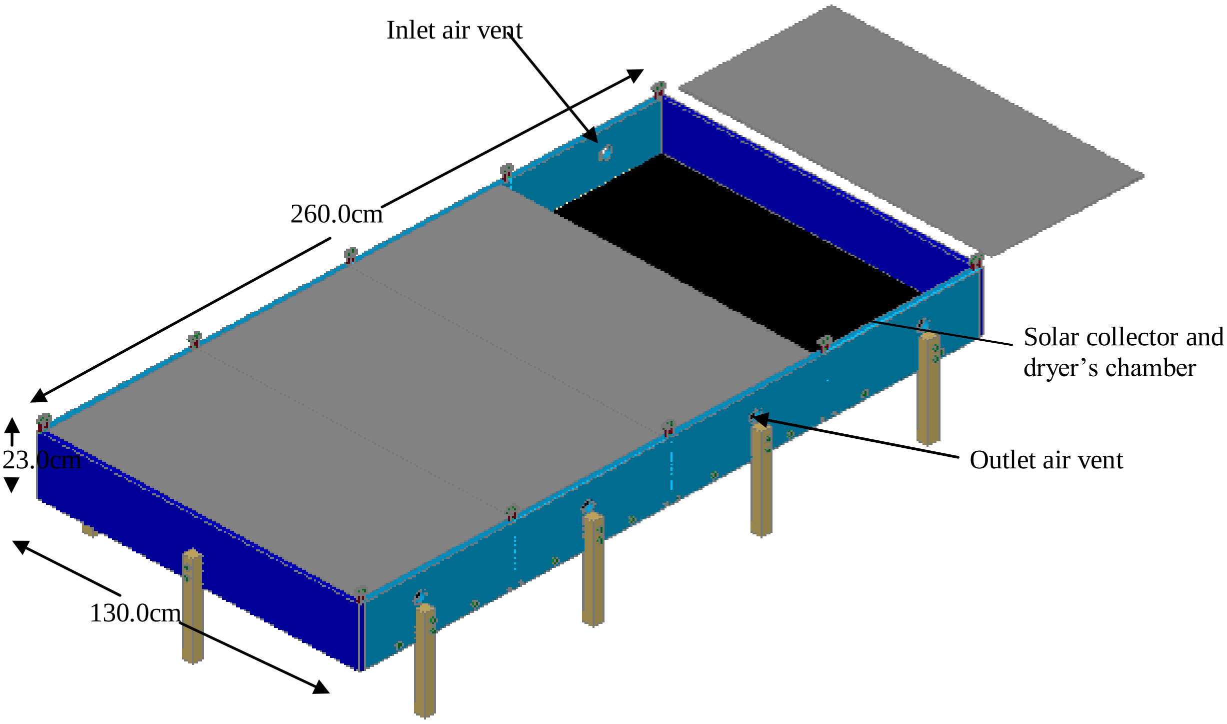

Figure 2. The Pictorial view of Solar Food Dryer. As seen in figure

figure 3, it shows how *Kwa* clearly looks. It shows how the bolt was slotted into the *maiks* and tied with a nut at the other end.

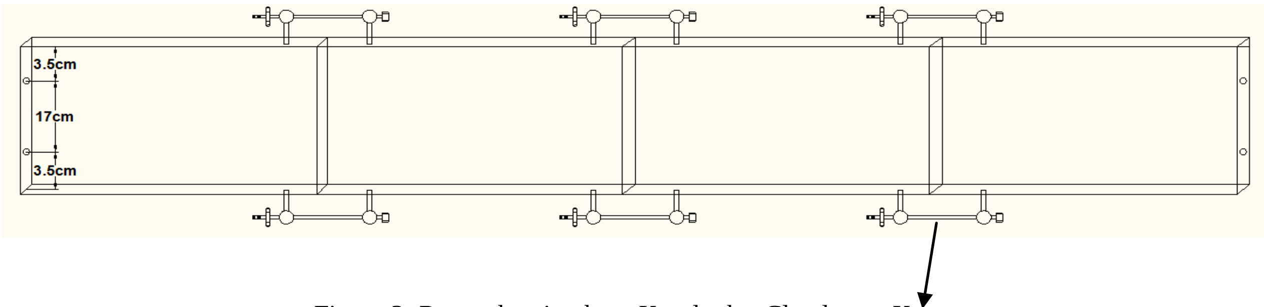

Figure 3. *Bosso* showing how *Kwa* looks, Clearly. *Kwa*

Likewise, Figure 4, shows how *Zaci* and *Maik* were used in the construction, and how the four *Yammas* were coupled together

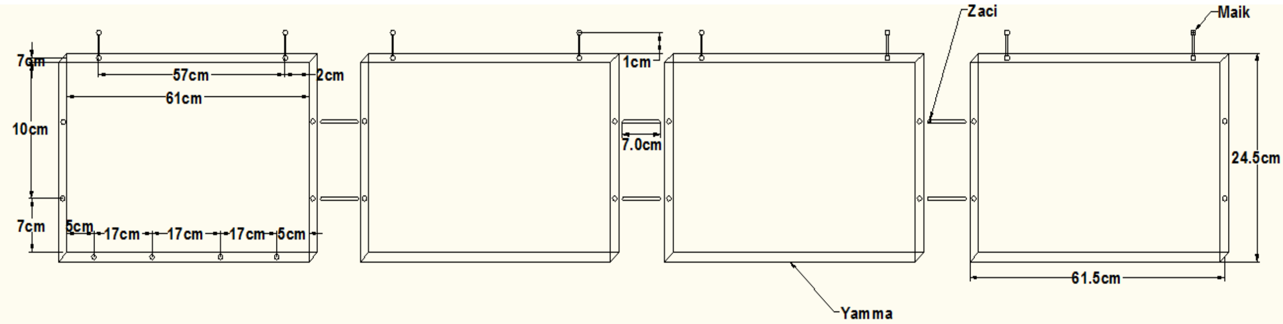

Figure 4. The use of *Zaki* and *Maik* in the construction, and how the four *Yammas* were coupled together

IV. CONCLUSION

A new model of a box type adjustable and collapsible natural convection solar food dryer, capable of taking 14,688 pieces equivalent to 16.52kg of fresh groundnut with maximum moisture content of 35%, at maximum capacity of 3.39m^2, and 3,672 pieces equivalent to 4.06kg of groundnut at minimum capacity of 0.8475m^2, was successfully designed and constructed using locally available materials.

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A Presumable Data Retentive Framework for Multi Cloud

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ABSTRACT

Cloud Storage or storage outsourcing is a rising trend where the cloud storage service provides a comparably low-cost, scalable, position-independent platform for storing client's data. This archival storage guarantees the authenticity of data on storage server, but does not guarantee for the tampering of data (modifications or deletions, to the data).Thus, the problem for proving the integrity of the data stored at the third party cloud service providers has increased its attention. This work defines a framework for the efficient construction of data possession at the cloud storage servers dynamically. This scheme is considered for a hybrid cloud in which multiple cloud storages servers are considered, based on a cryptographic technique Interactive Proof System-multi-proved Zero knowledge proof system. This system is based on homomorphic verifiable response from multiple cloud servers, and the stored data is indexed using collision resistant hash index hierarchy. This scheme satisfies the security properties of completeness, knowledge soundness, and zero-knowledge system. This work also presents an optimal method for minimizing the computation, communication costs of storage service providers.

KEYWORDS: *Data possession, data outsourcing, storage outsourcing, probabilistic possession.*

I. INTRODUCTION

As high-speed networks and ubiquitous Internet access become available in recent years, cloud storage has become a fastest profit growth point for many cloud storage service providers. As cloud computing environment is completely built on open architectures and open interfaces, it provides high interoperability by bringing multiple internal/external cloud services together. When coming to a distributed cloud environment, say multi-cloud or hybrid cloud, it has to allow many clients to easily access their resources remotely through web service interfaces. As the concept of cloud computing has become familiar, the need for opting of third party storage servers also has its significant growth instead of setting up its own infrastructure for any organization. Users just use services without being concerned about how computation is done and storage is managed. Storage Outsourcing can also be referred to as data outsourcing or outsourcing of data.

Data outsourcing means the owner of the data (client) moves his/her data to a third-party storage service provider(server) which is for a low fee, also faithful to the data owner. The significant features of data outsourcing include reduced cost for storage, maintenance, increased availability and transparency of the data. The main disadvantage of this kind of outsourcing is that the client /organization do not have any control over the data which has been uploaded. The data as well as control of the data will be in the hands of the third party which poses a question for maintaining the confidentiality of the data. Also the server does not guarantee whether the data has been tampered with or deleted. Also, given a large files for storage, the user has to be provided to validate the data without actually downloading the data. In this paper, we focus on designing a cloud storage system for ensuring the integrity of the data in storage out sourcing**.** In this work, a cloud storage system is considered as a large scale distributed storage system that consists of many independent storage servers.

II. EXISTING SYSTEM

To check for the integrity of outsourced data, researchers provides two basic approaches called Provable Data Possession (PDP) and Proofs of Retrievability (POR). In the first approach, they proposed the PDP model for ensuring possession of files on untrusted storages without downloading the actual data and provided an RSA-based scheme for a static case. It also includes a challenge for public verifiability, with this anyone, not just the owner can challenge the server for data possession.

This extends the application areas of PDP protocol by separating the data owners and the users. But this is insecure against replay attacks in dynamic scenarios because of dependencies in index of data blocks. Moreover, they are not fit for multi-cloud storage because there is no homomorphic property in the verification process. To overcome static file storage limits in PDP and to provide dynamic data operations in PDP the Scalable PDP model have been proposed. It is a lightweight PDP scheme based on Cryptographic hash function and symmetric key encryption. But due to the lack of randomness in the challenges the servers used to deceive the clients /owners by previous metadata responses. Another drawback in this model is block size and its length are fixed and hence the modification of blocks cannot be done anywhere. Based on this work two Dynamic PDP has been proposed. First is the basic scheme, called DPDP-I and Second is the, "block less" scheme, called DPDP-II. But these schemes are also not effective for a multi-cloud environment. Second approach is POR scheme; it describes the preprocessing steps that the clients should do before sending their file to a CSP. But not allow for updating the data efficiently. An improved version of this protocol called Compact POR has been proposed. This technique which uses homomorphic property to aggregate a proof into authenticator value but the solution is also static and could not prevent the leakage of data blocks in the verification process. The dynamic scheme with cost by integrating the Compact POR scheme and Merkle Hash Tree (MHT) into the DPDP has been proposed. Several POR schemes and models have been recently proposed by using RAID techniques. It introduced a distributed cryptographic system that allows a set of servers to solve the PDP problem. This is based on an integrity protected error correcting code (IP-ECC), which improves the security and efficiency of existing tools. Here, a file must be transformed into distinct segments with the same length, which are distributed across servers. It is more suitable for RAID rather than cloud storage.

2.1 Drawbacks of Existing System

1) The existing schemes apply to the case of static, archival storage. Also dependent on the number of file blocks.
2) The numbers of updates, insertions, deletions are limited and are fixed
3) Insertions cannot be performed dynamically.
4) The existing schemes are vulnerable to two major security attacks: *Data leakage attack* and *Tag Forgery attack.*
5) Mainly applicable for a single cloud storage environment, but not for a distributed cloud storage environment.

III. PROPOSED SYSTEM

In this work, the architecture for a multi-cloud storage service can be viewed as three different entities: Clients, Cloud Service Providers (CSP's), Trusted Third party Administrator.

[1] **Clients**: End users who have large amounts of the data to be stored at third party storage servers. These users have permissions to access as well as manipulate the data.
[2] **CSP's**: CSP's provide data storage services and possess enough computation and storage services.
[3] **Trusted Third Party**: The third party administrator who is trusted to store verification parameters, also offer public query services for those parameters.

In this work, the verification procedure for data possession can be described as follows: Initially, the client uses secret key to pre-process the file as a collection of n-blocks. For the processed n-blocks, verification tags will be generated which are stored at the CSP's along with the file. At the same time, he generates the public verification information for the TTP's. The client can delete his/her own local copy of the data. The TTP acts independently and is reliable through the following functions:

[1] To setup and maintain the cryptosystem for the DPDP scheme.
[2] To generate and store owner's public key
[3] To store the public verification parameters to execute the verification protocol of the DPDP scheme.

3.1 Provable Data Possession Schemes

In order to address the problem of data integrity and authenticity in a distributed cloud environment. The following aspects are taken into consideration: High performance, scalability, automatic failure recovery, verification transparency, high security. For an efficient construction of this scheme, a significant cryptographic technique, Interactive Proof System with multi-prover Zero Knowledge Proof system is used for security analysis. This model satisfies the security properties of completeness, soundness, zero-knowledge. The verification framework for the distributed cloud environment is implemented using two techniques. They are

[1] Hash Index Hierarchy
[2] Homomorphic verifiable response.

This framework provides security by resisting data leakage attacks and Tag forgery attacks. The framework can be defined as follows: Considering the security key and the tag for n-blocks of a file, the data possession scheme is given as

S= (KeyGen, TagGen, Proof).

The above said is a collection of two algorithms

- *(KeyGen, TagGen)*
- Interactive proof system, say *Proof*, can be explained as follows:

$Key(1^{\kappa})$**:** a security parameter κ as input, and returns a secret key sk or a public-secret key pair (pk, sk); $TagGen(sk, F, \mathcal{P})$: This function takes as inputs a secret key sk, a file F, and a set of cloud storage providerss $\mathcal{P}$ $=\{P_k\}$, and returns the triples (ζ, ψ, σ), where $\zeta$is the secret in tags, $\psi = (u, \mathcal{H})$ is a set of verification parameters u and an index hierarchy $\mathcal{H}$ for F, $\sigma = \{\sigma^{(k)}\} P_k \in \mathcal{P}$denotes a set of all tags, $\sigma^{(k)}$ is the tag of the fraction $F^{(k)}$ of F in P_k; $Pr(\mathcal{P}, V)$**:** a protocol of proof of data possession between all CSPs ($\mathcal{P} = \{P_k\}$) and a verifier (V), that is, $\langle \Sigma P_k \in (F^{(k)}, \sigma^{(k)}) \longleftrightarrow V \rangle (pk, \psi)$= $\{\{1\ F = \{(\mathrm{F}^{(k)})\}$ is intact$\}$, $\{0\ F = \{F^{(k)}\}$ is changed$\}\}$,where each P_k takes as input a file $F^{(k)}$, a set of tags $\sigma^{(k)}$, a public key pk, a set of public parameters ψ as the common input between $P$and V . At the end of each run of the protocol, V return as bit $\{0|1\}$ denoting false and true. Where, $\Sigma P_k \in \mathcal{P}$denotes cooperative computing among all the CSP's in $P_k \in \mathcal{P}$. The co-operability among all the CSP's storing the same set of the data is verified one by one, i.e., $\wedge P_k \in \mathcal{P} \langle P_k(F^{(k)}, \sigma^{(k)}) \longleftrightarrow V \rangle (pk, \psi)$, where $\wedge$ denotes the logical AND operations among the boolean outputs of all protocols $\langle P_k, V \rangle$on all the CSP's for all $P_k \in \mathcal{P}$.

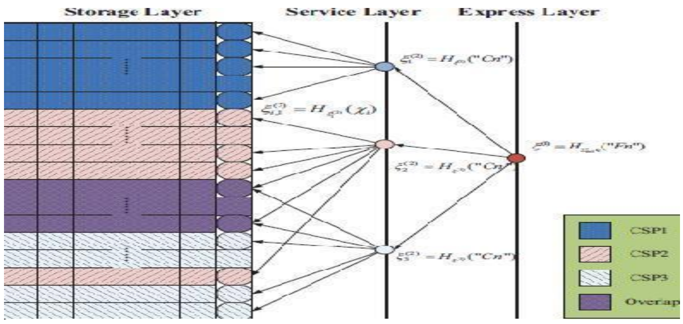
IV . SYSTEM MODEL

4.1 Hash Index Hierarchy

The architecture for this data possession scheme is a hierarchial model of file storage. This structure consists of three different levels which expresses the relationship among different storage resources:

1) **Express Layer**: an abstract representation of the stored resources.
2) **Service Layer**: manages and offers cloud storage.
3) **Storage Layer**: realizes data storage on many physical devices.

The storage layer defines a common fragment structure, a data structure that maintains a set of block-tag pairs. Given a file of blocks (m_1, m2,m3,…m_n), the respective block-tag pair will be generated as $(mi, \sigma i)$, where σi is a signature tag of block mi, generated by a set of secrets $\tau = (\tau 1, \tau 2, \cdots, \tau s)$. To check for the data integrity, the fragment structure implements the probabilistic verification as follows: Given a random probabilistic query $Q = \{(i , vi)\} i \in RI$, where I is a subset of the block indices and vi is a random Coefficient, the constant-size response is derived as $(\mu 1, \mu 2, \cdots, \mu s, \sigma')$, where μi comes from all $\{mk,i, vk\} k \in I$ and σ' is from all $\{\sigma k, vk\} k \in I$ To support virtualization of storage services, a simple Index-hash table $\chi = \{\chi i\}$ is introduced to record the changes of file blocks as well as to generate the hash value of each block in the verification process. The structure of index-hash table χ is similar to that of the structure of file block allocation table in file systems. This index-hash table consists of parameter values of serial number, block number, version number, and random integer. All the records in the index table are made unique to prevent forgery of data blocks and tags. Using this index records $\{\chi i\}$, this scheme also support dynamic data operations.



4.2 Homomorphic Verifiable Response

A homomorphism is a map function $f : \mathbb{P} \rightarrow \mathbb{Q}$ between two groups such that $f(g1 \oplus g2) = f(g1) \otimes f(g2)$ for all $g1, g2 \in \mathbb{P}$, where $\oplus$ denotes the operation in $\mathbb{P}$ and $\otimes$ denotes the operation in $\mathbb{Q}$. This notation has been used to define Homomorphic Verifiable Tags (HVTs). Given two values σ_i and σ_j for two messages m_i and m_j, anyone can combine them into a value σ' corresponding to the sum of the messages $m_i + m_j$. A response is called homomorphic verifiable response in a Data Possession protocol, if given two responses θ_i and θ_j for two queries or challenges on Q_i and Q_j from two CSPs, then an efficient algorithm combines them into a response θ corresponding to the sum of the challenges $Q_i \cup$. This Homomorphic verifiable response technique not only reduces the communication bandwidth, but also conceals the location of outsourced data, i.e., from which CSP the data is being accessed.

4.3 Working Model

This protocol can be described as follows: The manager who is a client first runs algorithm $KeyGen$ to obtain the public/private key pairs for CSPs as well as public users. The clients generate the tags of outsourced data by using $TagGen$. The protocol $Proof$ is performed by a 5-move interactive proof protocol between a verifier (client) and more than one CSP, in which CSPs need not to interact with each other during the verification process, an organizer (TTP) is used to organize and manage all CSPs.

1) The organizer (CSP) initiates the protocol and sends a commitment to the verifier (Client).
2) The verifier returns a challenge set of random index-coefficient pair'sQ to the organizer.
3) The TTP relays them into each Pi in $\mathcal{P}$ according to the exact position of each data block.
4) Each Pi returns its response of challenge to the organizer.
5) The organizer synthesizes a final response from received responses from all the CSP's and sends it to the verifier.

In the above said process, this scheme would guarantee that the verifier accesses files without knowing on which CSPs or in what geographical locations their files reside.

4.4 Advantages of Proposed System

1) Since these schemes are built based on collision-resistance signatures and random oracle model, these schemes have short query and response from public verifiability.
2) In distributed cloud storage, a file is divide into $n \times s$ sectors for which all the S sectors are represented with a single tag, there by reducing the storage for all the tags for S sectors.
3) As this scheme rely upon homomorphic properties, for aggregation of data and tags, into a constant size response, thereby minimizing the network communication bandwidth.
4) The hierarchial structure for storage provides virtualization for storage thereby concealing the location of the storage servers.

V. SECURITY ANALYSIS

This scheme satisfies the security properties of Completeness, Soundness, and Zero-knowledge

1) ***Completeness*** – To challenge the data integrity and ownership, the secret information is required with the verification protocol. The <Data, Tag> pair taken a (F,σ)ε TagGen(Sk,F), a random challenge is generated given as Q – (I,V_i) where I ε I can be checked for the success probability.

2) ***Soundness*** **-** The verifier is infeasible to accept any responses. This property can be used as a stricter notion for the unforgetability of the tags in order to avoid the ownership cheating. Hence, using this property, no intruder or server can tamper the data or forge the data tags. This property can be used efficiently to resist Tag Forgery attacks.

3) ***Zero –Knowledge*** **–** This property preserves the privacy of data blocks and respective tags to resist data leakage attacks, by introducing a random integer $\lambda_{j,k}$ for a response $\mu_{j,k}$, the random integer $\lambda_{j,k}$ is not known to the intruders.

VI. CONCLUSION

In this paper, a cloud storage system that consists of multiple cloud servers is considered. This scheme uses collision resistant hash index hierarchy model to store the data at multiple sites in an indexed manner. The response from the multiple cloud servers is a homomorphic verifiable response from multiple cloud servers. This work is completely based on multi-prover zero knowledge system, also satisfies all the security properties, thereby minimizing the communication overheads and computational costs for storage providers.

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Modeling and Characterization of Piezoelectric Mems Energy Harvester

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ABSTRACT

This paper presents the modeling, characterization of a piezoelectric microelectromechanical systems (MEMS) energy harvester using a d33 piezoelectric mode. A analytical modeling for the d33-mode device were first performed to estimate the output voltage as a function of the material parameters and device geometry. A Zno layer was newly applied as an interlayer between the PZT and silicon dioxide films to improve the piezoelectric property. The cantilever PZT film with an interdigital shaped electrode exhibited a polarization of 3.25e-15C/m^2, a relative dielectric constant of 1125.1, and a d33 piezoelectric constant of 50 pC/N. The simulated energy-harvesting device generated an electrical voltage of 0.3453V for a force 45e-6 of from a vibration. The corresponding electric field and polarization was produced.

KEYWORDS: *energy harvesting, interdigital electrodes, lead zirconate titanate (PZT) , microelectromechanical systems (MEMS), piezoelectric effect.*

I. INTRODUCTION

IN olden days power sources such as electrochemical batterieswhich are used when used in the lowpower- consuming wireless remote sensor systems currently employed for intelligent buildings and environmental monitoring, have some drawbacks such as their environmental pollution, large maintenance requirements, limited storage capacity, and limited lifetime. Now a days, the power consumption of tens to hundreds of microwatts is sufficient for wireless sensor node applications by the rapid development of low power ICs.

Three types of transduction methods that can be used for ambient vibration energy harvesters, namely electrostatic, electromagnetic, and piezoelectric. In these methods, piezoelectric transducers have received much attention because of their simple configuration and high conversion efficiency. Energy harvesters were also designed to operate in the *d*31 piezoelectric mode. In a previous micromachined energy harvester operating in the *d*31 mode which was structured with a parallel-plated capacitor, the output voltage was limited due to its large capacitance. The *d*33 piezoelectric mode, which was configured by an interdigital shaped electrode, was effective in generating a larger output voltage than the *d*31 mode, because it exhibited a much smaller capacitance and the output voltage could be easily controlled by adjusting its electrode gap. In addition, its piezoelectric constant was also much higher than that of the harvester operating in the *d*31 mode. The piezoelectric effect converts mechanical strain into electric current or voltage. This strain can come from many different sources. Human motion, low-frequency seismic vibrations, and acoustic noise are everyday examples. Most piezoelectric electricity sources produce power on the order of milliwatts, too small for system application, but enough for hand-held devices. Piezoelectric materials are permanently polarized crystalline materials. If the dimensions are changed as a result of mechanical force, electric charges proportional to the imposed force are accumulated on the surface up on which the force is imposed. This phenomenon is known as piezoelectricity. This property is exploited to measure many physical parameters such as force, pressure, strain, torque, acceleration, sound and vibration. Piezoelectricity is the combined effect of the electrical behavior of the material

$$D=\varepsilon E$$

where D is the electric charge density displacement (electric displacement), ε is permittivity and E is electric field strength. According to Hooks law

$$S=sT$$

These may be combined into so-called *coupled equations*, of which the strain-charge form is:

$$\{S\} = \left[s^E\right]\{T\} + [d]\{E\}$$
$$\{D\} = [d^t]\{T\} + \left[\varepsilon^T\right]\{E\}$$

where [d] is the matrix for the direct piezoelectric effect and $[d^t]$is the matrix for the converse piezoelectric effect. The superscript *E* indicates a zero, or constant, electric field; the superscript *T* indicates a zero, or constant, stress field; and the superscript *t* stands for transposition of a matrix.In this paper, the modeling of a silicon bulk micromachined energy harvester operating in the *d*33 piezoelectric mode were performed. In this model a single cantilever structure with a silicon inertial mass for scavenging low vibrations with frequencies of several hundreds of hertz. The maximum output voltage, were measured.

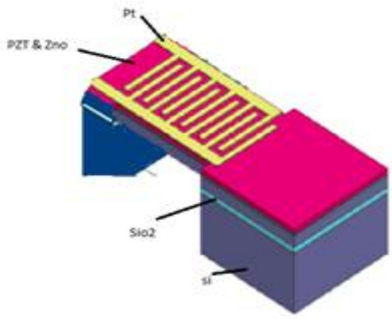

Fig. 1. Schematic drawing of the proposed energy harvester

II. MODELING

Fig. 1 shows the microelectromechanical systems (MEMS) energy-harvesting cantilever device operating in the *d*33 mode for low-frequency vibration conversion. It consists of a single cantilever structure, which is composed of a supporting silicon membrane, a piezoelectric layer, and interdigital shaped electrodes. The proof mass, which is made of silicon, is built at the free end of the cantilever to adjust the resonant frequency and reduce the spring constant.

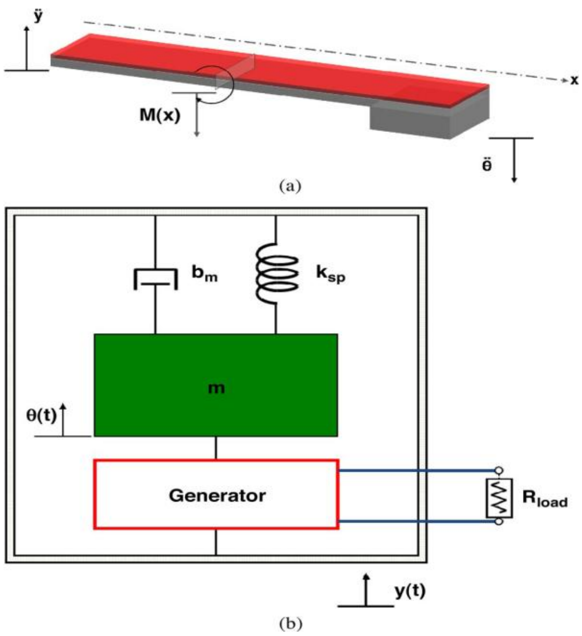

Fig. 2. (a) Single cantilever structure with a proof mass and (b) mass–spring– damper system model of the proposed piezoelectric MEMS energy harvester.

Fig. 2 (a) shows the single cantilever structure of energy harvesting. The vibration of total system is coupled to generator by means of the inertia of mass. This mass (*m*) is modeled as being suspended by a spring with spring constant (*k*), while its motion is damped by a parasitic damping (*bm*). This mass also damped by the generator (*Pg*). The displacement of total mass is $\theta(t)$ and the displacement of this system is represented by $y(t)$. This vibration energy harvester can be express by following equation.

$$m\ddot{y} = m\ddot{\theta} + bm\dot{\theta} + k\theta + Pg$$

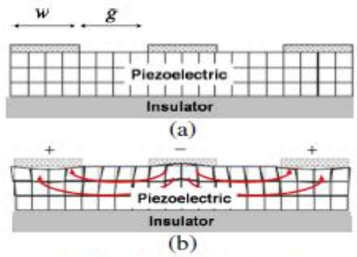

Fig. 3 Conceptual description of d_{33} piezoelectric mode operation on PZT thin film substrate.

The d33 piezoelectric mode in Fig. 3 is more eligible for energy harvesting of low level ambient vibration because d33 mode can generate larger voltage than d31mode with less displacement of cantilever due to followings.Firstly, the stress-strain distribution between electrodes of d33 piezoelectric mode is constant. It's assumed that the thickness of piezoelectric layer is much thinner than silicon membrane. The stress on piezoelectric layer can be expressed as

$$\sigma_{xx} = \frac{M(x)h}{I}$$

where, *l* is the length of the silicon membrane, *x* is the distance from fixed area of the beam, *M(x)* is the moment in the beam as a function of *x*, *I* is the effective moment of inertia, and *h* is the thickness of silicon membrane.

The electrical displacement and internal stress of piezoelectric material is described as

$$\begin{bmatrix} D \\ \delta \end{bmatrix} = \begin{bmatrix} d & \varepsilon \\ 1/Y_c & -d \end{bmatrix} \begin{bmatrix} \sigma \\ E \end{bmatrix}$$

where, *D* is the electrical displacement, δ is the strain, *d* is the piezoelectric constant, ε is the dielectric constant, σ is the stress, and *Yc* is the Young's modulus. The open circuit voltage can be derived from the electric displacement tem in (5) as following.

$$v_{oc} = \frac{d\sigma g}{\varepsilon}$$

where, σxx is stress in x direction. Therefore, this configuration also has an advance in forward bias of rectifying diodes circuit because the generated open circuit voltage (*VOC*) is strongly affected by gap of electrodes (*g*) and piezoelectric coefficient (*d*). Furthermore, the piezoelectric constant in d33 mode is two or three times larger than d31 mode and electrode gap can be easily defined while the increasing of thickness of PZT thin film has limitations due to fabrication process.

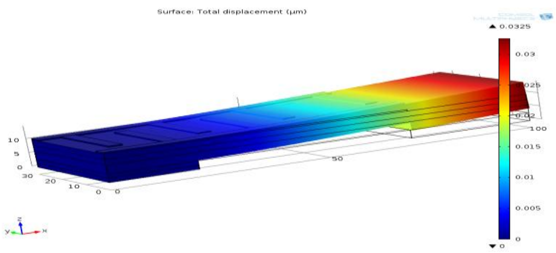

Fig. 4 Simulation of Displacement in Comsol Software

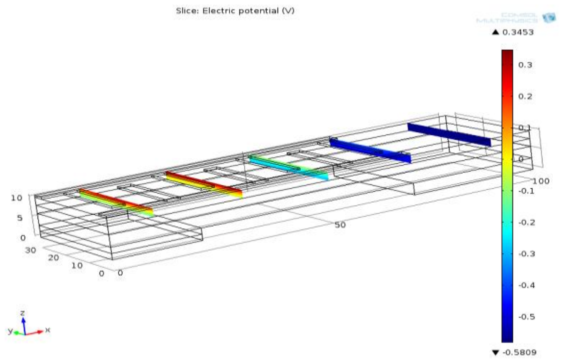

Fig. 5 Simulation of Voltage in Comsol Software

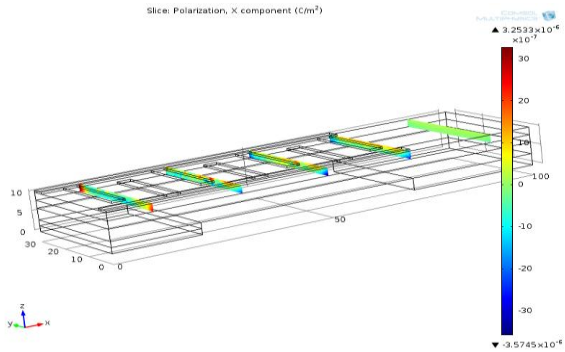

Fig. 6 Simulation of Polarization in Comsol Software

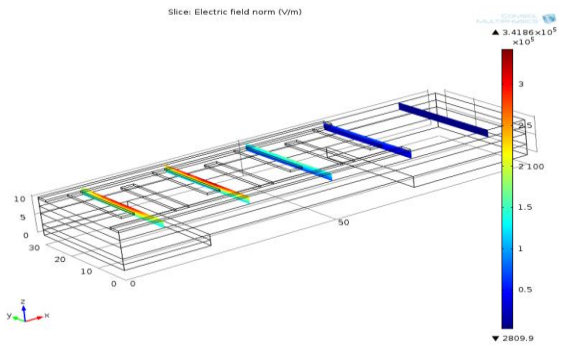

Fig. 7 Simulation of Electric Fieldin Comsol Software

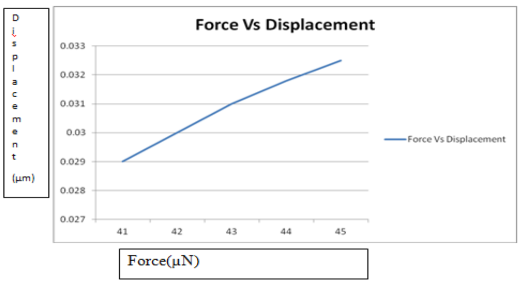

Fig. 8 Graph between force and displacement

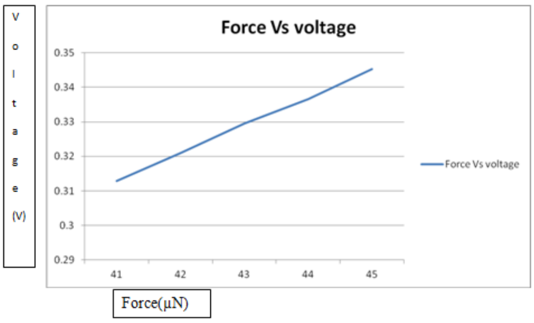

Fig. 9 Graph between force and voltage

III. CONCLUSION

This paper presented a piezoelectric MEMS energy harvester which was targeted to scavenge low-level ambient vibration energy. It was optimally designed with multi-layered cantilever structure with Si proof mass for adjusting resonant frequency and reducing spring constant. In order to achieve large output voltage, the inter-digital shaped electrodes were applied for d33 mode operation. The d33 piezoelectric mode has several advantages such as constant stress-strain distribution between electrodes and larger piezoelectric constant than conventional d31 mode.

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PS2 Controller IP Core For On Chip Embedded System Applications

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ABSTRACT

In many case on chip systems are used to reduce the development cycles. Mostly IP (Intellectual property) cores are used for system development. In this paper, the IP core is designed with ALTERA NIOSII soft-core processors as the core and Cyclone III FPGA series as the digital platform, the SOPC technology is used to make the I/O interface controller soft-core such as microprocessors and PS2 keyboard on a chip of FPGA. NIOSII IDE is used to accomplish the software testing of system and the hardware test is completed by ALTERA Cyclone III EP3C16F484C6 FPGA chip experimental platform. The result shows that the functions of this IP core are correct, furthermore it can be reused conveniently in the SOPC system.

KEYWORDS*: Intellectual property,*

I. INTRODUCTION

An intellectual property or an IP core is a predesigned module that can be used in other designs IP cores are to hardware design what libraries are to computer programming. An IP (intellectual property) core is a block of logic or data that is used in making a field programmable gate array (FPGA) or application-specific integrated circuit (ASIC) for a product. As essential elements of design reuse , IP cores are part of the growing electronic design automation (EDA) industry trend towards repeated use of previously designed components. Ideally, an IP core should be entirely portable - that is, able to easily be inserted into any vendor technology or design methodology. Universal Asynchronous Receiver/Transmitter (UART s), central processing units (CPU s), Ethernet controllers, and PCI interfaces are all examples of IP cores. IP cores may be licensed to another party or can be owned and used by a single party alone. The term is derived from the licensing of the patent and source code copyright intellectual property rights that subsist in the desig IP cores can be used as building blocks within ASIC chip designs or FPGA logic designs It IP cores in the electronic design industry have had a profound impact on the design of systems on a chip. By licensing a design multiple times, IP core licensor spread the cost of development among multiple chip makers. IP cores for standard processors, interfaces, and internal functions have enabled chip makers to put more of their resources into developing the differentiating features of their chips. As a result, chip makers have developed innovations more quickly.

II. IP CORES:

IP cores fall into one of three categories: hard cores , firm cores , or soft cores . Hard cores are physical manifestations of the IP design. These are best for plug-and-play applications, and are less portable and flexible than the other two types of cores. Like the hard cores, firm (sometimes called semi-hard) cores also carry placement data but are configurable to various applications. The most flexible of the three, soft cores exist either as a netlist (a list of the logic gate s and associated interconnections making up an integrated circuit) or hardware description language (HDL) code. The IP core can be described as being for chip design what a library is for computer programming or a discrete integrated circuit component is for printed circuit board design.The IP core can be described as being for chip design what a library is for computer programming or a discrete integrated circuit component is for printed circuit board design.

A. SOFT CORES:

IP cores are typically offered as synthesizable RTL. Synthesizable cores are delivered in a hardware description language such as Verilog or VERILOG. These are analogous to high level languages such as C in the field of computer programming. IP cores delivered to chip makers as RTL permit chip designers to modify designs (at the functional level), though many IP vendors offer no warranty or support for modified designs.

IP cores are also sometimes offered as generic gate-level net lists. The net list is a boolean-algebra representation of the IP's logical function implemented as generic gates or process specific standard cells. An IP core implemented as generic gates is portable to any process technology. A gate-level net list is analogous to an assembly-code listing in the field of computer programming. A net list gives the IP core vendor reasonable protection against reverse engineering.

Both net list and synthesizable cores are called "soft cores", as both allow a synthesis, placement and route (SPR) design flow.

B. HARD CORES: Hard cores, by the nature of their low-level representation, offer better predictability of chip performance in terms of timing performance and area.Analog and mixed-signal logic are generally defined as a lower-level, physical description. Hence, analog IP (SerDes, PLLs, DAC, ADC, etc.) are provided to chip makers in transistor-layout format (such as GDSII.) Digital IP cores are sometimes offered in layout format, as well.Such cores, whether analog or digital, are called "hard cores" (or hard macros), because the core's application function cannot be meaningfully modified by chip designers. Transistor layouts must obey the target foundry's process design rules, and hence, hard cores delivered for one foundry's process cannot be easily ported to a different process or foundry. Merchant foundry operators (such as IBM,Fujitsu, Samsung, TI, etc.) offer a variety of hard-macro IP functions built for their own foundry process, helping to ensure customer lock-in.

III. ALTERAS HW/SW DESIGN FLOW:

Generally the design flow starts in the Quartus II software by making a new project, subsequently, from the Quartus II the SOPC Builder tool can be accessed.In SOPC Builder the system is put together with ready intellectual property (IP)cores and/or user made IP cores. After the system is generated by the SOPC Builder tool, once again, the Quartus II software is used to add additional block s to the system, if needed. Before the system is synthesized pin assignment is made (this is also done in the Quartus II software). After synthesis and fitter operation, the Quarus II Programmer tool is used to configure the FPGA device. For software development the Nios II IDE is employed. When software debugging the GNUPro tools are used, these tools are integrated in the Nios II IDE. If real-time systemlevel debugging is required, a tool named SignalTap II logic analyzer can be utilized, thistool can be accessed from the Quartus II.

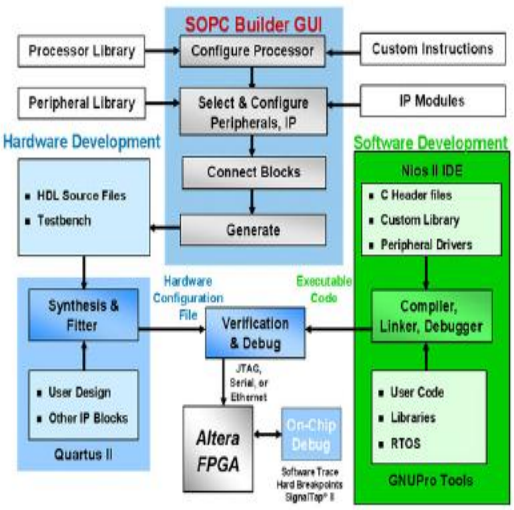

Fig 1 Software Architecture

IV. SYSTEM GENERATION IN SOPC BUILDER

In the project Altera´s Nios II CPU is used. Nios II is a 32-bit embedded-processor architecture designed specifically for the Altera family of FPGAs. Nios II incorporates many enhancements over the original Nios architecture, making it more suitable for a wider range of embedded computing applications, from DSP to system-control.Nios II is comparable to MicroBlaze, a competing softcore CPU for the Xilinx family of FPGA. Unlike Microblaze, Nios II is licensable for standard-cell ASICs through a third-party IP provider, Synopsys Designware. Through the Designware license, designers can port Nios-based designs from an FPGA-platform to a mass production ASIC-device.Nios II is a successor to Altera's first configurable 16-bit embedded processor Nios.The Nios II processor family consists of three cores–fast (Nios II/f), economy (Nios II/e), and standard (Nios II/s) cores – each optimized for a specific price and performance range. All three cores feature a general-purpose RISC CPU architecture and share a common 32-bit instruction set architecture.

For optimizing the miniming logic usage we are using Nios II/e.It uses 600-700 logical elements and two M4ks. After instancing the CPU we are going to instance the on-chip RAM and the JATG UART. The settings of on-chip RAM can be carried out by 32 bits memory width and total size of 20kByte . The on-chip RAM is built up of M4k memory blocks. The JATG UART Read/Write FIFO is set to be constructed of registers instead of M4ks, this option is set to save M4ks, a other method to save M4k memory blocks is to reduce the Read/Write FIFO.

V. ONCHIP EMBEDDED SYSTEM

This chapter discusses how HW/SW embedded systems are built of reusable building blocks or intellectual property (IP) within Alteras design environment. In addition software development, performance measurements and debugging is described and illustrated. The chapter starts by describing how a simple basic embedded system, consisting of a CPU, Onchip RAM and a UART, is developed. In order to utilize the systems correct function a simple application is written and ran. In Section 3.2. debugging support is added to the platform and its functions are explained. Section 3.3. describes how a high resolution timer is integrated into the system and how it is configured, with the purpose of measuring and analyzing software performance.

There is also a description on how the timer is used in applications, to measure the duration of several executions. In section 3.4. the system is extended by adding PIOs (Paralell Input Output), which in this case are used to control four LEDs with a push-button. Section 3.5. shows how the performance in the system can be enhanced, by migrating software functions to hardware. In section 3.6. the platform is further extended by integrating a RTOS kernel. The section illustrates and describes how the RTOS kernel is integrated into the system, both in HW and SW, and how it can be used in application development. In this section an external SRAM is integrated in the system.

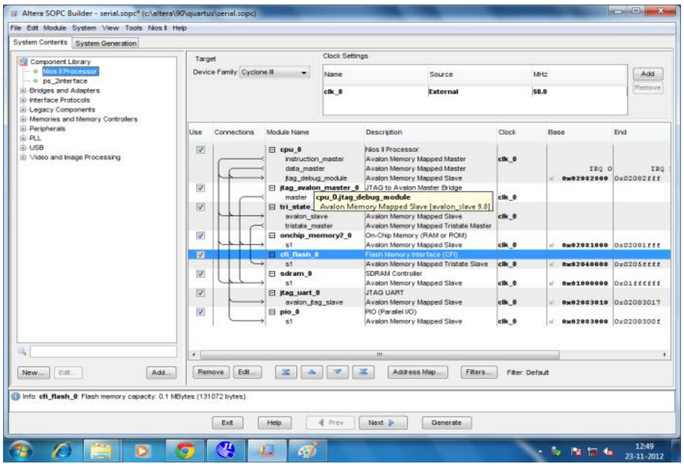

Fig 2 System development**:**

The section describes how the interface to the of-chip SRAM is connected to the Avalon data bus. Subsequently a application that verifies the external SRAM is developed.

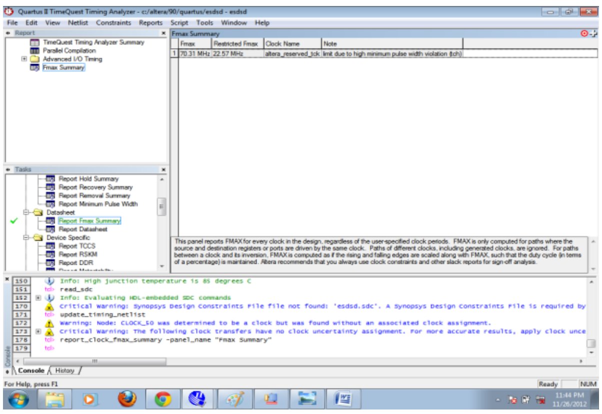

Fig 3 Performance report

V. CONCLUSION

The capabilities of FPGAs have increased to the level where it is possible to implement a complete computer system on a single FPGA chip. The main component in such a system is a soft-core processor. The Nios soft-core processor is intended for implementation in Altera FPGAs. In this thesis project a Verilog implementation of the Nios architecture has been developed, called Nios. Performance of Nios has been investigated and compared to that of the Altera Nios. Performance analysis has shown that, although the Altera and Nios implementations are quite different, their performance is similar. Design analysis has shown that although there is little room for improvement in the current Nios organization, there is a lot of room for experimenting with different processor organizations and architectural parameters.

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Medical Diagnosis by Using Relation Extraction

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ABSTRACT

The healthcare information system extracts the sentences from published medical papers that mention group of diseases and treatments, and identifies semantic relations that exist between diseases and treatments.The extracted information is less accurate. My proposed methodology obtains reliable outcomes that could be integrated in an application to be used in the medical care main. The potential value of my paper stands in the ML settings that I propose and in the fact that would outperform previous results on the same data set. The same data set to provide the fact.

INDEX TERMS: *Healthcare, machine learning, natural language processing*

I. INTRODUCTION

Datamining is the process of analyzing the data from different perspectives and summarizing it into useful information.The main aim of the project is Kernel-Based Learning for Biomedical Relation Extraction for helping health care and clinical data repositories. The designing and representation techniques in combination with various learning methods to identify and extract biomedical relations. Electronic Health Records (hereafter,EHR) are becoming the standard in the healthcare domain.Researches and studies show that the potential benefits of having an EHR system are

Health information recording and clinical data repositories : immediate access to patient diagnoses, allergies,and lab test results that enable better and time-efficient medical decisions;

Decision support: the ability to capture and use quality medical data for decisions in the workflow of healthcare.

Obtain treatments that are tailored to specific health needs: rapid access to information.In order to embrace the views that the EHR system has,we need better, faster, and more reliable access to information. Medline(medical literature analysis and retrieval system online) a database of extensive life science published articles. identifying sentences published in medical abstracts (Medline) as containing or not information about diseases and treatments, and automatically identifying semantic relations that exist between diseases and treatments, as expressed in texts. The second task is focused on three semanticrelations: Cure, Prevent, and Side Effect.Our objective for this work is to show what Natural Language Processing (NLP) and Machine Learning (ML)techniques—what representation of information and what classification algorithms—are suitable to use for identifying and classifying relevant medical information in short texts.We acknowledge the fact that tools capable of identifying reliable information in the medical as stand as building blocks for a healthcare system that is up-to-date with the latest discoveries.

II. RELATED WORK

Prior work is based on entity recognition for diseases and treatments. The data set consists of sentences from Medline abstracts annotated with disease and treatment entities and with eight semantic relations between diseases and treatments. prior representation techniques are based on words in context, part of speech information, phrases, and a medical lexical ontology—Mesh6 terms. Compared to this work, my work is focused on different representation techniques,different classification models, and most importantly generates improved results with less annotated data.The task addressed is information extraction and relation extraction.Information extraction is the process of extracting the information from the database..Relation extraction is the process of detecting and classifying semantic relations by given text. Various learning algorithms have been used for the statistical learning approach with kernel based learning is the popular ones applied to Medline abstracts.

III. THE PROPOSED APPROACH

The two tasks that are undertaken in this paper provide the basis for the design of an information technology framework that is capable to identify and disseminate healthcare information. The first task identifies and extracts informative sentences on diseases and treatments while the second one performs a finer grained classification of these sentences according to the semantic relations that exists between diseases and treatments.The first task (task 1 or sentence selection) identifies sentences from Medline published abstracts that talk about diseases and treatments. The second task (task 2 or relation identification) has a deeper semantic dimension and it is focused on identifying disease-treatment relations in the sentences already selected as being informative (e.g., task 1 is applied first). We focus on three relations: Cure, Prevent, and Side Effect, a subset of the eight relations that the corpus is annotated with. Decided to focus on these three relations because these are most represented in the corpus. Table 1 presents the original dataset. The numbers in parentheses represent the training and test set size. For example, for Cure relation, out of 810 sentences present in the data set, 648 are used for training and 162 for testing. The data sets contain sentences that are annotated with the appropriate information. the annotations of the data set are used to create a different task (task 1). It identifies informative sentences that contain information about diseases and treatments and semantic relations between them, versus non informative sentences. This allows us to see how well NLP and ML techniques can cope with the task of identifying informative sentences, or in other words, how well they can weed out sentences that are not relevant to medical diseases and treatments.

Relationship	Definition and Example
Cure 810 (648, 162)	TREAT cures DIS *Intravenous immune globulin for recurrent spontaneous abortion*
Only DIS 616 (492, 124)	TREAT not mentioned *Social ties and susceptibility to the common cold*
Only TREAT 166 (132, 34)	DIS not mentioned *Flucticasome propionate is safe in recommended doses*
Prevent 63 (50, 13)	TREAT prevents the DIS *Statins for prevention of stroke*
Vague 36 (28, 8)	Very unclear relationship *Phenylbutazone and leukemia*
Side Effect 29 (24, 5)	DIS is a result of a TREAT *Malignant mesodermal mixed tumor of the uterus following irradiation*
NO Cure 4 (3, 1)	TREAT does not cure DIS *Evidence for double resistance to permethrin and malathion in head lice*
Total relevant: 1724 (1377, 347)	
Irrelevant 1771 (1416, 355)	Treat and DIS not present *Patients were followed up for 6 months*
Total: 3495 (2793, 702)	

TABLE 1 Dataset description

The approach used to solve the two proposed tasks is based on NLP and ML techniques. In a standard supervised ML setting, a training set and a test set are required. The training set is used to train the ML algorithm and the test set to test its performance. The objectives are to build models that can later be deployed on other test sets with high performance. The task of identifying the three semantic relations is addressed in two ways:

Setting 1. Three models are built. Each model is focused on one relation and can distinguish sentences that contain the relation from sentences that do not. This setting is similar to a two-class classification task in which instances are labeled either with the relation in question (Positive label) or with non relevant information (Negative label);

Setting 2. One model is built, to distinguish the three relations in a three-class classification task where each sentence is labeled with one of the semantic relations.

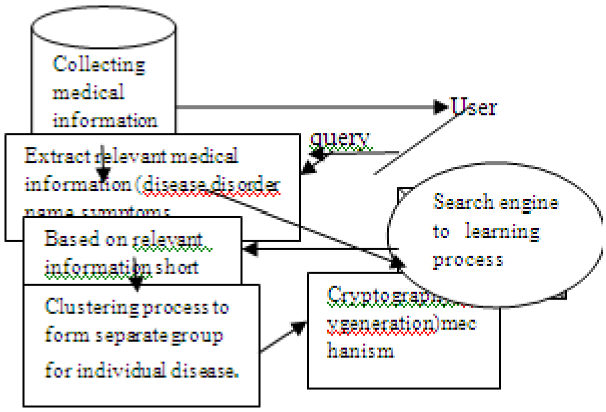
	Informative sentences	Non-informative sentences
Training set	1225	1176
Test set	612	591

TABLE 2 Data Sets Used for the First Task

	Training		Test	
	Positive	Negative	Positive	Negative
Cure	554	531	276	266
Prevent	42	531	21	266
SideEffect	20	531	10	266

TABLE 3 Data Sets Used for the Second Task.
As a result of task2 only informative
sentences are classified into the three semantic relations.

IV. SYSTEM ARCITECTURE



The Medical care related information to collect (e.g., published articles, clinical trials, news, etc.) is a source of power for both healthcare providers and laypeople. The relevant information extracted, which the information is Disease name, disorder name, and symptoms. To identify sentences from Medline published abstracts that talk about diseases and treatments. We are introducing new techniques for learning approach. The task is similar to a scan of sentences contained in the abstract of an article in order to present to the user-only sentences that are identified as containing relevant information. (For example: disease and treatment information). Semantic model is used to identify the semantic dimension and it is focused on identifying disease-treatment relations in the sentences already selected as being informative (e.g., task 1 is applied first). We focus on three relations: Cure medicine, Prevent medicine, and Side Effect medicine, a subset of the eight relations that the corpus is annotated with.

The people are searching the web and read medical related information in order to be informed about their health.according to user query search engine searches the data and extract relevant information from the database.Search engine mine the data available from the database and return that information to user. classification algorithms are suitable to use for identifying and classifying relevant medical information in short texts. k means clustering is machine learning algorithm used to cluster the observations into groups of related observations without prior knowledge. Support vector machine algoritm used to classify the text into some predefined categories. Advanced encryption standard algorithm(AES) used to generate the random key for the user.In AES algorithm encryption and decryption uses the same key.authentication algorithm provide random key for each user that secure the data for each individual user through that the treatment should not be changed to anyother user. The biomedical system in the architecture used to form the short text for each individual records.If any user enter the query,searches the relevant information according to the query.this relevant information is applied to the biomedical system to form the short text,based on that information search enginedisplays the result to the user.

V. DATA REPRESENTATIONS

The models should be reliable at identifying informative sentences and discriminating disease-treatment semantic relations. The research experiments need to be guided such that high performance is obtained.

5.1 Bag-of-Words Representation

The bag-of-words (BOW) representation is commonly used for text classification tasks. It is a representation in which features are chosen among the words that are present in the training data. Selection techniques are used in order to identify the most suitable words as features.Feature space is identified, each training and test instance is mapped to this feature representation by giving values to each feature for a certain instance. Two most common feature value representations for BOW representation are: binary feature values—the value of a feature can be either 0 or 1, where 1 represents the fact that the feature is present in the instance and 0 otherwise; or frequency feature values—the value of the feature is the number of times it appears in an instance, or 0 if it did not appear.

5.2 NLP and Biomedical Concepts Representation

The second type of representation is based on syntactic information: noun-phrases, verb-phrases, and biomedical concepts identified in the sentences. In order to extract this type of information. The following preprocessing steps are applied in order to identify the final set of features to be used for classification.removing features that contain only punctuation, removing stop words (using the same list of words as for our BOW representation), and considering valid features only the lemma-based forms. We chose to use lemmas because there are a lot of inflected forms (e.g., plural forms) for the same word and the lemmatized form (the base form of a word)will give us the same base form for all of them. Another reason is to reduce the data sparseness problem. Dealing with short texts, very few features are represented in each instance; using lemma forms alleviates this problem. Experiments are performed when using as features only the final set of identified noun-phrases, only verb-phrases, only biomedical entities, and with combinations of all these features. When combining the features, the feature vector for each instance is a concatenation of all features.

5.3 Medical Concepts (UMLS) Representation

The Unified Medical Language system12 (hereafter, UMLS) concept representations. UMLS is a knowledge source developed at the US National Library of Medicine (hereafter, NLM) and it contains a metathesaurus, a semantic network, and the specialist lexicon for biomedical domain. The metathesaurus is organized around concepts and meanings; it links alternative names and views of the same concept and identifies useful relationships between different concepts. UMLS contains over 1 million medical concepts, and over 5 million concept names which are hierarchical organized.All concepts are assigned at least one semantic type from the semantic network providing a generalization of the existing relations between concepts. There are 135 semantic types the knowledge base that are linked through 54 relationships.

5.4.Evaluation Measures

The most common used evaluation measures in the ML settings are: accuracy, precision, recall, and F-measure. The formulas for the evaluation measures are: Accuracy =the total number of correctly classified instances; Recall = the ratio of correctly classified positive instances to the total number of positives. This evaluation measure is known to the medical research community as sensitivity. Precision = the ratio of correctly classified positive instances to the total number of classified as positive. F-measure = the harmonic mean between precision
and recall.

VI. CONCLUSION

This paper provides the framework for ML,NLP techniques to classify the text. In NLP and ML community, BOW is a representation technique that even though it is simplistic, most of the times it is really hard to outperform. we outperform it when we combine it with more structured information such as medical and biomedical concepts. the simple BOW approach, well known to give reliable results on text classification tasks, can be significantly outperformed when adding more complex and structured information from various ontologies.

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Modelling of Automated Controllable Network Transformer

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ABSTRACT:
Controllable Network Transformer (CNT) is considered as an important component in the AC links. It has flexibility of matching two networks of different voltage levels with subsequent power flow control. This work highlights the use of controllable network transformers along with simulation. The work further analysed CNT by automating its response to system voltage variation. The automation is successfully done using MATLAB simulation package. The output obtained proves beyond doubt the capability and indispensable nature of CNT in future trend of the network links.

KEYWORDS: *AC chopper, CNT, LTC, pulse width, tap.*

I. INTRODUCTION

Off-line optimal power flow and state estimation techniques are the conventional approaches used in the network operation. The dual constraints of the optimal power flow problem are the branch currents and the bus voltages. The output of the optimal power flow algorithm is used to set the operating points of various generators, shunt VAR compensation and Load Tap-Changing settings. In a highly interconnected meshed network, this represents a very challenging control problem. FACTS devices such as UPFC and SSSC provide control of both voltage magnitudes at a node, as well as phase angle. The angle control is instrumental in controlling branch currents. Shunt devices such as SVC's and STATCOM's provide the VAR regulation required to maintain the bus voltage levels in the network within acceptable range. Phase angle regulators provide power flow control. Its disadvantages are slow response and inability to control bus voltages. The Intelligent Universal Transformer [3] provides only unidirectional control of power flow and it is expensive. Power Electronics Transformer [4] has a high switch count and cost due to the high frequency transformer. The Sen Transformer [5] provides a solution for power flow control. Here, the interconnection between phases creates complex fault modes and high switch count is a limitation.

Controllable Network Transformer (CNT) is realised by augmentation of an existing load tap-changing (LTC) transformer with a small fractionally rated direct bidirectional ac chopper. CNT provides dynamic control of voltage magnitude and phase angle simultaneously over a meaningful control range. Also, CNT provides control of bus voltages and line currents in a meshed system which cannot be accomplished using conventional techniques. In this paper, modelling and automation of CNT is carried out using MATLAB.

II. POWER FLOW STUDY

Power flow studies, commonly known as load flow study, form an important part of power system analysis. They are necessary for planning, economic scheduling, and control of an existing system as well as planning its future expansion. The problem consists of determining the magnitudes and phase angle of voltages at each and active and reactive power flow in each line. In solving a power flow problem, the system is assumed to be operating under balanced conditions and a single-phase model is used.In order to make the load flow study as a simulation, representations are required for various components involved. The type of bus and the impedence connecting them forms the foremost requirement for any power system model. The general classifications of buses used in the system are as follows.

2.1.Bus Classification

A bus is a node at which one or many lines, one or many loads and generators are connected. In a power system each node or bus is associated with four quantities, such as magnitude of voltage $|V|$, phase angle of voltageδ, active or true power P and reactive power Q. In load flow problem, two out of these four quantities are specified and remaining two quantities are required to be determined through the solution of equation. Depending on the quantities that have been specified, the buses are classified into three categories. For load flow studies it is assumed that the loads are constant and they are defined by their real and reactive power consumption. The main objective of the load flow is to find the voltage magnitude of each bus and its angle when the powers generated and loads are pre-specified.

2.2.Load buses. In these buses no generators are connected and hence the generated real power $P_{gi}$and reactive power $Q_{gi}$are taken as zero. The load drawn by these buses are defined by real power $-P_{li}$and reactive power $-Q_{li}$in which the negative sign accommodates for the power flowing out of the bus. This is why these buses are sometimes referred to as P-Q bus. The objective of the load flow is to find the bus voltage magnitude $|V_i|$ and its angle δi.

2.3.Voltage controlled buses. These are the buses where generators are connected. Therefore the power generation in such buses is controlled through a prime mover while the terminal voltage is controlled through the generator excitation. Keeping the input power constant through turbine-governor control and keeping the bus voltage constant using automatic voltage regulator, we can specify constant $P_{gi}$and $|V_i|$for these buses.

2.4.Slack or swing bus. Usually this bus is numbered 1 for the load flow studies. This bus sets the angular reference for all the other buses. Since it is the angle difference between two voltage sources that dictates the real and reactive power flow between them, the particular angle of the slack bus is not important. However it sets the reference against which angles of all the other bus voltages are measured. For this reason the angle of this bus is usually chosen as 0°. Furthermore it is assumed that the magnitude of the voltage of this bus is known.Using the bus voltage level and the admittance connecting them, power flow equations can be obtained. The solution of the equation is required for predicting power flow along various lines in the system. The typical power flow equation is discussed as follows.

2.5.Power flow equation: Consider a typical bus of a power system network as shown in the Figure 2.1. Transmission lines are represented by their equivalent π models where impedences have been converted to per unit admittances on a common MVA base.

Application of Kirchoff's Current Law to this bus results in:

$$I_i = y_{i0}V_i + y_{i1}(V_i - V_1) + y_{i2}(V_i - V_2) + \ldots\ldots + y_{in}(V_i - V_n)$$
$$= (y_{i0} + y_{i1} + y_{i2} + \ldots + y_{in})V_i - y_{i1}V_1 - y_{i2}V_2 - \ldots\ldots - y_{in}V_n \quad (2.1)$$

The real power(P) and reactive power(Q) at bus 'i' is given by:

$$P_i + jQ = V_iI_i^* \quad (2.2)$$

From the above relation, the mathematical forrmulation of the power flow problem results in a system of algebraic nonlinear equations which must be solved by iterative techniques.

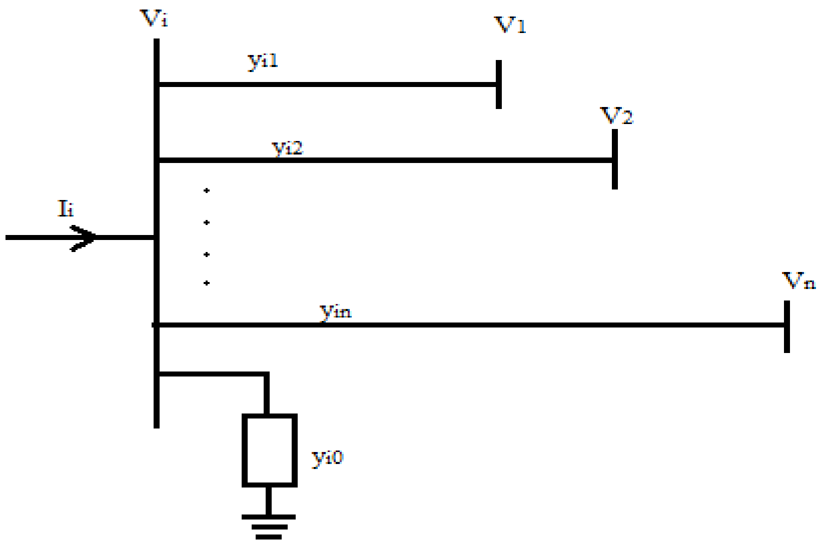

Figure 2.1 **A typical bus of the power system.**

Once the power flow across the system is determined, the adjustment at various levels can be obtained usually by voltage variations. Hence the tap changing transformer forms an integral and important part of the power system.

2.6.Tap changing transformers

Voltage variation in power systems is a normal phenomenon owing to the rapid growth of industries and distribution network. System voltage control is therefore essential for:

[1] Adjustment of consumers' terminal voltage within prescribed limits.
[2] Control of real and reactive power flow in the network.
[3] Periodical adjustment (1-10%) to check off-set load variations.

Adjustment is normally carried out by off-circuit tap changing, the common range being 5% in 2.5% steps. Daily and short-time control or adjustment is carried out by means of on-load tap changing gear. Besides the above, tapping are also provided for one of the following purposes:

[1] For varying the secondary voltage
[2] For maintaining the secondary voltage constant with a varying primary voltage.
[3] For providing an auxiliary secondary voltage for a special purpose, such as lighting.
[4] For providing a low voltage for starting rotating machines.
[5] For providing a neutral point,e.g. for earthing.

There are two types of tap-changing

[1] Off-load tap changing.
[2] On-load tap changing.

Off load tap changing transformer requires shut down of power for a while. Hence, on load tap changers are highly preferable in spite of disadvantages like losses etc.

2.7.Controllable network transformers

As an improvement, existing Load Tap Changing (LTC) transformer is augmented by a direct bidirectional AC chopper to give Controllable Network Transformer (CNT). The chopper consists of four IGBT/diode forming two ac switches (S1 and S2).The upper two IGBT/diode form S1and the lower two IGBT/diode form S2. A small capacitor, $C_f$and an inductor,$L_f$act as filters. A simple circuit of CNT is shown in the Figure 3.1.The two switches are operated by means of a pulse generator with fixed duty cycles. The switch S1 is operated at duty cycle D and the switch S2 at 1-D. When the switch S1 is ON, the turns ratio of the transformer is 1:(1+n), while when the switch S2 is ON, it becomes 1:(1-n). By applying fixed duty cycle D, it ispossible to control the output voltage magnitude between 1/1+nand 1/1−nper unit, where n is the tap ratio.

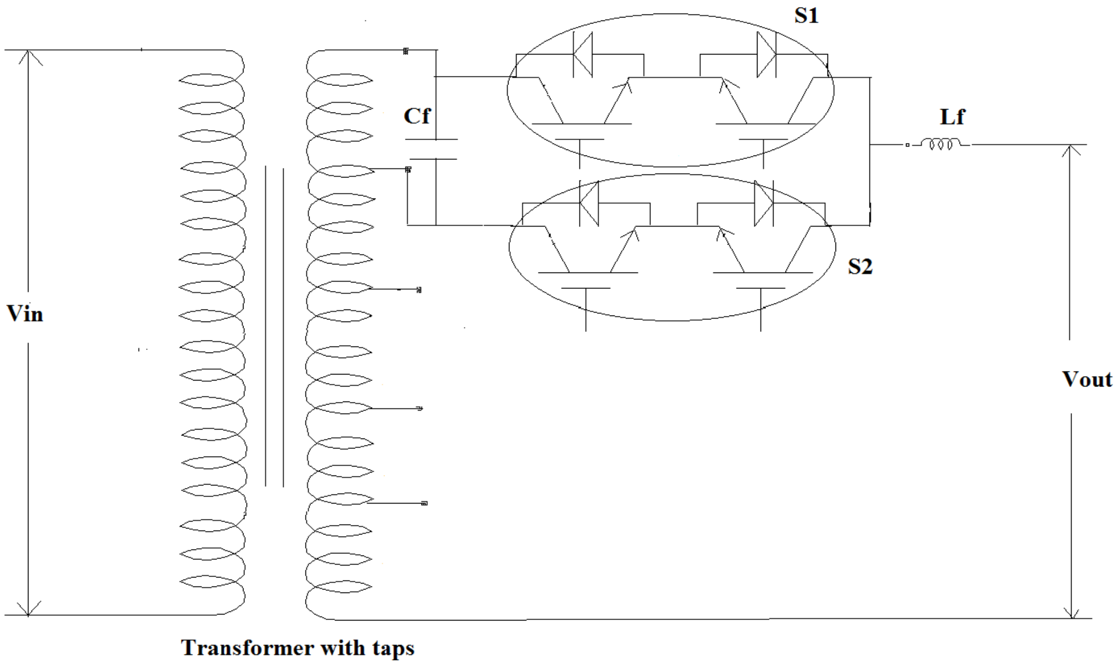

Figure 3.1**Controllable network transformer.**

If a small change in voltage level is needed, then the firing of IGBT is adjusted. If a major change in voltage level is required, then the tapings are changed according to the requirement.

IV. MODELLING AND AUTOMATION OF CNT

The modelling and simulation of CNT is done using circuit given in the Figure 4.1. The operating model of CNT is given by the block diagram as shown in the Figure 4.2.The block diagram consists of AC voltage source, multiwinding transformer, automatic tap selector subsystem, programmable pulse generator subsystem, multiport switches, AC chopper, and a resistive load.

4.1. Functions of CNT blocks

4.1.1 AC source. The input voltage to the multiwinding transformer is given by the AC voltage source.
4.1.2 Multiwinding Transformer. It is a transformer with multiple windings. The number of windings can be specified for the left side and for the right side of the block. Taps can be added to the upper left winding or to the upper right winding.

4.1.3 Multiport Switch. Multiport switch pass through the input signals corresponding to the truncated values of the first input. The inputs are numbered top to bottom. The first input port is the control port. The other input ports are data ports.

4.1.5 AC chopper. AC chopper converts the fixed alternating voltage to the variable alternating voltage.
4.1.6 Automatic tap and pulse width selector subsystem. The automatic tap selector subsystem provides information to choose the appropriate tap number for the voltage given at the subsystem input port.
4.1.7 Programmable pulse generator subsystem. This subsystem generates the triggering pulses applied to the gate of the IGBT switches of the AC chopper.

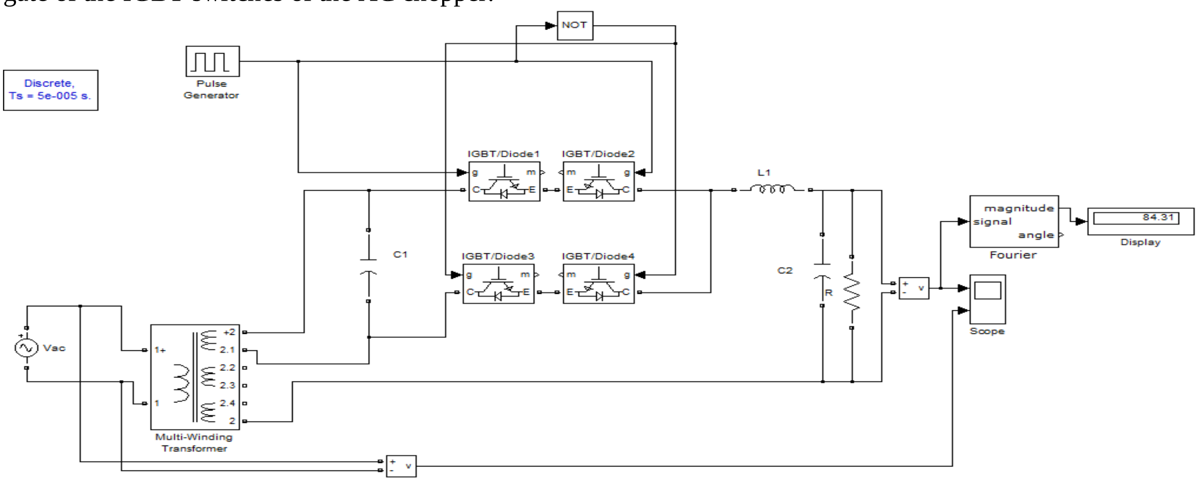

Figure 4.1 **Simulation model of CNT.**

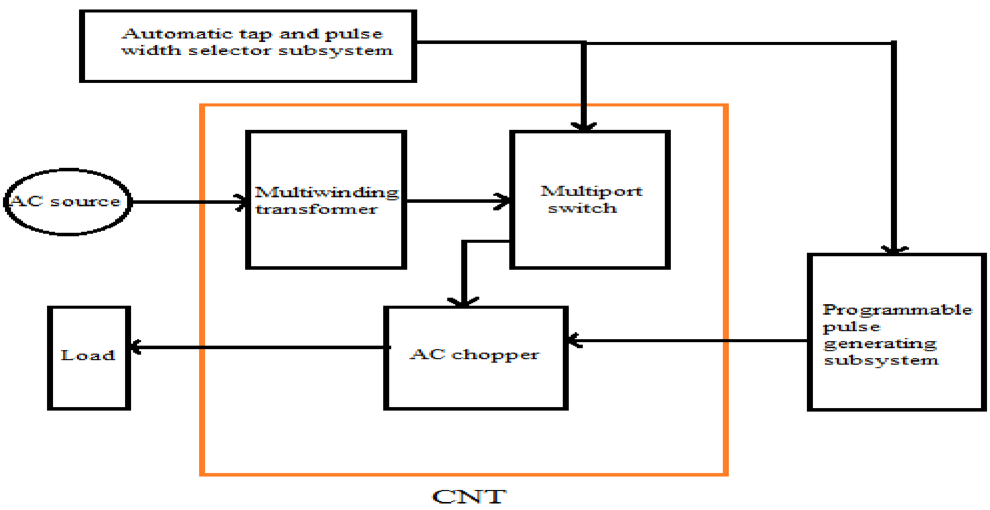

Figure 4.2 **Block diagram of the CNT model**

4.2. Operation of CNT

A model of CNT is simulated with a multiwinding transformer of rating 230/100V with five tapping on secondary. At first, the chopper is connected between the uppermost tap and the next tap as shown in the Figure 4.1.This arrangement makes the chopper to be connected between 100 and 80 volts. The IGBT switches of the chopper are triggered using pulse generator. The upper two IGBTs of the chopper are given duty cycle D and the lower two IGBTs are given duty cycle 1-D. By varying the pulse width applied to the gates of the IGBT switches, the voltage at the output of the chopper can be varied between 100 and 80 volts. Simulation of the CNT model is carried out for different pulse width and the corresponding voltage at the output are taken.

Next, the chopper is connected between 80 and 60 volts and simulated for different pulse width. The corresponding output voltages are noted. Then, the chopper is connected between 60 and 40 volts. Finally, the chopper is connected between 40 and 20 volts. The model is simulated for various values of pulse width and the corresponding output voltages are taken and tabulated as shown in the Table 4.1. The various elements and operation are discussed as follows.

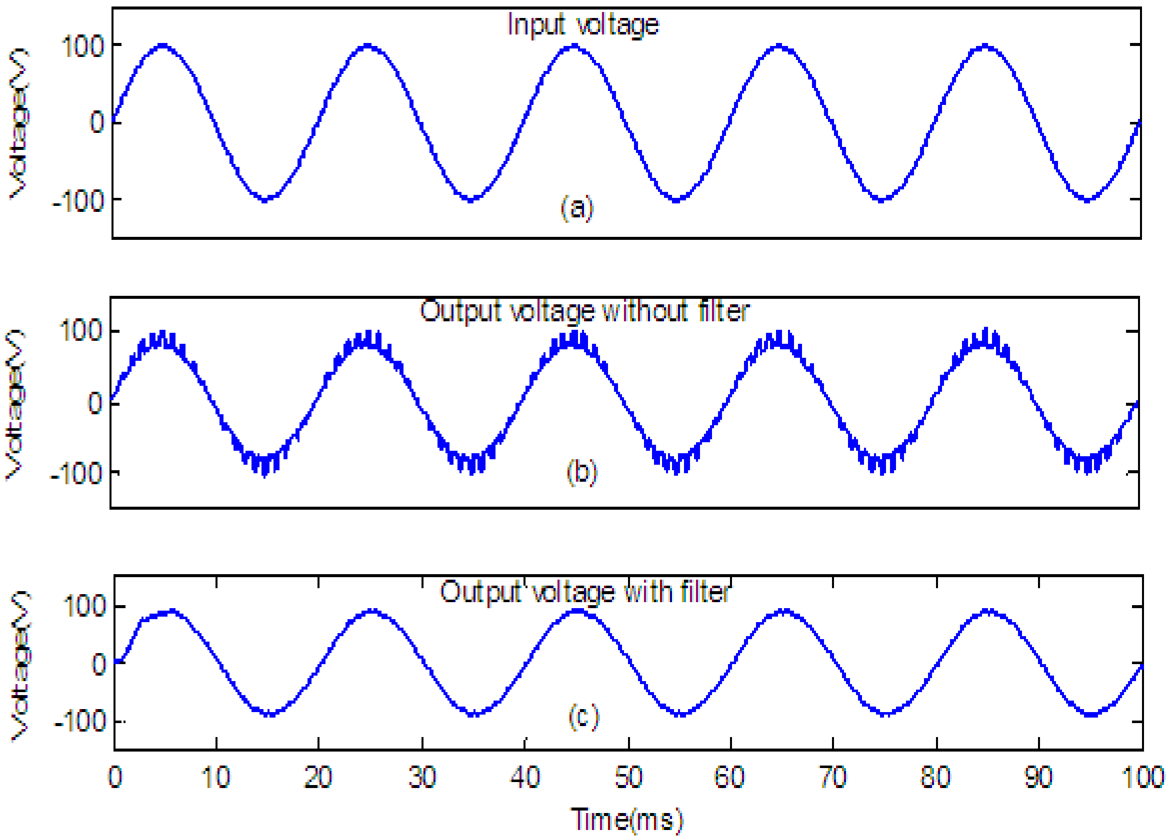

Figure 4.3. **Waveforms of AC chopper. (a) input voltage, (b)output voltage without filter, (c)output voltage with filter.**

4.2.1. AC chopper. AC chopper is a type of AC-AC Converter. The input voltage is chopped into segments and the output voltage level is decided by controlling the duty cycle of the chopper switches. The mean output voltage over one switching cycle is proportional to the duty cycle in that period. If V_{in} is the input voltage and V_{out} is the output voltage, they are related by the formula as follows: $V_{out} = \alpha.V_{in}$, where α is the duty cycle.

The waveforms of input voltage, output voltage without filter, output voltage with filter for thirty percentage of the duty cycle when the chopper is connected between 100 and 80 volts is shown in the Figure 4.3.

4.2.2. Automatic Tap and Pulse Width selector subsystem. The tap selection and pulse width selection is evaluated priory for various voltage levels and tabulated as given in the Table 4.1. The table is used for the simulation in the MATLAB. When an input of required voltage is given, the lookup table, which contains the previously evaluated table will give tap and pulse width with interpolation if required. The Simulation model of this subsystem is shown in the Figure 4.4.

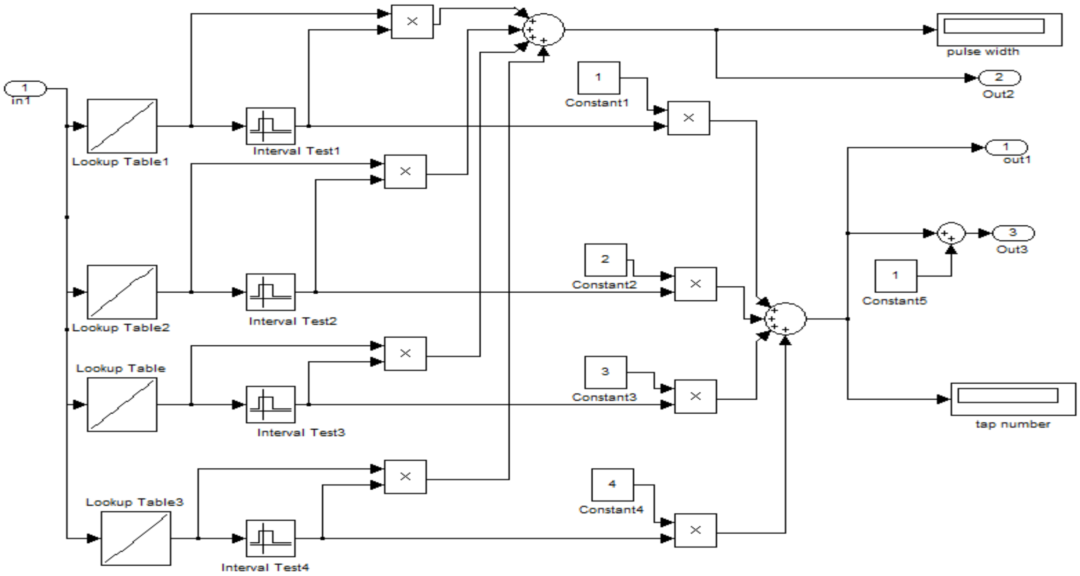

Figure 4.4. **Simulation model of automatic tap and pulse width selector subsystem.**

4.2.3. Programmable Pulse generator subsystem. Programmable pulse generating subsystem will obtain the pulse width output as described in the section 4.2.2 and produces pulse for triggering the corresponding chopper. Thus the integrated system acts as an automated CNT.In order to explain the operation of the automated CNT, an example is given in which the voltage required by the system is 65 volts. This voltage data is fed to the inport of the automatic tap and pulse width selector subsystem. All the four lookup tables in the subsystem get this data at their inputs. The lookup tables contain information of pulse width for the required voltage. After the pulse width information, taps selection is done based on relevant output. Hence, tap positions of number 2 and 3 are selected with pulse width of 20 percentage of the duty cycle. In this way, the chopper outputs the same voltage (65 volts) required by the system.

Table 4.1. **Pulse width vs. voltage magnitude for different taps**.

Pulsewidth (percentage of time period)	**Voltage magnitude**			
	Between taps 2 & 2.1	**Between taps 2.1 & 2.2**	**Between taps 2.2 & 2.3**	**Between taps 2.3 & 2.4**
10	84	63	43	22
20	86	65	45	24
30	88	67	47	27
40	90	69	49	29
50	92	71	51	31
60	94	73	53	33
70	96	75	55	35
80	98	78	57	37
90	100	80	59	39

V. Conclusion

The simulation of Controllable Network Transformer and its automation is successfully done by using the MATLAB simulations.CNT is considered as the important component and has flexibility of matching two networks of different voltage levelsPower flow through the tie-lines connecting two control areas can be controlled by controlling the output voltage magnitude by using CNT. The output proves the capability and indispensable nature of the CNT in the future power grids.

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Construction of Theissen Polygons for Rain Gauge Stations in Anantapuram District

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ABSTRACT

Anantapuram district is one of the drought affected districts in Andhra Pradesh and has semi arid type of climate. The spatial and temporal variability of rainfall in the district is high. It is necessary to adopt a suitable method to evaluate the applicable precipitation for water resources management. Computation of weighted precipitation considering all the influencing rain gauge stations of the catchment area is one of the suitable methods. Theissen polygon method can be used for finding the influencing zones of the rain gauge stations. In the present study an attempt has been made to construct Theissen polygons for all the existing 63 rain gauge stations in Anantapuram district so that the area influenced by each rain gauge station can be determined. It provides facility to estimate the weighted area for the proposals where ever necessary with in Anantapuram district.

KEY WORDS :*Influencing area, Isohyet, Perpendicular bisectors, Precipitation, Rain gauge station, Theisssen polygon and Weighted area.*

I. INTRODUCTION

The definition of precipitation is, any form of water, liquid or solid falling from the sky. It includes rain, sleet, snow, hail and drizzle plus a few less common occurrences such as ice pellets, diamond dust and freezing rain. In cold air way up in the sky, rain clouds will often form. Rising warm air carries water vapor high into the sky where it cools, forming water droplets around tiny bits of dust in the air. Some vapor freezes into tiny ice crystals which attract cooled water drops. The drops freeze to the ice crystals, forming larger crystals we call snowflakes. When the snowflakes become heavy, they fall. When the snowflakes meet warmer air on the way down, they melt into raindrops.Hanefi Bayraktar et.al., used the percentage weighting polygon (PWP) method to estimate average areal rainfall in Southeastern Anatolia Region of Turkey for the first time by considering 10 meteorological stations. In a paper entitled “A comparative analysis of techniques for spatial interpolation of precipitation” by Guillermo Q. Tabios III et.al., various proposed interpolation techniques for estimating annual precipitation at selected sites were compared and It has been concluded that the inverse distance interpolation and the Thiessen polygon gave fairly satisfactory results when compared to the polynomial interpolation technique. Precipitation will be measured at different rain gauge stations by ordinary rain gauges or self recording rain gauges. In order to find the applicable precipitation over an area consisting of more number of rain gauge stations, some methods like arithmetic mean method, Theissen polygon method and Isohyetal methods are available.

1.1 Arithmetic mean method

In this method the rainfall values at different rain gauge stations that are existing in a particular area are to be added and divided by the total number of rain gauge stations to get the average value of rainfall for that particular area.

1.2 Theissen polygon method

An accurate estimation of the spatial distribution of rainfall can be done by using Theissen polygon method which is one of the interpolation methods. This method assigns weight at each gauge station in proportion to the catchment area that is closest to that gauge station.

The polygons can be constructed as follows:

[1] First the rain gauge stations are to be located.
[2] Lines are to be drawn to connect the adjacent stations.
[3] Perpendicular bisectors are to be drawn for all the lines joining the rain gauge stations.

[4] The bisectors are to be extended to form the polygon around each gauge station.

[5] The area of each polygon must be multiplied by the rainfall value of the station that is existing inside the polygon.

The values obtained from step 5 are to be added and divided by total catchment area to get the weighted precipitation.

1.3 Isohyetal method :

An isohyet is a line joining points of equal rainfall magnitude. The isohyets of various rainfall values are to be drawn. The area between two adjacent isohyets are to be determined and if the isohyets go out of the catchment the catchment boundary is to be taken as the bounding line. For every pair of isohyets the average rainfall value is to be determined and it should be multiplied with the area that is surrounded by these two isohyets. And a set of such values are to be determined. All these values are to be added and divided by the total area to get the average value of rainfall.

1.4 An overview of the above methods :

An overview of the advantages and limitations of the above techniques of assessing applicable precipitation for water resources projects are.

a) Arithmetic mean method gives equal importance to all the rain gauge stations irrespective of their location and magnitude of precipitation. In general, the rain gauge stations may not be evenly positioned and the magnitude of precipitation may vary from place to place. Hence Arithmetic mean method may not be suitable.

b) In case of Isohyetal method, the Isohyets are to be drawn for every situation as the magnitude of precipitation varies from time to time and hence it can not be standardized.

c) Theissen polygon method provides the influencing areas of the existing rain gauge stations and hence a polygon for a particular region can be standardized.

II. CASE STUDY :

Anantapuram district is lying between 76° 45′ East longitude to 78° 30′ East longitude and between 13° 40′ North latitude to 15° 15 ′ North latitude. The geographical area of the district is 19134.772 sq. km. The total number of rain gauge stations existing in the district, are 63. The locations of all the 63 rain gauge stations are identified on plan and lines are drawn to connect the adjacent stations. Perpendicular bisectors are drawn for all the lines joining the rain gauge stations and are extended to form the polygon around each gauge station. A map showing the locations of rain gauge stations and the construction lines for Theissen polygon is given in figure 1.

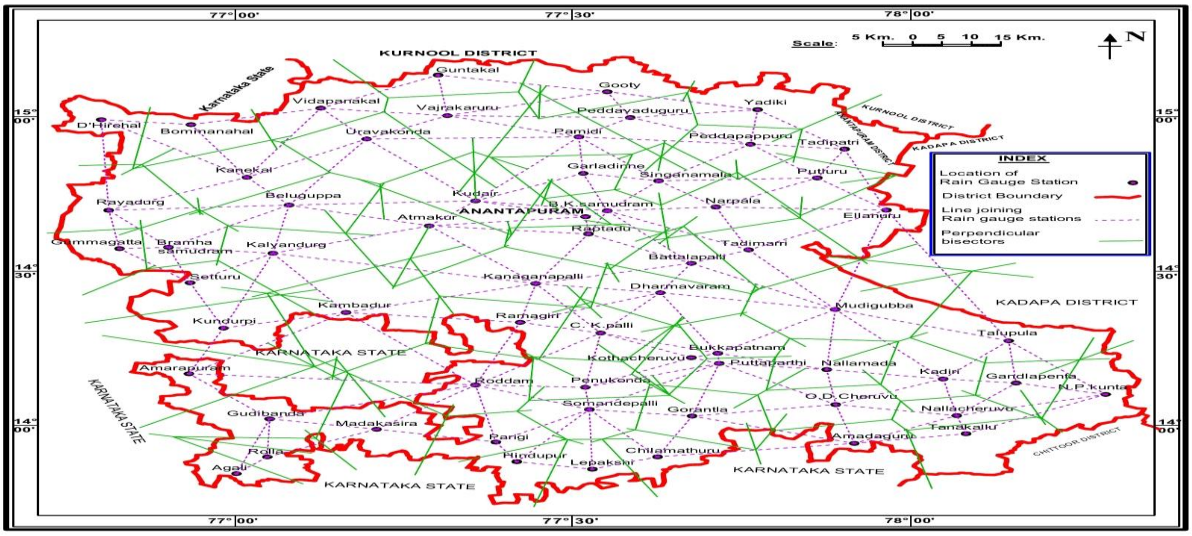

Figure 1 : Map showing the locations of rain gauge stations and construction lines for Theissen polygons in Anantapuram district

By adopting the above procedure, Theissen polygons for all the rain gauge stations in the district are constructed and are shown in figure 2.

Table 1. Influencing areas of rain gauge stations in Anantapuram district

S No.	Name of the rain gauge station	Influencing area (Sq. km)	% area Influence in total area	S No.	Name of the rain gauge station	Influencing area (Sq. km)	% area Influence in total area	S No.	Name of the rain gauge station	Influencing area (Sq. km)	% area Influence in the total area
1	Anantapuram	125.700	0.657	23	Battalapalli	268.604	1.404	45	Amarapuram	172.445	0.901
2	Rapthadu	288.124	1.506	24	C.K. Palli	315.747	1.650	46	Gudibanda	268.711	1.404
3	Garladinne	269.714	1.410	25	Kanaganapalli	473.935	2.477	47	Rolla	182.689	0.955
4	Atmakur	543.614	2.841	26	Ramagiri	296.005	1.547	48	Agali	111.072	0.580
5	Kuderu	436.075	2.279	27	Kalyanadurgam	448.836	2.346	49	Hindupuram	198.528	1.037
6	Singanamala	260.242	1.360	28	Beluguppa	420.425	2.197	50	Parigi	223.631	1.169
7	B.K. Samudram	151.677	0.793	29	Kambadur	456.794	2.387	51	Lepakshi	187.635	0.981
8	Narpala	327.036	1.709	30	Kundurpi	305.604	1.597	52	Chilamattur	228.893	1.196
9	Tadipatri	319.787	1.671	31	Brahmasamudram	240.500	1.257	53	Gorantla	352.803	1.844
10	Yadiki	384.016	2.007	32	Setturu	265.056	1.385	54	Kadiri	299.213	1.564
11	Peddapappur	297.976	1.557	33	Rayadurgam	373.267	1.951	55	Mudigubba	627.216	3.278
12	Putluru	289.083	1.511	34	D. Hirehal	190.147	0.994	56	Nallamada	353.508	1.847
13	Yellanur	293.657	1.535	35	Gummagatta	170.671	0.892	57	N.P. Kunta	303.598	1.587
14	Guntakal	264.337	1.381	36	Kanekal	452.563	2.365	58	Talupula	437.34	2.286
15	Gooty	385.665	2.015	37	Bommanahal	304.873	1.593	59	Nallacheruvu	202.087	1.056
16	Pamidi	316.199	1.652	38	Penukonda	286.960	1.500	60	O.D. Cheruvu	318.332	1.664
17	Peddavadaguru	257.057	1.343	39	Somandepalli	263.930	1.379	61	Tanakal	355.378	1.857
18	Uravakonda	439.918	2.299	40	Roddam	301.033	1.573	62	Amadaguru	179.425	0.938
19	Vajrakarur	416.702	2.178	41	Puttaparthi	173.695	0.908	63	Gandlapenta	255.802	1.337
20	Vidapanakal	310.796	1.624	42	Kothacheruvu	192.082	1.004		**Total**	**19134.772**	**100**
21	Dharmavaram	375.196	1.961	43	Bukkapatnam	219.602	1.148				
22	Tadimarri	394.660	2.062	44	Madakasira	308.906	1.614				

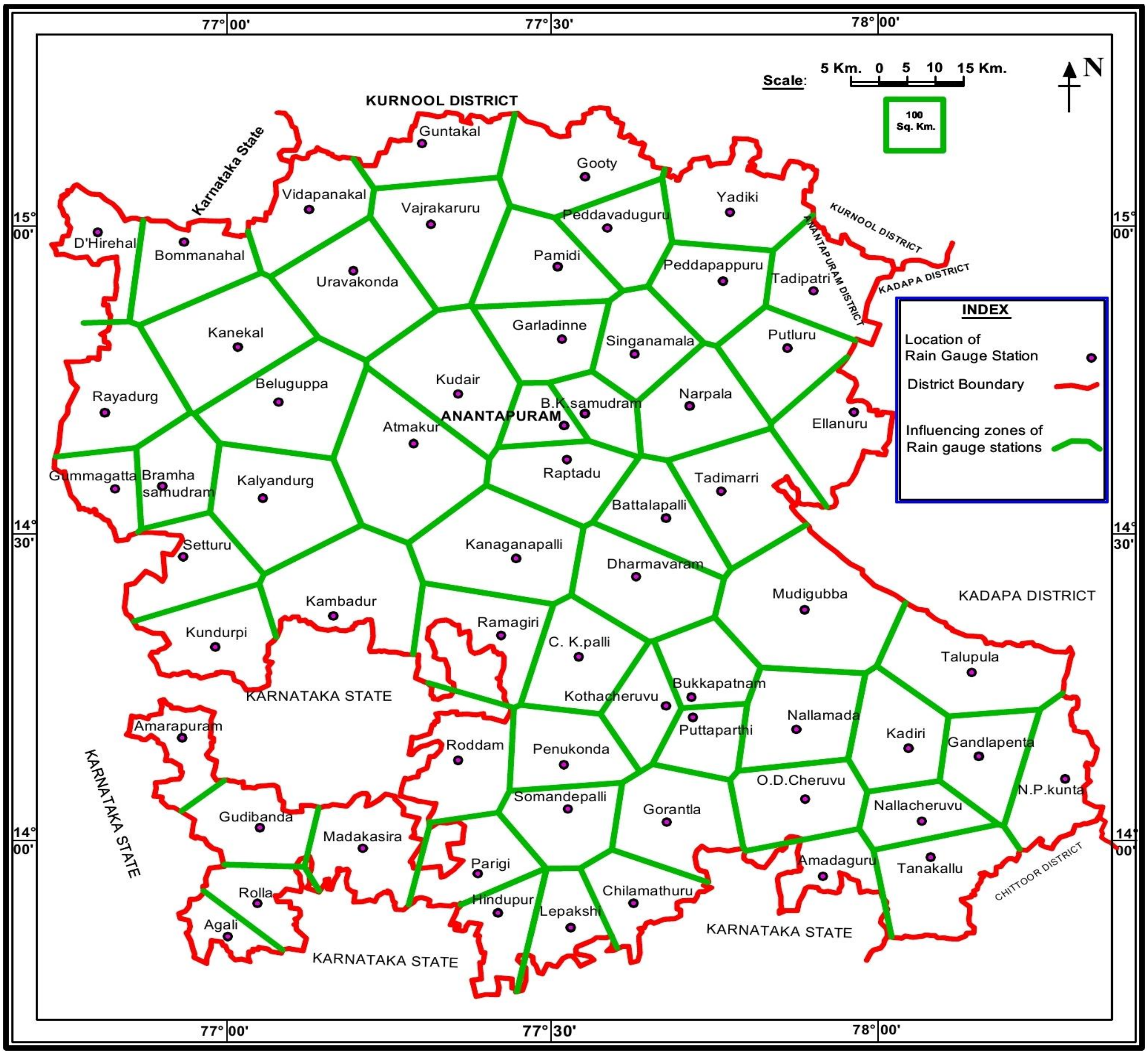

Figure 2 : Map showing Theissen polygons of rain gauge stations in Anantapuram district.

III. RESULTS :

From figure 2, the influencing area of each rain gauge station is obtained and the corresponding percentage area in the total geographical area of the district is computed. These details are presented in table 1.

Conclusions Figure 2 and Table 1 can be readily used for computation of weighted precipitation as long as the number and locations of rain gauge stations are not changed.

1. The weighted precipitation can be computed for a specified location and for the entire district for a specified period.

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Ranked Keyword Search in Cloud Computing: An Innovative Approach

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ABSTRACT

Cloud computing has become an integral part of IT industry. Amount of information available on World Wide Web is increasing at an exponential pace. In such a vast collection it becomes difficult for the user to query something out of the whole collection. Great efforts have been made for facilitating users via keyword search. However, there are a few researches about entertaining the exact user query and presenting a ranked URL list according to it. In this paper, We give an overview of our framework for keyword searching with summaries, besides we describe a ranking algorithm for ranked keyword search and their results. Keyword searches are typically done so that users can actively utilize clouds to query a collection. This paper discusses our study design on user presenting a query in a cloud.

KEYWORDS: *Cloud computing, Ranked keyword search*

I. INTRODUCTION

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network .It has the potential to change the IT industry. It enables cloud customers to remotely store their data into the cloud so as to enjoy the on-demand high quality application and services from a shared pool of configurable computing resources [7]. Cloud Computing is the result of evolution and adoption of all the existing technologies and paradigms. The goal of cloud computing is to allow users to take benefit from all of these technologies, without the need for deep knowledge about or expertise with each one of them. Clouds enable customers to remotely store and access their data by lowering cost of hardware ownership while providing robust and fast services [6]. As Cloud Computing becomes prevalent, sensitive information are being increasingly centralized into the cloud. In this, data owners may share their outsourced data with a large number of users, who might want to only retrieve certain specific data files they are interested in during a given session. One of the most popular ways to do so is through keyword-based search. Such keyword search technique allows users to selectively retrieve files of interest and has been widely applied in plaintext search scenarios [7]. In a cloud the service providers offer their resources as services to the general public. Public clouds offer several key benefits to service providers, including no initial capital investment on infrastructure and shifting of risks to infrastructure providers. However, public clouds lack fine-grained control over data, network and security settings, which hampers their effectiveness in many business scenarios

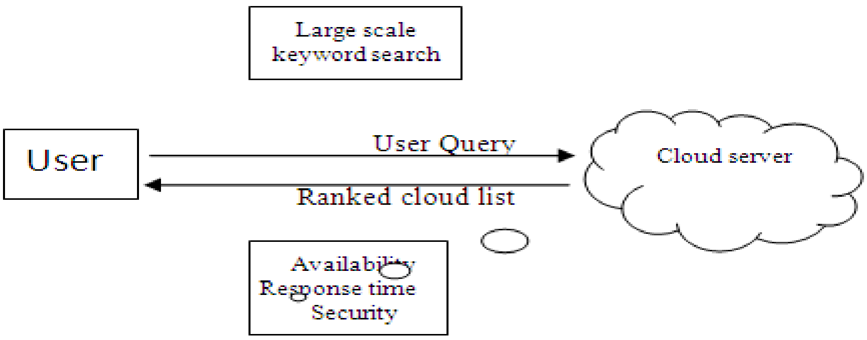


Fig.1 Architecture of keyword search

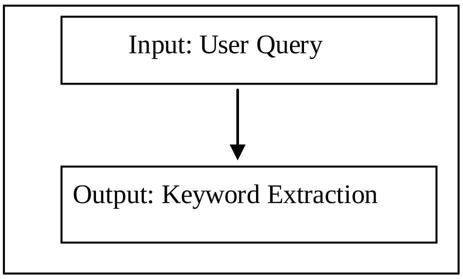
II. RELATED WORK

In this section, main research areas related to keyword search are presented. When we talk about cloud service the work is more specific and the parametric. Many researchers performed a lot of work in the same direction. In year 2007, Byron Y.L. Kuof presented a tag based summarization approach for the web search. The presented work is suggested on the public cloud. In which the integration of the web architecture and the database extraction is integrated. The work includes the refinement of the user query based on the cloud tags. The words extracted from the query are been summarized and this summarized query is passed to the public cloud. The cloud interface enabled the extraction of new and required information [1].In year 2009, Hang Guo presented personalization architecture for the cloud services. The work includes the individual access to the cloud to perform the user query. The author work is presented in two main parts one is client side and other is cloud side. The client side basically fetches the periodic information from the system where as the cloud data search engine presents the data for the modeling [2]. In year 2011, Ju-Chiang Wang presented a content oriented tag based search for the database search. In his work the music database is selected for the query analysis. The query performed by the user is analyzed and divided to different colors or the levels to perform the effective content based retrieval. The probabilistic fusion model was defined based on Gaussian mixture model and the multinomial mixture model. The author evaluated the proposed system for the effectiveness of the user query and the related results [3].In Year 2012; Cengiz Orencik presented a rank based keyword search on the data cloud. In this work the document retrieval is performed on the cloud server based on the keyword analysis and the information search is performed relative to the defined information. The presented work is performed on the encrypted data that has improved the security and the reliability of the retrieval. On this basis a secure protocol is suggested called Private Information Retrieval. The system will performed the query and present the final results on the basis of parametric ranking. The presented work is the efficient computation and communication of the requirement analysis [4]. Another cloud search is suggested by Daniel E. Rose in 2012 which is based on the information retrieval. The author presented his work on Amazon cloud service. The work is tested under different criteria such as scalability, configuration etc. The presented search reduce the barrier to allow a person or the organization to perform the content oriented search and the search is tested under the enterprises environment as well as on web search[5].

III. PROPOSED WORK

The cloud architecture is widely spread in the form of public cloud and is available to all the users. The presented work is the agent based work performed by the middle layer to perform service level agreement. In this, at first the user query will be analyzed respective to the user requirement specification. Now a parametric match will be performed based on the availability and the requirements. For this kind of match a cloud search will be performed to identify the keyword occurrence and will assign an initial rank based on the keyword match. The second generic criteria defined here is the security, the clouds that provides the communication in secure way will be assigned with some higher rank. The security will be identified based on the SSL availability and the https transmission for cloud access. The first level is completely the based on server side features. The second level of ranking will be done based on the availability and the response time factors. This layer will work for the middle layer architecture that will exist between the user and the cloud server. The middle layer will maintain a database to identify the minimum, maximum and average response time for all cloud services and based on which the rank will be affected. The parameters taken will be the user interest and the user visit over a cloud. More the user interest, higher the cloud rank will be. Finally these three levels will be collected together and will generate an effective ranking formula. As the approach is rule based, the results here are more reliable. The work will perform a segmented search that will also increase the efficiency of the search mechanism.

In this, user will interact with the web for his topic based query to retrieve the web pages. As the page is query performed it will send request to the web and generate a basic list of all the URLs related to the topic. Now it will retrieve the data from the web. For the URL collection it will use the concepts of indexing and ranking. Indexing will provide a fast access to the web page and ranking will arrange the list according to the priority. The analysis includes the keyword extraction by removal of stop words. Once the keyword is extracted the next work is to perform the keyword summarization based on frequency of keywords. Once we get the summarized keywords it will be used as the content based analysis. In this, at first the query is made by the user and on this a query analysis is performed.



Now this extracted keyword will work as input to the cloud search architecture and based on the algorithmic approach it will return the effective URL list along with ranking.

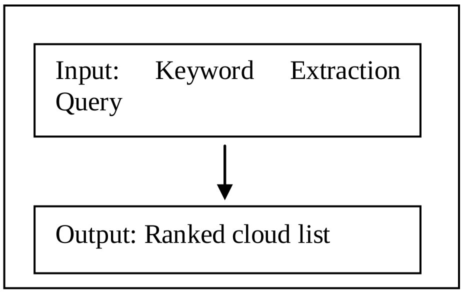


Fig 2: Basic concept of the Ranked Keyword Search

Ranking Algorithm:

[1] Define the list of available clouds on any public cloud server called Cloud(1),Cloud(2)…..Cloud(n)

[2] For i=1 to n
{Identify parameters for Cloud (i) called Availability (i), Response Time(i), Security(i) }

[3] Accept the User Query called Req under the specification ReqKeyword, ReqSecurity, ReqDeadLine,

[4] Activate the Middle layer to provide the best service selection

[5] Accept the user query and filter it to retrieve the keywords under the following step

- Remove the stop list words from the query list
- Rank the different keywords respective to category
- Find the frequency of keywords
- Keep the most occurring keywords and present as relevancy measure

[6] As the keywords retrieve perform query on each public cloud and perform the content and tag based match.

[7] Find the list of M clouds that satisfy the relevancy criteria as well as identify the other cloud parameters like response time, security measure

[8] For i=1 to M
[Perform the Content based similarity measure as]

[9] RelevencyVector = 0
For j=1 to Length (User Keywords)
{RelevencyVector=RelevencyVector + Keyword Occurrence(Clound(i) ,Keyword(j)) /Total Keywords(Clound(i),Keyword(j)); }

[10] Security Vector=0; If (UserSecurityReq=Security (Cloud(i))
Security Vector=1;

[11] ResponseTimeVector=0 If (User Deadline>Response Time(Cloud(i))

{ResponseTimeVector=UserDeadline-ResponseTime(Cloud(i) }

[12] Rank (Clound(i))= RelevencyVector*w1 +Security Vector*w2 +ResponseTimeVector*w3;

[13] As user get Ranked list of clouds, selection can be performed for best cloud service provider respective to user interest.

IV. RESULTS

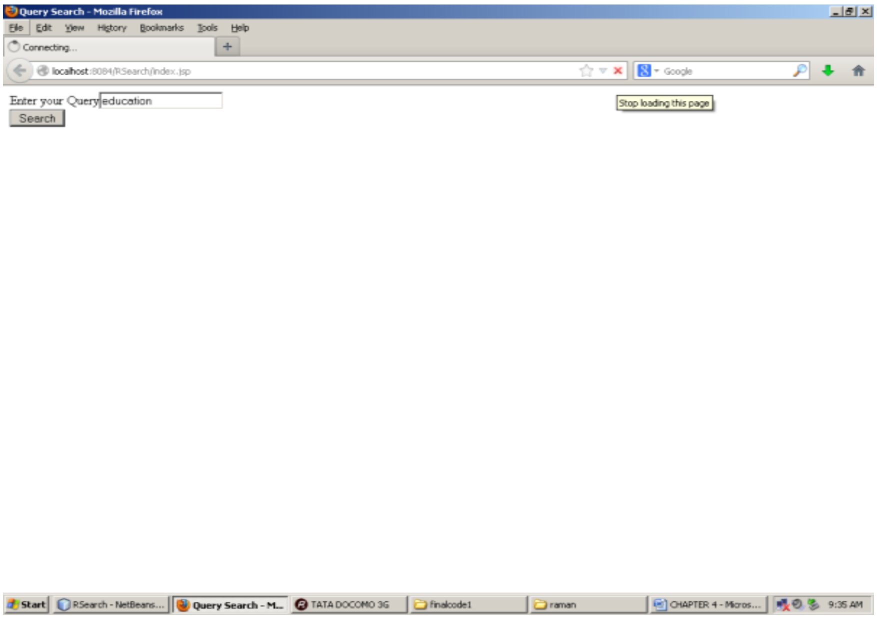


Fig. 3 Basic GUI of Proposed Work

This figure shows the basic GUI of proposed work. The application will accept the keyword from user and perform the proposed approach on it. On server side the page is processed via database to get the optimized results.

6/12/13 localhost:8084/Search

Rank: 1:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=4179+14456691978068572337&category=&query=education
like 9 dislike 0 ratio 3 % visitor count 1 Response Time 0.06 Security Enabled No
Rank: 1:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=4549+15875783284424139434&category=&query=education
like 12 dislike 2 ratio 1 % visitor count 0 Response Time 0.12 Security Enabled No
Rank: 1:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=10563+7689389076047685700&category=&query=education
like 5 dislike 0 ratio 7 % visitor count 0 Response Time 0.03 Security Enabled No
Rank: 0:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=7773+7590489509277721099&category=&query=education
like 1 dislike 0 ratio 7 % visitor count 0 Response Time 0.02 Security Enabled No
Rank: 0:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=8318+3306511064324875498&category=&query=education
like 0 dislike 7 ratio 9 % visitor count 1 Response Time 0.03 Security Enabled No
Rank: 0:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=4843251+8214004630913433645&category=&query=education
like 4 dislike 0 ratio 5 % visitor count 0 Response Time 0.02 Security Enabled No
Rank: 0:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=3448+13514655874890414016&category=&query=education
like 0 dislike 0 ratio 4 % visitor count 0 Response Time 0.03 Security Enabled No
Rank: 0:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=5514046+7401480558999949689&category=&query=education
like 1 dislike 0 ratio 7 % visitor count 0 Response Time 0.03 Security Enabled No
Rank: -1:-http://www.google.com/enterprise/marketplace/viewListing?productListingId=3442+15105250666671696895&category=&query=education
like 1 dislike 9 ratio 1 % visitor count 0 Response Time 0.02 Security Enabled No

Fig 4. Output of Keyword Search (Education)

Figure 4 is showing the results driven based on the search performed for keyword Education. The output is shown in the form of crawled Cloud Service. The Cloud Services are presented with few options to show the visited count, page rank and the like/dislike count for each Cloud Service. The ranking will be changed respective to the user interest and the number of visits to different pages. If visitor count is say 4 then, it will be considered as 0.4. If page-rank is 60 then, it will be considered as 6.

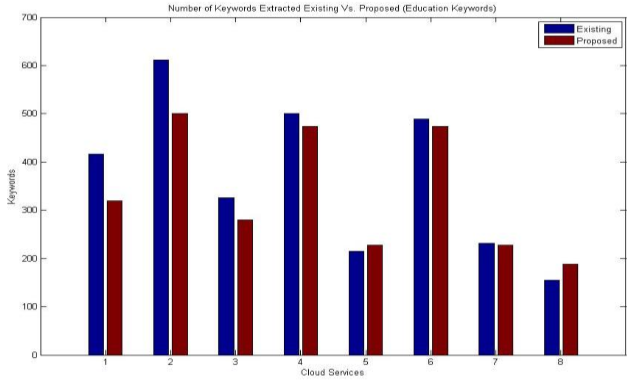


Fig. 5 Comparison of Keyword Search Education (Proposed Vs. Existing)

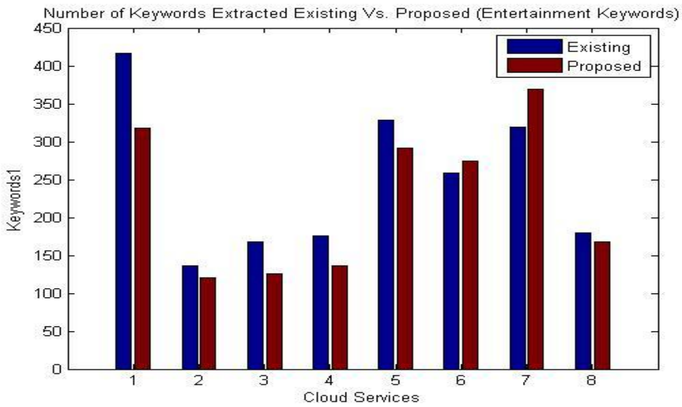


Fig.6 Comparison of Keyword Search Entertainment (Proposed Vs. Existing)

Here, the comparison is shown of the keyword analysis performed in existing work and the proposed work. The existing work represents the query performed on the cloud search without keyword extraction where as the proposed approach shows the keyword extraction after the keyword analysis. Here the outcome of the keyword analysis of education is shown. As we can see, the presented approach gives more filtered relevancy so that the comparison can be performed easily.

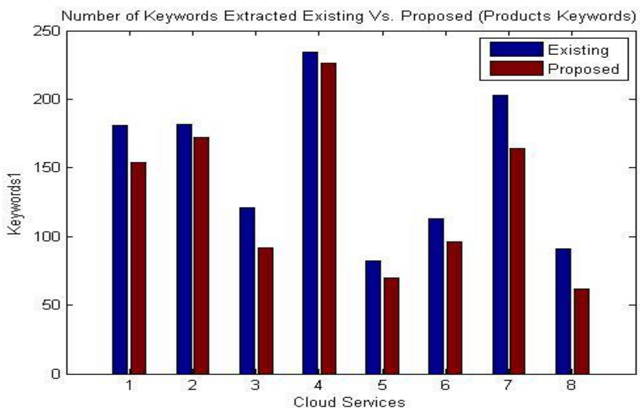


Fig.7 Comparison of Keyword Search Products (Proposed Vs. Existing)

Here, the comparison is shown for the keyword products.

V. CONCLUSION AND FUTURE SCOPE

In this paper, as an initial attempt, we motivate and solve the problem of supporting efficient ranked keyword search in a cloud. We proposed a framework that allows thinking of keyword searches more naturally.
In this present work, the GUI interface will be created to pass the user query like a search engine. The first output will be drawn in terms of query filtration and extraction of keyword from query analysis. Once the keyword analysis is performed, keyword reduction will be done and finally the keywords will be drawn as output. Now, this extracted keyword will work as input to the cloud search architecture and based on algorithmic approach, it will return the effective URL list along with ranking. The proposed ranking method proves to be efficient in analyzing user query and returning highly relevant document corresponding to submitted search terms. We prove that are proposed method satisfies all the requirements of keyword analysis.
Following the current research, we propose several possible directions for ranked keyword search. There is large agenda of interesting issues to be tackled. We are interested in exploring different criteria for selecting words and ranking and indexing them. The efficiency in this work is the major issue, as the repository is larger and not having the service database, the search contents takes time. In future, the work can be improved in this direction.

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Effects of Earthquake Loads on Existing School Buildings In Sudan

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ABSTRACT

Schools built world-wide routinely collapse in earthquakes due to avoidable errors in design and construction. This is because existing technology is not applied and existing laws and regulations are not enforced. Unless action is taken immediately to address this problem, much greater loss of life will occur. It is estimated that of the approximately one billion children in compulsory education living in countries with high seismic risk, several hundred millions would be in danger if an earthquake were to strike while they are attending school. Recently the evaluation of seismic performance of existing school buildings has received a great attention. All school buildings in Sudan are not earthquake-resistant. The objective of this paper is to assess the seismic performance and retrofitting of existing school buildings in Sudan. Two typical case studies have been chosen. The evaluation has proved that the two-story school is not safe. A comparative study has been done to choose a suitable strengthening method. An effective method has been proposed by adding steel shear walls.

KEYWORDS: *Earthquake, Existing, Loads, Retrofitting, School building, Steel plate, Sudan.*

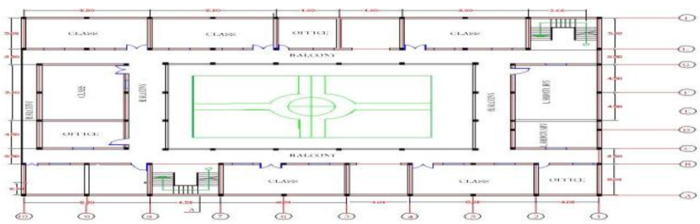
I. INTRODUCTION

An earthquake is the vibration of the earth's surface that follows a sudden release of energy in the crust. During an earthquake, the ground surface moves in all directions. The most damaging effects on buildings are caused by lateral movements which disturb the stability of the structure, causing it to topple or to collapse sideways. Since buildings are normally constructed to resist gravity, many traditional systems of construction are not inherently resistant to horizontal forces. Thus design for earthquakes consists largely of solving the problem of building vibrations. Sudan is not free from earthquakes. It has experienced many earthquakes during the recent history [1], and the previous studies on this field demonstrated this argument [1]. Schools play a vital role in the community. Schools play a vital role in the community. They are not only the places where students learn and teachers teach; they are also used for social gatherings, theatre and sports. In addition, school buildings play an important role in responding to and recovering from natural disasters. In the event of an earthquake, hurricane or flood, schools can serve as emergency shelters and, as such, can be used to house, feed and care for the local population. This research in an attempt to study the effect of seismic loading on school buildings in Sudan.

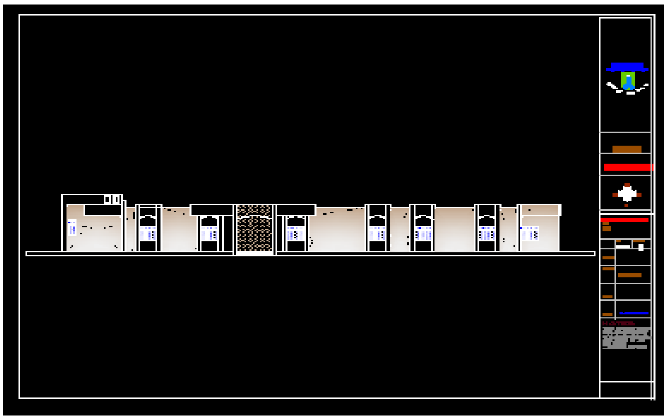
II. FIRST CASE STUDY

2.1 Description of the school building

This case study is a typical one-story model for elementary schools in Sudan. The building is comprised of a reinforced concrete structural frame with infill masonry walls. The structure members are made of in-situ reinforced concrete. The overall plan dimensions are 28.5 m x 36.5 m. Height of the building is 3.5 m. The floor is a beam supported solid slab system. Figs. 1, and 2 show detailed information on the structural and architectural layout of the school.



(a) Plan of School building.



(b) Elevation.

Figure 1: Plan and Elevation of first case study.

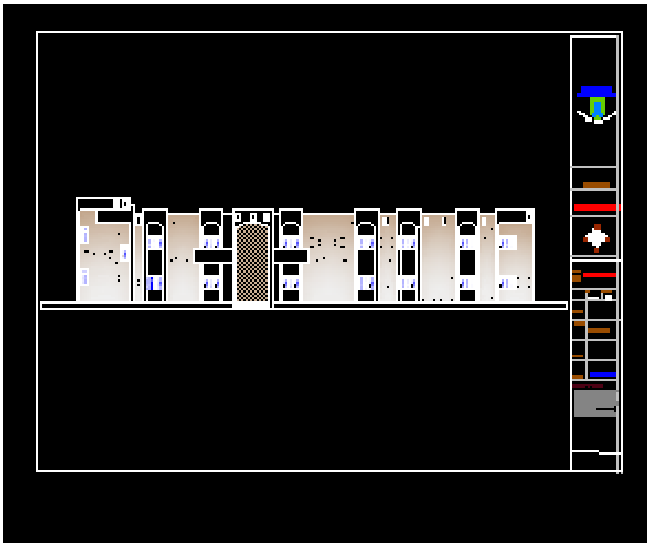


Figure 2: Elevation of second case study.

2.2 Geometry and Material Properties

Most data is associated with layout, it is necessary to make some reasonable assumptions and engineering judgments during the analysis. The following assumptions are considered:

[1] The cross sections of beams and columns are input according to the original design

[2] 2-The walls with brick material are modeled with shell element in order to consider out-of-plane stiffness.

[3] The school building is modeled as 3-D frames with fixed supports at the foundation level.

2.3 SAP 2000 Model

The numerical models are built using SAP2000 version 14 [2]. This software package from Computers and Structures is based on the finite element method for modeling and analysis. Also, it has the capability of designing and optimizing building structures. Among the features introduced by the analysis engine of SAP2000 are static and dynamic analysis, linear and nonlinear analysis, and pushover analysis. The analytical modeling used in this software is the member type model which means that beams or columns are modeled using single elements. The material used in the model buildings are RC and steel, as modeled in SAP 2000. This school building has been analyzed by SAP 2000 and designed by (ISACOL) [2] for dead load and live load case only for getting the reinforcement details. Fig. 3 and 4 show the models of a 1-story school building and layout of columns.

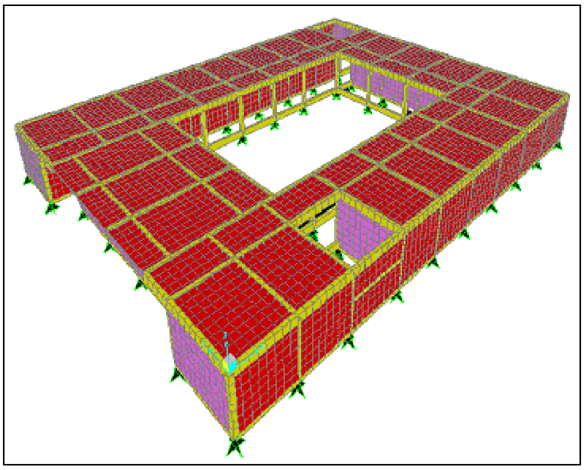


Figure 3: Model of one-story school building.

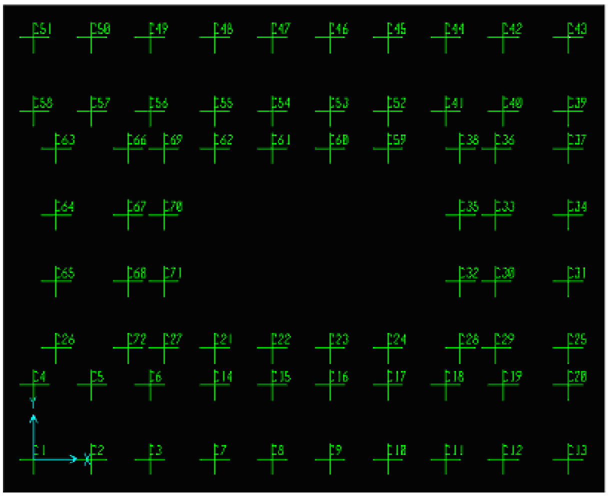


Figure 4: Layout of columns.

2.4 Design of structural elements against gravity loads

The reinforced concrete sections were designed according to the BSI 8110 [4] using the limit state design method (Mosley and Bungey, 1997) [5].

2.4.1 Design of columns

(a) Calculation of internal forces in columns

The columns were designed to resist axial compression forces and bending moment due to gravity load. The design forces in columns obtained from the computer analysis program SAP2000 are shown in Table 1.

Table 1: Internal forces in columns due to gravity loads.

Column No.	N		My
	(KN)	(KN.m)	(KN.m)
C40	383.81	31.02	19.73
C68	405.95	0.8	29.05
C72	296.83	24.68	23.71

(b) Design of columns *before* adding seismic loads

The design of columns has been performed using a computer program called ISACOL [3]. Figs.5 and 6 show the main window of ISACOL program and sample of a column design.

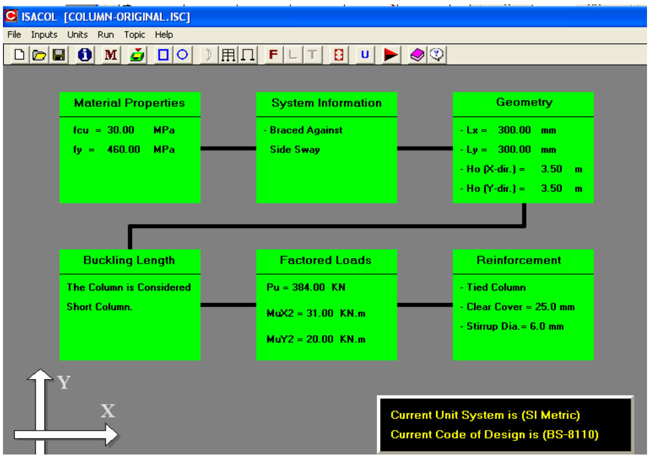


Figure 5: Main window of (ISACOL) program.

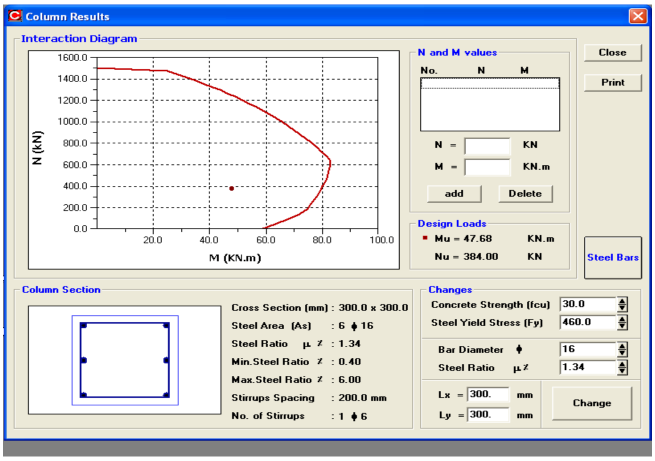


Figure 6: ISACOL program results for C40.

(c) Results of design

Table 2. Shows the design results of some columns

Table 2: Design of columns before adding seismic Loads

Column No.	Original design		Present design	
	Dimensions	Reinforcement	Dimensions	Reinforcement
C40	300 X 450	8 Φ 16	300 X 300	6 Φ 16
C68	300 X 450	8 Φ 16	300 X 300	6 Φ 16
C72	300 X 450	8 Φ 16	300 X 300	6 Φ 16

2.4.2 Design of beams

As for the beams the internal forces due to gravity loads have been calculated first .Then the BSI [4], has been used to check the existing design. It has been found that the existing design is adequate.

III. SECOND CASE STUDY

3.1 Description of the school building

This case study is a typical two-story model for secondary schools in Khartoum. The building is comprised of a reinforced concrete structural frame with infill masonry walls. The structure members are made of in-situ reinforced concrete .The overall plan dimension is 28.5x36.5m. Height of the building is 7 m .The floor is a beam supported solid slab system. The same procedure as that used in the first case study has been used. The following results have been obtained:

3.2 Design of columns
(a) Results of design

Table 3. Shows the design results of some columns

Table 3: Design results for some columns before adding seismic loads

Column No.	Original design		Present design	
	Dimensions	Reinforcement	Dimensions	Reinforcement
C40	300 X 450	8 Φ 16	300 X 400	6 Φ 16
C68	300 X 450	8 Φ 16	300 X 400	6 Φ 16
C72	300 X 450	8 Φ 16	300 X 400	6 Φ 16

(b) Design of beams
As for the beams the internal forces due to gravity loads have been calculated first .Then the BSI [4], has been used to check the existing design. It has been found that the existing design is adequate.

IV. EVALUATION OF SEISMIC PERFORMANCE OF SCHOOL BUILDINGS

Most buildings and structures in Sudan have not yet been designed and constructed in compliance with earthquake provisions or given any consideration for earthquake effect. To design a school building to resist earthquake forces several factors must be considered. These factors can be divided_into the following five categories:

(1)Seismological factors such as the seismic zone on which the structure is to be constructed.
(2)Geotechnical factors such as the soil type, the soil profile, its dynamic properties and its liquefaction potential.
(3)Structural factors such as lateral force resisting systems, dynamic properties of the structure and building materials
(4)Architectural factors such as building shape and form.
(5) Social factors such as building occupancy and importance.

4.1 Calculation of loads
Dead loads, live loads and earthquake loads must be calculated and taken into consideration according to the following rules:
4.1.1 Dead and live loads
The dead loads and live loads are calculated following the rules which given in the BSI 8110 [4].
4.1.2 Earthquake loads
The earthquake loads are calculated following the rules which are given in the Regulations for earthquake resistant design of building in Egypt, 1988 [8] . These regulations have been prepared by the Egyptian Society for Earthquake Engineering (ESEE).
4.2 Total horizontal seismic force
Using the static lateral force procedure and according to Regulations of the Egyptian Society for Earthquake Engineering (ESEE 1988) [8] every building shall be designed and constructed to withstand a total horizontal seismic force (V) in each direction under consideration in accordance with the following formula: According to clause 2.3.2.1 of the (ESEE) Regulations [8], the total horizontal seismic force V is given by:
4.3 Seismic Map for the Sudan
In 2009, Hassaballa et. al. Developed new seismic maps for the Sudan , as shown in Fig.7 [6] .Also in 2002, Eissa et al . Developed a new seismic hazard maps and seismic zoning map for the Sudan (Eissa et al , 2002) [8] , as shown in Fig.8.

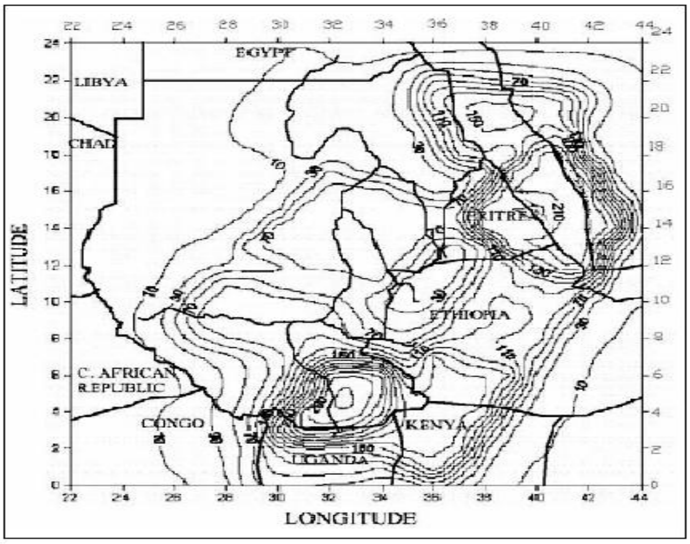


Figure 7: Seismic Hazard Map of the Sudan [6].

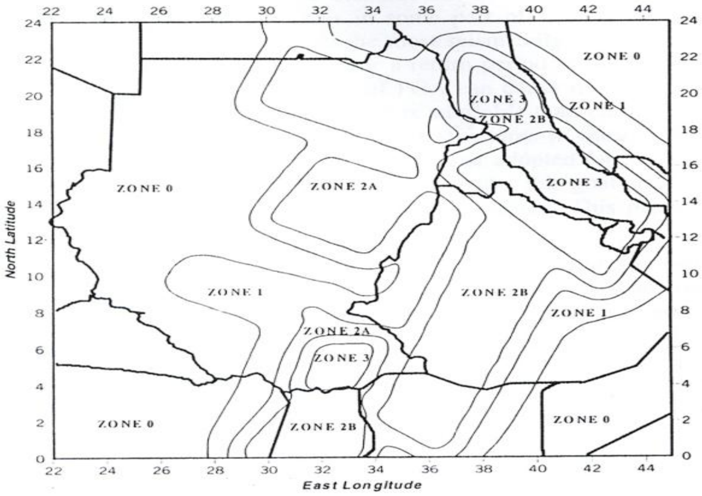


Figure 8. Seismic Zoning Map of the Sudan (Eissa et al , 2002) [7]

V. EVALUATION OF SEISMIC PERFORMANCE OF FIRST CASE STUDY

In this case study, the one-story reinforced concrete school building will be designed to resist the earthquake forces in addition to gravity loads

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5.1 Numerical modeling using SAP2000 software

The numerical model is built using SAP2000 version 10 [2], as shown in Figs.8. The lateral force resisting system consists of moment resisting frames without shear wall.

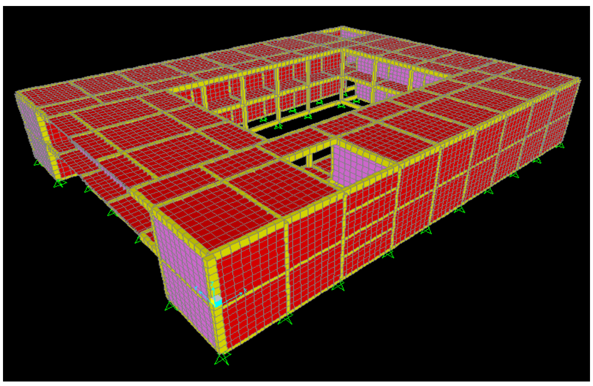

Figure 8: Model of 2-story school building.

5.2 Calculation of base shear

The equivalent lateral force procedure of (ESEE 1988) [8] was used to calculate the design base shear. The resulting seismic coefficient, *Cs*, was determined to be 0.16 and the corresponding base shear was approximately 2143.3 KN

5.3 Distribution of horizontal seismic force

The period of the building is the same in both directions. Hence, the load in the E-W direction are the same as those for the N-S direction as shown Fig. 9. It calculated from equation (1): $\sum_{i=1}^{n} W_i h_i$ = (13395.7 x 3.5) = 46885

$$\text{Fi} = \frac{hiwi}{\sum_{i=1}^{n} W_i h_i}(v - \text{Ft}) \quad (1)$$

F_t = 0.0 for (H/d) less than 3.0 m.
F1 =V= [(13395.7 X 3.5) / (46885)]* 2143.3 = 2143.3 KN

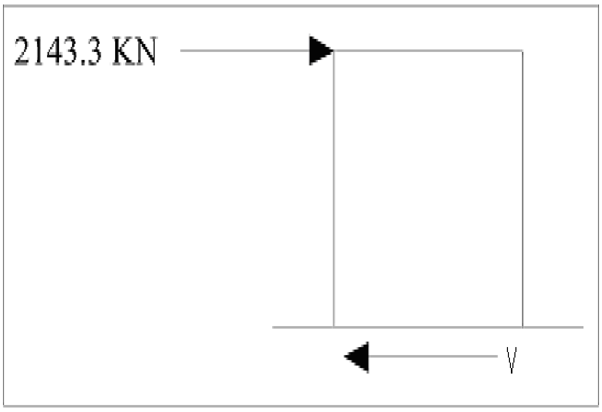

Figure 9: Load Distribution for one-story School Building.

5.4 Calculation of internal forces

Tables 4. and 5 show the internal forces in columns in directions (X) and (Y), respectively.

Table 4: Straining actions of columns due to load case1

Column No.	Nx (KN)	Mx (KN.m)	My (KN.m)
C40	1013.86	78.14	40.1
C68	1048.42	0.94	59.42
C72	794.19	62.74	48.27

Table 5: Straining actions of columns due to load case2

Column No.	Nx (KN)	Mx (KN.m)	My (KN.m)
C40	810.07	83.74	42.32
C68	945.53	19.99	68.42
C72	556.74	67.17	50.11

Where:
Nx : is the axial load in the column due to dead loads , live loads and the earthquake forces applied in x-direction .
Ny : is the axial load in the column due to dead loads , live loads and the earthquake forces applied in y-direction .

Mx : is the bending moment at the column due to the earthquake forces applied in x- direction .
My : is the bending moment at the column due to the earthquake forces applied in y- direction .

5.5 Design of the structural elements

The reinforced concrete sections are designed according to the BSI 8110 [4] using the limit state design method [5] .

5.6 Results of columns' design.

(i) Earthquake force in Direction x-x

Table 6: Design of columns after adding seismic loads-direction (x)

Column No.	Original design		Including seismic loads	
	Dimensions	Reinforcement	Dimensions	Reinforcement
C40	300 X 450	8 Φ 16	300 X 350	8 Φ 16
C68	300 X 450	8 Φ 16	300 X 300	6 Φ 16
C72	300 X 450	8 Φ 16	300 X 350	8 Φ 16

(ii)Earthquake in Direction y-y

Table 7. Shows the design of columns after adding seismic loads.

Table 7: Design of columns after adding seismic loads-direction (y)

Column No.	Original design		Including seismic loads	
	Dimensions	Reinforcement	Dimensions	Reinforcement
C40	300 X 450	8 Φ 16	300 X 350	8 Φ 16
C68	300 X 450	8 Φ 16	300 X 350	8 Φ 16
C72	300 X 450	8 Φ 16	300 X 350	8 Φ 16

(b) Design of beams

As for the beams the internal forces due to gravity loads have been calculated first .Then the BSI [4] , has been used to check the existing design .It has been found that the existing design is adequate.

5.7 Summary of the first case study

The results of this study show that:
1-All columns and beams are safe to withstand gravity loads.
2-The existing school building studied in this case doesn't need strengthening.

VI . EVALUATION OF SEISMIC PERFORMANCE OF SECOND CASE STUDY

The same procedure as that used in the first case study has been used .The following results have been obtained:

6.1 Calculation of base shear

The equivalent lateral force procedure of (ESEE 1988) was used to calculate the design base shear. The resulting seismic coefficient, *Cs*, was determined to be 0.16 and the corresponding base shear was approximately 4073 KN.

6.2 Distribution of horizontal seismic force

The period of the building is the same in both directions. Hence, the load in the E-W direction are the same as those for the N-S direction as shown Fig. 10.

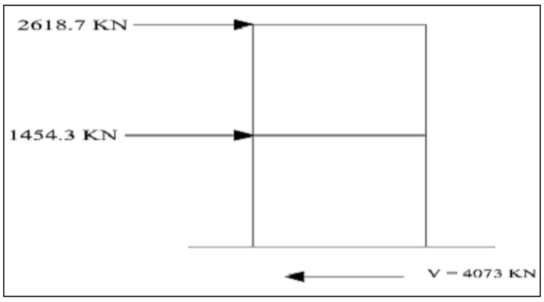

Figure 10: Load distribution for two- storey.

6.3 Results of columns' design
1- Earthquake in Direction x-x
Table 8. Shows the design of columns after adding seismic loads.

Table 8 : Design of columns after adding seismic loads-direction (x)

Column No.	Original design		Including seismic loads	
	Dimensions	Reinforcement	Dimensions	Reinforcement
C40	300 X 450	8 Φ 16	300 X 550	12 Φ 16
C68	300 X 450	8 Φ 16	300 X 550	12 Φ 16
C72	300 X 450	8 Φ 16	300 X 450	10 Φ 16

2- Earthquake in Direction y-y
Table 9. Shows the Design of columns after adding seismic loads.

Table 9: Design of columns after adding seismic loads-direction (y)

Column No.	Original design		Including seismic loads	
	Dimensions	Reinforcement	Dimensions	Reinforcement
C40	300 X 450	8 Φ 16	300 X 550	12 Φ 16
C68	300 X 450	8 Φ 16	300 X 550	12 Φ 16
C72	300 X 450	8 Φ 16	300 X 450	10 Φ 16

6.4 Results of beams' design

As for the beams the internal forces due to gravity loads have been calculated first.Then the BSI [4], has been used to check the existing design. It has been found that the existing design is adequate to resist gravity loads only. In general, it has been found that all beams in this model are safe under static loads, whereas few columns are unsafe. From this fact, school buildings in Sudan should be strengthened.

VII. PROPOSED METHOD FOR STRENGTHENING EXISTING RC SCHOOL BODINGS IN SUDAN

Seismic retrofitting is a modification of the structural and / or non-structural components in a building that aims to improve the building's performance in future earthquakes. Adding structural walls is one of the most common structure-level retrofitting methods to strengthen existing structures. This approach is effective for controlling global lateral drifts and for reducing damage in frame members. In this paper the seismic retrofitting of existing reinforced concrete schools by means of steel shear panels is examined.

7.1 The main function of steel plate shear walls

The main function of a steel plate shear wall (SPSW) is to resist horizontal story shear and overturning moment due to lateral loads. In general, steel plate shear wall system consists of a steel plate wall, two boundary columns and horizontal floor beams, Figs. 11 , and 12. Show samples of steel plate shear wall systems [9].

Figure 11: Coupled steel plate shear wall [9].

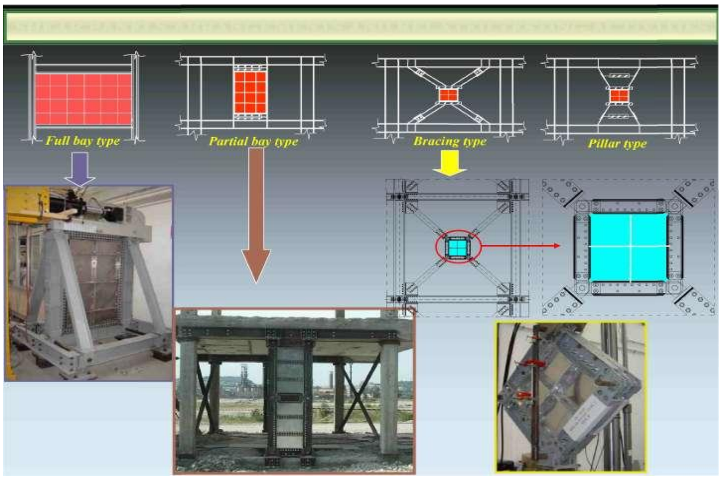

Figure 12: The steel plate wall and two boundary columns [10].

VIII. STRENGTHENING OF SECOND CASE STUDY

8.1 Description of the School Building:

The building is comprised of a reinforced concrete structural frame with infill masonry walls. The structure members are made of in-situ reinforced concrete .The overall plan dimension is 28.5x36.5m. Height of the building is 7 m .The floor is a beam supported solid slab system.

8.3 Modeling of steel shear walls in Analysis

The steel plate shear walls can be modeled using full shell elements and isotropic material. It is suggested that the wall panel be modeled using at least 16 shell elements (4x4 mesh) per panel [8]. The lateral force resisting system consists of moment resisting frames with steel plate shear walls. The thickness of steel shear wall panels is taken 25 mm according to above example and other examples [9]. The school building is analyzed for gravity and seismic loads using SAP2000 structural analysis software package [2]. British standard code (BSI) [4] , and Seismic Loads According to ESEE -Regulations [8] .

8.4 Comparative Study

Five cases of different positions of the shear walls have been examined. Reinforced concrete walls with thicknesses of 20 cm and 25 cm , and metal shear walls with thicknesses of 15 mm, 20mm and 25mm have been chosen for this case study. Figs. 13 – 17 show the five different positions of shear walls. The following results have been obtained:

1- For the first four cases and when using the shear walls of concrete and steel, with different thicknesses, it has been found that some columns in both x- and y- directions are unsafe.

2- The results of the fifth case when using 25 mm thick steel shear walls, it has been found that all columns in both x- and y- directions are safe.

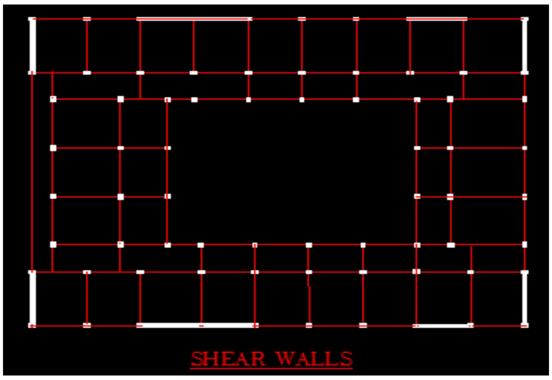

Figure 13: Case one [11].

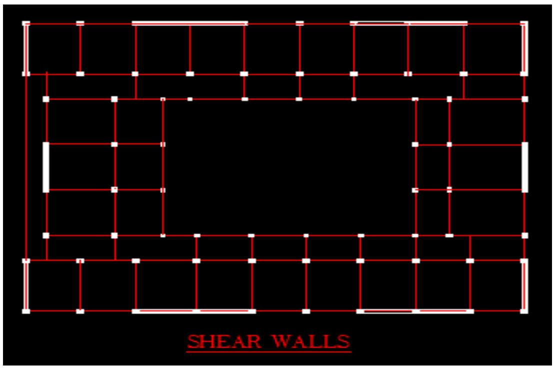

Figure 14: Case two [11].

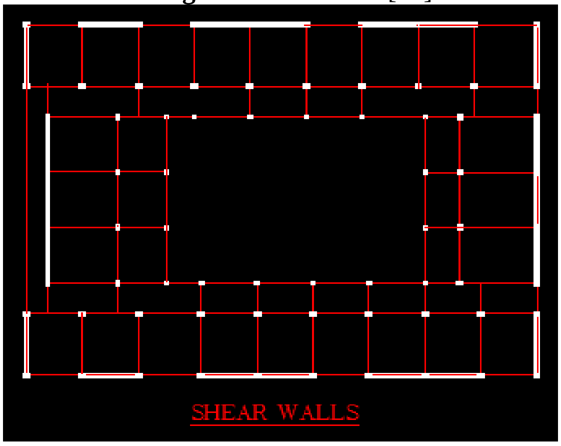

Figure 15: Case three.

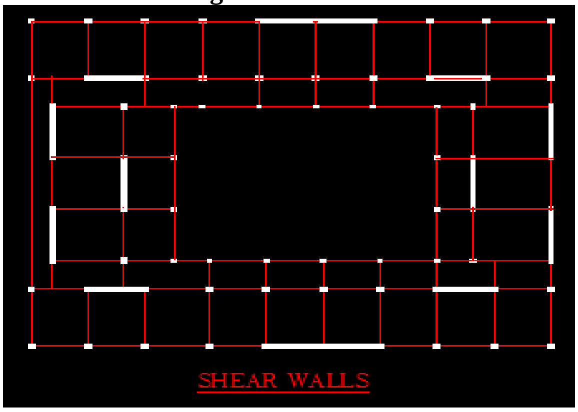

Figure 16: Case four.

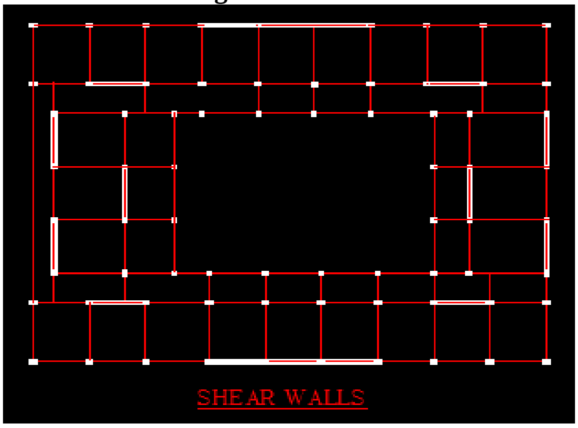

Figure 17: Case five.

8.5 Design of some columns after retrofitting

The same procedure as that used in the design before retrofitting has been used. The following results have been obtained:

8.6 Calculation of base shear

The equivalent lateral force procedure of (ESEE 1988) was used to calculate a design base shear. The resulting seismic coefficient, *Cs*, was determined to be 0.16 and the corresponding base shear was approximately 2773 KN.

8.7 Comparison between original and retrofitted design

1-Earthquake forces in Direction x-x

Table 10. Shows the design results of some columns after retrofitting due to earthquake forces in direction x-x

Table 10: Design results of some columns after retrofitting- direction (x)

Column No.	Original design		Design including seismic loads		After retrofitting	
	Dimensions	Reinforcement	Dimensions	Reinforcement	Dimensions	Reinforcement
C40	300 X 450	8 Φ 16	300 X 550	12 Φ 16	300 X 300	6 Φ 16
C68	300 X 450	8 Φ 16	300 X 500	10 Φ 16	300 X 300	6 Φ 16
C72	300 X 450	8 Φ 16	300 X 500	10 Φ 16	300 X 400	8 Φ 16

2- Earthquake in Direction y-y

Table 11. Shows the design results of some columns after retrofitting due to earthquake forces in direction y.

Table 11: Design results of some columns after retrofitting -direction (y)

Column No.	Original design		Dseign including seismic loads		After retrofitting	
	Dimensions	Reinforcement	Dimensions	Reinforcement	Dimensions	Reinforcement
C40	300 X 450	8 Φ 16	300 X 550	12 Φ 16	300 X 400	6 Φ 16
C68	300 X 450	8 Φ 16	300 X 500	10 Φ 16	300 X 300	6 Φ 16
C72	300 X 450	8 Φ 16	300 X 500	10 Φ 16	300 X 300	8 Φ 16

XI. CONCLUSIONS

Shear metal panels actually represent a very suitable strategy to reduce the seismic vulnerability of exiting RC school buildings in Sudan. From the results obtained, it can be concluded that:

1-Current design of school buildings in Sudan does not consider earthquake loads.

2-A proposed methodology has been presented for evaluation of seismic resistance of existing school buildings in Sudan.

3-It has been found that the current design of school buildings in the Sudan is not safe for the current seismicity of the Sudan.

4-A strengthening technique for existing school buildings has been presented.

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Detection System of Illegal Logging Image Using Matching Process With Discrete Cosine Transform

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ABSTRACT

To support the government monitoring system, Logging Detection Tool is used as an implementation of remote sensing technology. It prevents the forest from any damage due to illegal logging activity. Illegal Logging is an actifity of deforestation without any authority and causes many problems in some sectors such as economic, ecology and enviromental inbalance as a result of disruption of the forests. The research is aim to create a system to detect the illegal logging, using Discrete Cosine Transform (DCT). The Image Processing Stage is using index selection. The value of index is taken from RGB Image that has been proceed with DCT and applied as the data to determine the forest location based on its damage. In this system, to reveal the site or forest location, it is derived from its damage level through the selection of total of avarage index value and characterized as low, moderate and severe level. Image sample is taken from reserved forests in Gowa, South Sulawesi, Indonesia. It has 750 m x 560 m size and using a sample image pairs in year 2007 as the initial data and year 2009 for the final data. The test results give the accuracy of the illegal logging detection system with DCT and it reaches 83.33%.

KEYWORDS: *Illegal Logging, Illegal Logging Detection, Discrete Cosine Transform, Image Processing Stage, Index selection.*

I. INTRODUCTION

Forest has many advantages to human life and the earth as the lungs of the world. In the economic field, the forestry sector contributes significantly to the national income accounts. The high price of timber in international market leds to timber exploitation in the early 90's [S. Syarif, et.al, 2012]. It encourages illegal logging actifity, which causes adverse effects especially on the economy and ecology fields. In the economic field, the state revenues declined due to the loss of timber tax and the chance to produce the high quality products of timber also decreased. In addition, the nature inbalance causes climate change, declining soil productivity, soil erosion and flooding, habitat destruction, and loss of biodiversity. To solve the problems, the illegal logging detection system is urgently needed.

In this research, image processing and Discrete Cosine Transform (DCT) are applied for the detection. Nowadays, image processing has a very wide application in various fields of life, i.e astronomy, archeology, industrial, and remote sensing. The image data in this research obtained from Google Earth that is composed of high-resolution images (Quick bird, Iconos, Geo-eye) and medium resolution imagery (Landsat, Aster, Spot).DCT is a mathematical transformation that takes and converts the signal from spatial domain into the frequency domain. Many digital image and video compression scheme are using block-based DCT, because the algorithm minimizes the amount of data needed to create digital images. In particular, JPEG and MPEG use DCT to concentrate image information by removing the spatial redundancy in the two-dimensional image. The DCT transformation is also known as low-frequency term, medium frequency and high frequency. This relates to the frequency of the wave of DCT basis functions. If the function of a small base, then the corresponding coefficients are called low-frequency coefficients.

The aims of this research are to help the government and other parties to monitor the human activity in the forest to reduce the illegal logging. However, identification of illegal logging in protected forest areas in Gowa, one of regions of South Sulawesi in Indonesia, was difficult because the forest functions like a water buffer. In this research, The used of image sample size is 530 x 400 pixels where one pixel in the image presents the actual size of 2 m^2. The structure of this paper as follows: Section II defines the pre image processing, Section III describes the proposed design system, Section IV discusses the results of design system and Section V concludes the paper.

II. Image Processing Theory

Each picture element (pixel), in indexed color image, has an assigned intensity that ranges from 0 to 255, called color palette, as shown in Figure 1. Color palette facilitates the manipulation of the color image without changing any information at any point in the image. In addition, the image size becomes smaller.

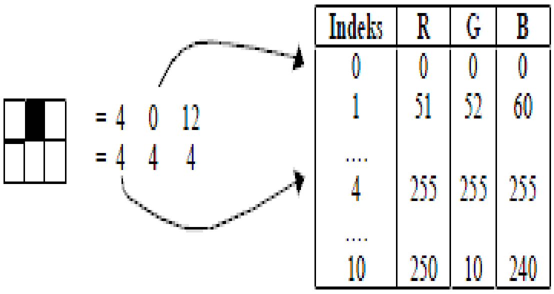


Figure 1 The Division of RGB Index [Iqbal, Muhammad, 2009]

To simplify image processing analysis, the color images are converted to the grayscale images. A color image composed of three matrix layers, namely the ***R***-layer, the ***G***-layer, and ***B***-layer. The value of ***RGB*** in the color image is converted to the ***S*** value in the grayscale image as shown in equation 1. The example of the image conversion is shown in Figure 2.

$$\boldsymbol{S} = (\boldsymbol{R} + \boldsymbol{G} + \boldsymbol{B}) / 3 \qquad (1)$$

Figure 2 The Example of Grayscale Image [Rahmanti and Farah Zakiyah, 2010]

2.1 DCT (Discrete Cosine Transform)

The Discrete Cosine Transform (DCT) transforms a signal into its fundamental components. It is widely used in image compression. DCT has two main properties for image and video compression, namely:

1) Concentrate image energy into a small number of coefficients (energy compaction).
2) Minimize the mutual dependence between the coefficients (correlated).

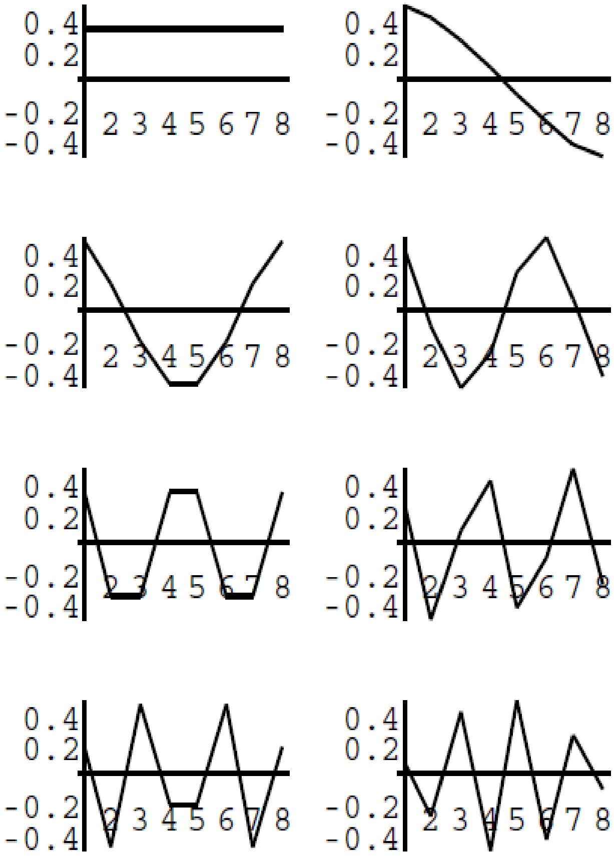


Figure 3 The eight basis vectors for the discrete cosine transform of length eight []

Each element of the transformed list *S(u)* is the inner (dot) product of the input list *s(x)* and a *basis vector*. The constant factors are chosen, thus the basis vectors are orthogonal and normalized. The eight basis vectors for n = 8 are shown in Figure 3. The DCT can be written as the product of a vector (the input list) and the n x n orthogonal matrix whose rows are the basis vectors. The list $s(x)$ can be recovered from its transform $S(u)$ by applying the inverse cosine transform (IDCT): [Khayam and Syed Ali, 2003]

$$S(x) = \sqrt{2/n}/n \sum_{n=0}^{n-1} S(u)\, C(u)\, \cos\frac{(2x+1)\,u\pi}{2n} \tag{2}$$

where $x = 0, 1, 2, \ldots, n-1$ and $c(u)$ defined as

$$C(u) = \begin{cases} 2^{-1/2}, for\ u = 0 \\ 1, \ \ otherwise \end{cases} \tag{3}$$

This equation expresses s as a linear combination of the basis vectors. The coefficients are the elements of the transform S, which may be regarded as reflecting the amount of each frequency presents in the input s.

III. PROPOSED SYSTEM

The research is purposed to create the detection system of illegal logging using Discrete Cosine Transform (DCT). The color image data from Google Earth is converted to the grayscale image data before the matching process using Discrete Cosine Transform (DCT) is completed. The concept of the system is illustrated in Figure 4.

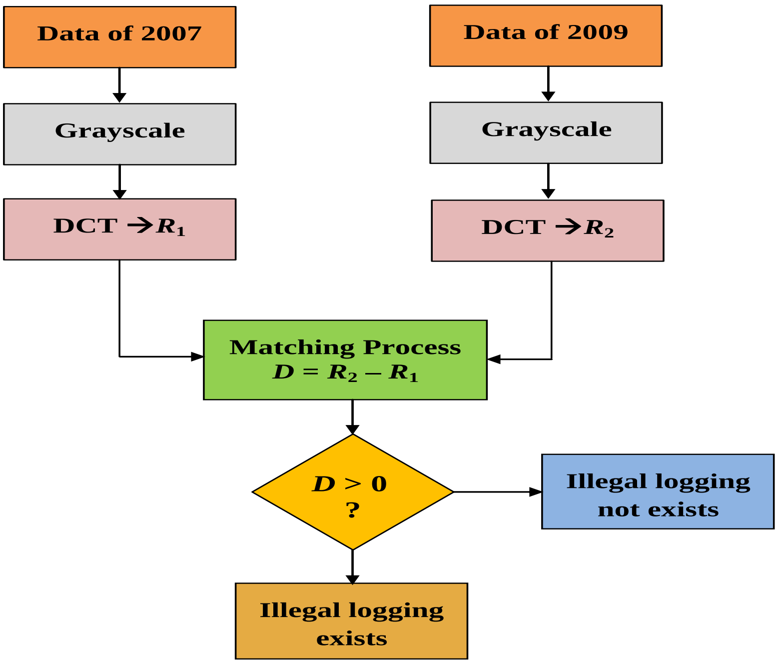


Figure 4 The concept of the system

The Image from Google Earth is cropped and normalized to 530 × 400 pixels. Each pixel is classified by the index value. Damage levels due to illegal logging based on the index value are categorized into :
(1) Low illegal logging : Index value ≤ 150.
(2) Medium illegal logging : index value between 150–200.
(3) High illegal logging : index value ≥ 200

The example of the illegal logging areas based on the ***RGB*** value of each pixel is shown in Figure 5. The dark blue color represents trees area and the light blue to the dark brown represent illegal logging area.

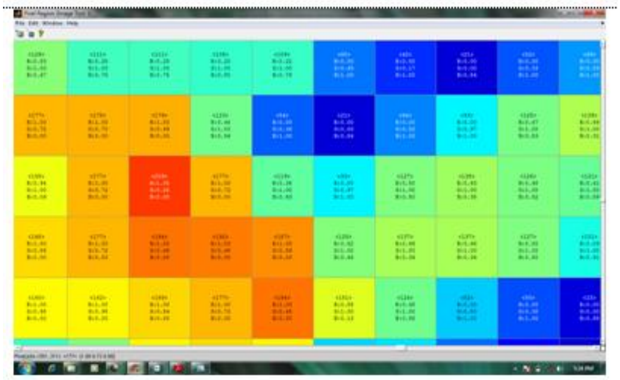
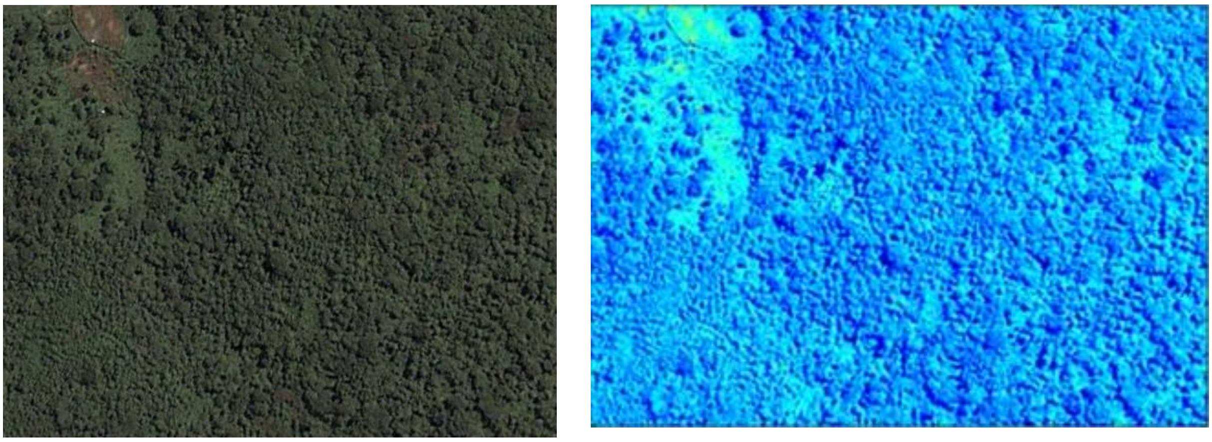


Figure 5 The example of the color index

In this research, the detection system is designed by Matlab and using the DCT function of MATLAB. Data from clustering index has been created and put into the function of DCT as a parameter to determine the level of illegal logging.

IV. RESULTS AND DISCUSSIONS

Figure 6 shows the results example of image before and after DCT process. Data input is the image of reserved forest in Gowa, South Sulawesi, Indonesia. The accuracy of illegal logging detection system using DCT is 83.33%. Therefore, the research is very useful for the forestry department to reduce the level of illegal logging. The detection results based on the illegal logging levels are shown in Table 1. The minimum area detection is $2m^2$.



(a) Before matching process by DCT (b) After matching process DCT

Figure 6 The example of the results

Table 1 The detection results

Data		Non Illegal Logging (%)	Illegal Logging low (%)	Illegal Logging medium (%)	Illegal Logging high (%)	Total Illegal Logging (%)	Areas of Illegal Logging (m^2)	Results of Detection	Validation
1	Start	79.4151	20.5434	0.0415	0	20.5849	-	-	-
	End	24.1637	49.5052	25.8415	0.4896	75.8363	234266	Detection Illegal Logging	Illegal Logging
2	Start	99.6874	0.3126	0	0	0.3126	-	-	-
	End	32.0278	55.0579	12.7552	0.1591	67.9722	287418	Detection Illegal Logging	Illegal Logging
3	Start	99.7227	0.2731	0.0028	0.0014	0.2773	-	-	-
	End	30.3847	51.4694	17.7674	0.3785	69.6153	294548	Detection Illegal Logging	Illegal Logging
4	Start	99.7853	0.2147	0	0	0.2147	-	-	-
	End	41.4586	48.5767	9.5932	0.1568	58.5414	247772	Detection Illegal Logging	Illegal Logging
5	Start	99.7335	0.2637	0.0028	0	0.2665	-	-	-
	End	32.0734	48.9315	18.9482	0.4468	67.9266	287420	Detection Illegal Logging	Illegal Logging
6	Start	99.6088	0.3912	0	0	0.3912	-	-	-
	End	37.5391	56.4383	6.0141	0.0085	62.4609	263672	Detection Illegal Logging	No Illegal Logging

V. CONCLUSION

The results of illegal logging detection system using Discrete Cosine Transform is showing the accuracy of the detection approaches 83.33% with the minimum area detection is $2m^2$. The accuracy of detection results is influenced by the quality of the input image and brightness level.

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Literature Review on Application of Artificial Neural Network (Ann) In Operation of Reservoirs

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ABSTRACT

Population explosion, urbanisation and industrialisation increased the water demands for various purposes other than irrigation demands like domestic requirements, industrial demands, hydropower and recreation etc. Reservoirs, the most important elements of a complex water resources system are constructed for spatial and temporal redistribution of water resources. Once the structural facilities like dams, barrages and distribution network etc. are constructed, the benefits that could be available / gained depends to a large extent, upon how well these facilities are operated and managed. System analysis like simulation and optimisation has proved to be a potential tool in the planning, operation and management of the available resources. In recent years, artificial intelligence techniques like Artificial Neural Networks (ANN) have arisen as an alternative to overcome some of the limitations of traditional Guide curve methods. Artificial Neural Networks (ANN) is black box models that are used to forecasting and estimating purposes in so many different areas of the science and engineering. A study will be carried out to develop an ANN model for reservoir operation and assess the application potential of ANN in attaining the reservoir operation objectives compared with the conventional rule curves. In this paper, an attempt is made to present the literature review on applications of ANN in the field of water resources engineering with special mention to reservoir operation. This literature review may not be exhaustive but it glimpses the Artificial Neural Network's (ANN) contribution in the field of modelling reservoir operation.

KEY WORDS: *Artificial Neural Network, Guide curves (Rule curves), optimisation, reservoir operation, System analysis.*

I. INTRODUCTION

Reservoir operation is an important element in water resources planning and management. It consists of several parameters like inflow, storage, evaporation and demands that define the operation strategies for giving a sequence of releases to meet a large number of demands from stake-holders with different objectives, such as irrigation, water supply, hydro power etc. Applying simulation and optimisation techniques for reservoir operation is not a new idea. Various techniques have been applied in an attempt to improve the efficiency of reservoir (s) operation. This technique includes Linear Programming (LP); Non liner Programming (NLP); Dynamic Programming (DP); Stochastic Dynamic Programming (SDP). In recent years Heuristic Programming such as Genetic Algorithms (GP), Fuzzy logic and Artificial Neural Networks (ANN) are emerging as an alternative to conventional techniques.

Hydraulic constraints are defined by the reservoirs continuity equation,

$S(t+1) = S(t) + I(t) - R(t) – E(t)$, $t = 1,2……….T$

Where, $S(t+1)$ is storage at time step t+1.,

$S(t)$ is storage at time step t; $I(t)$ is the reservoir net inflow at time step t (including reservoir inflow and precipitation) ; $R(t)$ is the reservoir out flow at time step t and $E(t)$ is the reservoir evaporation at time step t. T is the total number of time steps in the considered period.Constraint on out flow/releases defined by maximum and minimum permissible reservoir releases:

$R\ min \leq R(t) \leq R\ max$ $t = 1,2,……….T$

Constraints on storages defined by maximum and minimum permissible reservoir storages

$S\ min \leq S(t) \leq S\ max$ $t = 1,2…………..T$

Constraints on elevations defined by maximum and minimum permissible water level at specified sites/reservoirs;

$h\ min \leq h(t) \leq h\ max$ $t = 1,2,…….T.$

In general, a multi-objective reservoir operation problem can be formulated as follows
Maximise / Minimise F (x) = [F1 (x), F2 (x) ……….Fn(x)]
Subject to
$q_i(x) \leq 0$ I = 1,2,……….m
Where Fj (x) , j = 1,2,…….N are the objective functions, X is a vector of decision variables, qi (x) are constraints that define the feasible solutions.

II. THEORITICAL BACKGROUND

An Artificial Neural Network (ANN) is a massively parallel-distributed-information-processing system that has certain performance characteristics resembling biological neural network of human brain. In application of ANN to reservoir operation, preparation of train and test data is the first step. Initial storage, inflow forms input data whereas optimal release of reservoir forms output layer of ANN model. Dynamic programming model will be used for optimum operation policy of a reservoir and then simulation model presents the optimum monthly release of the reservoir over a considerable long period. Out of these data some represents train data and some represents test data of ANN model. Finally the structure of an ANN model will be constructed defining 1) the number of hidden layers and neurons in each layer, 2) selection of transformation function's type. Lastly supposing the method for acquiring optimum weight of the nodes, the final network will be implemented by trial and error. Performance of a network is usually evaluated by some parameters such as 1) RMSE (root mean square error); 2) R-(correlation coefficient); 3) e- (relative error). All these parameters should be evaluated for both training and testing sets.

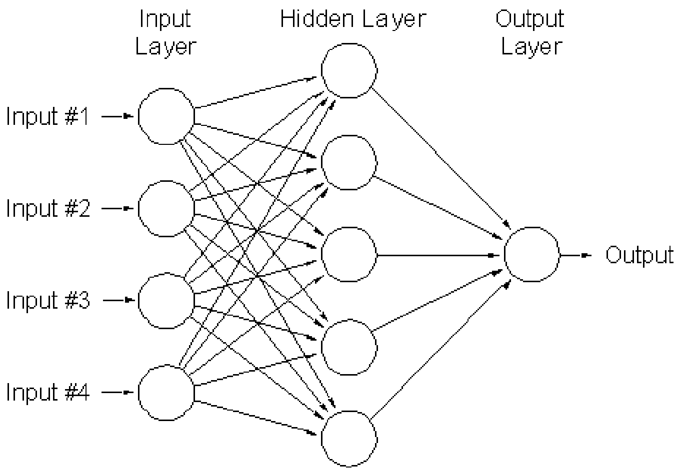
A typical Artificial Neural Network is shown below.

Input-1 Initial Storage

Input-2 Inflow

Input-3 Evaporation

Input-4 Reservations etc.



Output -- Optimum Release

III. HISTORY

Development of ANN has an interesting history. Major events / achievements in ANN history are presented here to appreciate how contributions to the field have led to its development over the years. The year 1943 is often considered the initial year in the development of ANN systems; when W.S. McCulloch and W. Pitts proposed a theory of information processing based on networks of binary processing elements, called 'neurons'. The network differs from a traditional computer in that the steps of the program are not executed sequentially, but in parallel with 'neurons'. This model laid the foundation for future development. In 1949, Donald Hebb first proposed a learning scheme for updating neuron's connections that we now refer to as the Hebbian learning rule. The works of McCulloch and Hebb are on the neural science aspects of neural networks. Minsky in 1954 built & tested the first neurocomputer. Neuron like element called perceptron was developed / invented by Frank Rosenblatt in 1958. It was a trainable machine of learning to classify certain patterns by modifying connections to the threshold elements. The idea caught the imagination of engineers and scientist and laid the groundwork for the basic machine learning algorithms that we still use today. In 1960, Bernard Widrow & Marcian Hoff founded the first neural network company, the minister corporation. The monograph on learning machines by Nils Nilsson in 1965 summarized many of the developments of that time. This book also formulates inherent limitations of learning machines with modifiable connections.

The study of learning in networks of threshold elements and of the mathematical theory of neural networks was pursued by Sun Ichi Amari (1972,1977), Fukushima and Miyaka (1980). Associative memory research has been pursued by, among others, Tuevo Kohonen in Finland (1977, 1982, 1984, and 1988) and James Anderson (1977), Kohonen (1982), Stephen Grossberg and Gail Carpenter (1974, 1982). Hopfield's work in 1982 & 1984 is considered a breakthrough in neural network research. The Hopfield network is directly related to electronic circuits, and therefore is easy for VLSI implementations. The publication by McClelland and Rumelhart opened a new era for the once underestimated computing potential of layered networks. The PDP group published their book Parallel Distributed Processing in 1986. Many research achievements were included. There are numerous publications on neural networks. The International Neural Network Society (INNS) holds annual conferences & publishes its proceedings. The journal Neural Networks was founded by INNS. Many special issues can be found in periodicals under the names IEEE & ACM. Most important articles that establish the foundation of neural networks can be found in two books edited by Anderson & Ressenfield. The list of applications that can be solved by neural networks has expanded from small test size example to large practical tasks. Very large scale integrated neural network chips have been fabricated. Educational offering have been established to explore the artificial neural network science. Although ANN has had interesting history, the field is steel in its early stages of development.

IV. APPLICATION IN WATER RESOURCES ENGINEERING

Neural network is a computational method inspired by studies of brain and nerves systems in biological organism. Neural network models are aimed to mimic the function of human brain. Since the early 1990's there has been a rapidly growing interest among engineers & scientist to apply ANN in diverse field of water resources engineering like forecasting of stream flows, river stage, rainfall, water table fluctuations , ground water modelling, water quality modelling, water management, reservoir operation and so on. Since inflow prediction is the most important and deciding factor in reservoir operation, important events/studies related to application of ANN in inflow prediction are described in the following paragraphs.

French et al (1992) developed three layered neural networks to forecast rainfall intensity fields in space and time. After training with input patterns, the neural network was used to forecast rainfall using the current fields as input. They showed that ANN was capable of learning the complex relationship describing the space-time evolution of rainfall. Ranjithan et al (1993) used neural network based screening approach for ground water reclamation.Smith and Eli (1995) used ANN to model rainfall-runoff process. They used a 5x5 grid cell synthetic watershed to generate runoff from stochastically generated rainfall patterns. They used a back propagation algorithm for training to predict the peak discharge and the time of peak resulting from single rainfall pattern. Muller (1996) and Babovic & Larsen (1998) reported many applications of decision support and management systems, geographic information systems and neural networks. Hsu et al (1999) used ANN for the estimation of physical variables from multichannel remotely sensed imageries for rainfall estimation.Dawson & Wilby (1998) used artificial neural network approach to rainfall runoff modelling. They used multilayered feed forward network structure to model the flood forecasting system and back propagation algorithm for training the network combinations. Mair and Dandy (1999) used feed forward ANN to forecast the salinity in the river. They concluded that any impact different learning rules have on training speed is masked by the effect of epoch size and the number of hidden nodes required for optimal model performance.

Raman and Sunilkumar (1995) used ANN for the synthesis of inflows to reservoirs. Real observations were used to train and test the feed forward networks. Feed forward structure was used to model the ANN and back propagation algorithm to train the ANN. They remarked that the neural network provides a very good fit with the data. Thirumaliah and Deo (1998) used ANN in real time forecasting of water levels at a given site continuously throughout the year based on the same levels at some upstream gauging station and or using the stage time history recorded at the same site.

They concluded that the continuous forecasting of a river stage in real time sense was possible through the use of ANN. Young et al (1997) developed ANN model to simulate fluctuations in mid span water table depths and drain out flows as influenced by daily rainfall and potential evapotranspiration rates. They concluded that it is highly desirable in ANN modelling to have a training data set that include both general and extreme conditions otherwise the model performance may not be very satisfactory. Zealand, Burn and Simonovic (1999) used the ANN to forecast the short-term stream flow. They explored the possibility of using ANN over the conventional methods for the forecasting of the flood. From the results they concluded that ANN approach might provide a superior alternative to the time series approach for developing input-output simulation and forecasting models in situations that do not require modelling of the internal structure of the water shed. Jurgen Garbrecht (2006) compared three alternative ANN designs for monthly rainfall-runoff simulation. The performance of three ANN designs that account differently, for the effects of seasonal rainfall and runoff variation were estimated for monthly rainfall runoff simulation. For the three ANN designs tested, a regression of simulated versus measured runoff displayed a slope slightly under 1 and positive intercept, pointing to a tendency of the ANN to under predict high values and over predicts low values. Rajib Maity & D Nagesh

Kumar (2006) used ANN approach for stream flow forecasting in India. ANN approach is shown to be a useful tool to capture the unknown relationship between stream flow and large scale circulation phenomena. Dogan E at all (2009) studied daily inflow forecasting using ANN. Taesoon Kim at all (2009) successfully used ANN for inflow forecasting of reservoir Hwacheon in South Korea. They concluded that ANN is useful to forecast inflow of reservoir especially for the real time operation since it can be used in case of input data missing. El Shafie A at all (2009) studied radial basis Neural network model and upstream monitoring stations measurements in enhancing inflow forecasting model at Aswan High Dam. El Shafie at all (2011) used ANN technique for rainfall forecasting to Alexandra. Recently Doan (2012) used ANN for reservoir inflow forecasting for Missouri river basin. Ozlem Terzi & Sadik Onal (2012) studied application of ANN and multiple linear regression to forecast monthly river inflow in Turkey. The performance of the models suggested that the flow could be forecasted easily from available data using ANN. A Sarkar & R Kumar (2012) successfully used the ANN approach to examine its applicability to model the event based rainfall-runoff process. The result demonstrated that ANN model are able to provide a good representation of an event based R-R process.

V. APPLICATION IN RESERVOIR OPERATION

Many studies are reported in the literature on the application of ANN in the field of water resources were in the field of stream flow and rainfall forecasting. Few studies have been concentrated on reservoir operation. In most of the studies, feed forward structure and the back propagation algorithm have been used to design and train the ANN models respectively. Important studies/papers related to the reservoir operation studies using ANN are briefly described in the following paragraphs. Saad et al(1994) described a disaggregation procedure by training an ANN. After training, this network gave the storage level of each reservoir of a system when supplied with the value of an aggregate storage level. The training set was obtained by solving the deterministic operation problem of a large number of equally likely flow sequences. They used back propagation algorithm and the minimisation of quadratic error was computed by gradient method. The aggregate storage level was determined by SDP algorithm in which all hydroelectric reservoirs were aggregated to form one equivalent reservoir. He presented a comparison with principle component analysis disaggregation technique with ANN based technique.

Jain, Das and Shrivastava(1999) used artificial neural network for reservoir inflow prediction and the operation for upper Indravati Multipurpose Project, Orissa. They developed two ANN to model the reservoir inflows and to map the operation policy. Feed forward structure was used in ANN model. They found that ANN was suitable to predict high flows. The optimal releases were derived using nonlinear regression by relating inflow, storage and demand. They concluded that ANN was a powerful tool for input output mapping and can be used effectively for reservoir inflow forecasting & operation.Raman and Chandramouli (1996) used artificial neural networks for deriving better operating policy for the Aliyer dam in Tamil Nadu. They used feed forward back propagation algorithm. They derived the operating policies using three models; dynamic programming model, stochastic dynamic programming model and standard operating policy. General operating policies were derived using neural network model from the DP model. The results of ANN with dynamic programming algorithm provided better performance than the other models. Chandramouli et al (2002) developed a dynamic programming based neural network model for analysing the water sharing between two reservoirs in a multi reservoir system catering for irrigation. They found that the DPN model gives very good performance compared to other models considered. Cancelliere et all (2002) used artificial neural networks for deriving irrigation reservoir operating rules and found that operating rules based on an optimization with constraints resembling real system operation criteria lead to a good performance both in natural and in drought period, reducing maximum deficits and water spills. Oscar Dollins and Eduardo Varas (2004) presented a paper which depicts a decision support procedure that integrates continuous simulation, ANN and optimisation to produce decision rules in water shed management for multipurpose complex water resources system. the methodology was applied to the San Juan river basin, Argentina. Result shows conclusively the usefulness of simulation in the study of alternatives of water resources system with multiple use and the feasibility of ANN to encapsulate the behaviour of simulation model.

Ismail Kilnic and Kerem Cigizoglu (2005) focused on the estimation of three random variables crucial in reservoir management i.e. monthly inflow, monthly evaporation and monthly storage. Two different neural network methods, the radial basis functions and the feed forward back propagation are employed for this purpose.

It is shown that both methods provide quite satisfactory estimations reflected in performance evaluation criteria and in plots. Importance of the number of input layer elements can be seen easily from the output tables of the study. These results give us a good opinion about the future parameters of the reservoir. The types and number of the parameters in the input layer affects the resulting forecast very sensitively. Haddad and

Alimohammadi (2005) evaluated the performance of ANN model in extracting the optimum operation policy of reservoirs, as a tool for substituting of simulation models. Using a stochastic dynamic programming model, the discrete values of optimum releases for each month, which are a function of both monthly initial storage volumes and mean monthly releases in a 43 years historical period, are obtained by a simulation model using the SDP rules. These two parts of data were used in training and testing an ANN model and the results shown that ANNs are good substitutions to simulation models.

Farid Sharifi, Omid Haddad and Mahsoo Naderi (2005) derived operation rule of reservoir for a specific duration by dynamic programming. Output of this model was used as a set of train and test data for ANN. In each month by forecasting of inflow of reservoir in that period demand of that month and the reservoir level in the same period, input data of ANN model was available and the release of that month could fit the optimum value. Results had shown that ANN method for low inflow periods is more reliable. With the increase in number of periods of data, accuracy decreases. They concluded that 1) decreasing the number of forecasting periods and trying to retain the network with accurate data, 2) trying to provide a vast range of input data by producing various historical times a series with DP can enhance ANN model to be trained by every possible monthly release during operational period. Paulo Chaves & Fi John Chang (2008) proposed a intelligent reservoir operation system based on an evolving ANN. Evolving means the parameters of the ANN model are identified by the GA evolutionary optimisation technique. The results demonstrated that the developed ANN improved the operation performance of the reservoir when compared to its current operational strategies. The system was capable of successfully simultaneously handling various decision variables and provided reasonable and suitable decisions. Yi min Wang at all (2009) used simulation with radial basis function (RBF) neural network model for reservoir operation rules for the Yellow river upstream multi reservoir system. Amir Ali Moaven Shahid (2009) for deriving the optimal single reservoir operation, two dynamic programming based neural network were developed.

The paper presents the usefulness of the neural network in deriving general operating policy for a single reservoir system. The advantage of ANN model is due to the nonlinearity of the connection exist between all the input and output variables. El Shafie A at all (2011) used an integrated ANN & stochastic dynamic programming madel for optimising the operation policy of Aswan high dam. Sabah S Fayaed at all (2011) investigated the potentials of ANN model to establish relationship between elevation, area and capacity of a reservoir sq. Langat dam in Malaysia. Their study shown that ANN model show good capability to model hydrological process. Dr.Bithin Datta (2012) successfully studied the application of ANN in real time optimal operation of multireservoir system. T. S. Abdulkadir at all (2012) applied ANN technique to model the management of hydropower reservoirs along river Niger. They predicted the future storage values using ANN and formulated operating policies for Jebba and Kainji hydropower reservoirs. They concluded and recommended that forecasting using ANN is very versatile tool in reservoir management modelling.

VI. CONCLUSSION

Artificial neural networks technology is still very new and is developing quickly. The most likely applications of neural networks is to simulate physical systems that are best expressed by parallel networks involving classification, association and reasoning rather than sequential arithmetic computing. Water resources engineering especially prediction of inflows and the optimal operation of reservoirs is one of the most promising application of ANN. An attempt will be made to develop artificial neural network model for reservoir operations and assess the application potential of the Artificial Neural Network in attaining the reservoir operational objectives compared with the conventional rule curves. In this paper, an attempt is made to present the literature review on applications of ANN in the field of water resources engineering with special mention to reservoir operation. This literature review may not be exhaustive but it glimpses the Artificial Neural Network's (ANN) contribution in the field of modelling reservoir operation.

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Road Extraction from High Resolution Satellite Imagery

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ABSTRACT:

This paper describes the task of extracting road from a satellite image. Road information is essential for automatic Geographical Information System (GIS) application, such as cartography, military, traffic controlling software and infrastructure planning. Automatic and semi-automatic, two types of techniques for road extraction, have improved the extraction rate of road networks. In this paper a methodology is introduced to predict the performance of road detection from high resolution satellite image. Extented Kalman Fiter (EKF) is used for single road detection. While in typical areas, where there are obstacles, Particle Filter (PF) with EKF has been used. In contrast to previous work on road detection, the focus is on characterizing the road detection performance to achieve reliable results of the detection when both human and computer resources are involved.

KEYWORDS: *Road map extraction, satellite imaging, Extended Kalman filtering, particle filtering.*

I. INTRODUCTION

Preparing new maps and updating the existing maps, from satellite images and aerial images is a necessary task now these days which has huge usage in various applications. Road network extraction from images depends on human labor, which makes networks database development an expensive and time-consuming. Automated and Semiautomatic road extraction can significantly reduce the time and cost of data acquisition and update, database development and turnaround time. Therefore, automated and Semi-automatic road extraction has been a hot research topic over the past two decades. Road is an important man-made object whose information is important in cartography, traffic controlling, urban planning and industrial development. Road extraction methods are categorized into automatic and semiautomatic methods. In Automated method there is no interaction of human operator with the process while in Semi-automatic method, human operator interacts with system regularly. Road detection and tracking requires knowledge about the road database as well as image related knowledge [1], including previous processing results, rules, and constraints [2]. Most of road tracking methods make assumptions about road properties like

- roads are elongated,
- there is enough contrast between road and adjacent areas,
- surfaces are usually homogeneous

as discussed in the work, proposed by Wang and Newkirk [3], Vosselman and Knecht [4], Mayer and Steger [5], Katartzis et al. [6], Bentabet et al. [7], Zlotnick and Carnine [8], Mckeown et al. [9], Tupin et al. [11].
Problem with these systems is that assumptions are pre-defined and fixed whereas image road properties may change. For example:

- Road surfaces may be built from several materials that can cause change in radiometric properties.
- Roads may not be elongated at junctions, bridges, and inclined surfaces.
- Land objects such as trees, buildings, vehicles and shadows may occlude the road.

Such properties cannot be predicted completely and establish a source of problems incomplete automated systems. The solution to such problem is to follow a semi-automatic approach that holds human in the entire process where computer vision algorithms are used to help humans performing these tasks [12]. McKeown and Denlinger [10] used a semiautomatic road tracking technique working on road profile correlation and road edge detection. The user initialized the tracker to find out starting values for position, direction and width of the road. The axis points of road were drawn by the road trajectory and correlation model. A road tracker based on a single-observation Kalman filter was introduced by Vosselman and Knecht [4]. To initialize the state of the Kalman filter and to extract a template for road profile human input was used. The Kalman filter then updated its state to find out the road axis points from matching the template profiles to the mentioned profiles. Baumgartner et al.

[13] proposed a model based on the above method. An interaction interface was projected to organize actions of human operator with computer predictions. Gruen and Li [14] used Semi-automatic approaches which includes the least squares template matching methods. These semi-automatic systems grant human operator to start the road tracking and to stay connected with system in entire tracking process. Xiong and Sperling [15], presented an another semi-automatic system which shows a semi-automatic tool that assist the user to check and correct the errors resulting while performing road network matching. This paper represents a different approach that uses a semi-automatic road tracking approach working on human– computer interaction. It also uses the Bayesian filtering as shown by Arulampa-lam et al. [16]. Extended Kalman filters and particle filters, two models of Bayesian filters, are used to calculate the current state of the system based on past and current observations. When the tracking is fail, a human operator finds out the cause of the failure and initializes another filter. The Observation profiles are created from the road texture described by its 2D features. The current state of the Bayesian filters and the multiple observations are used for optimal profile matching. Therefore, the road tracker is flexible enough in handling the different types of road including obstructions like trees, bridges, vehicles, shadows road surfaces changes and more. These approaches consist of beginning of the road. One limitation of the past work, mentioned in the road extraction methods [4,16] is the restricted processing of the image. These algorithms use EKF and PF for a given seed point on the road tostart the tracing. These stop their processing when an occlusion is occurred, a junction, or even a sudden variation in the direction of the road is encountered.This paper provides a practical solution to the applications used in image processing and remote sensing areas. There are various automatic algorithms have been generated, but a very few of them have been used practically [18].

II. PREPROCESSING

2.1.Road width estimation

In the previous work of semi-automatic road trackers, proposed by McKeown and Denlinger [10]; Baumgartner et al. [13] and Vosselman and Knecht [4], the human operator is required to enter the road width at the starting of the tracking process. Road width is required to determine whether the road profiles are extracted correctly or not, whereas in our system, the road width is calculated automatically at the starting of the tracking process. A road segment is entered by the human operator. In this work an assumption is taken that the roadsides are straight and parallel lines to each other on the both side of the road axis. We need to calculate the distance between the roadsides to figure out the width of the road.To detect the road edges, the selection of edge detectors is important for the generation of appropriate edge information.The Sobel, Robert and Canny detectors are commonly used edge detectors. Sobel cannot provide satisfactory results because some redundant edges within the roads can also be detected, but cannot be removed due to the fixed parameters set in the Sobel. The Robert edge detector can easily achieve a clear and proper edge image from a Quick Bird Pan image. However, some detailed edges in indistinct edge areas cannot be detected. The Canny edge detection algorithm is known as an optimal edge detector, which needs to adjust two thresholds and a standard deviation of a Gaussian smooth mask to yield a proper result.So we have applied the Canny edge detector. The main reason to use the Canny edge detector is, the edges from the Canny detector are thin. But, edges in blurred areas can be clearly delineated. That means it provides good results while dealing with low resolution images.

(a) (b)

Figure 1 a) Satellite image and, **b)**Edge detection using Cannyedge detector.

2.2 Profile extraction

An reference profile from the road segment inputted by human operator is created as a vector of grey levels. The new profiles are then generated from another road segments inputted by human operator and kept into a list, called profile list, for using next time. To increase the performance robustness of the system, we use the two-dimensional features of the road. We seek along a line that is perpendicular to the road direction, and also seek a line along the road direction. Finally, we combine the both Profiles that were extracted in both. The parallel profile is required in grey level values which change little with respect to the road direction, whereas this will not work on off-road areas. So the chance of tracking the off-road is reduced and, the result, there are less tracking errors.We find a profile sequence, containing the information about the road texture which may include occluding objects, from the human input. For a following sequence of road profiles P=[p_1, p_2,…, p_n], the process profile extraction goes as follows. First of all, we need to compute an average profile. Then each profile is cross-correlated with this average profile sequentially. If the correlation coefficient is less than a threshold, fixed to 0.8, the profile is discarded from the profile list sequence. Following this way, all points on the road axis are calculated and also road profiles generated from noisy areas, for example, where cars, bus and other vehicles are present, are discarded. The algorithm keeps repeating the entire process until a sequence of new profiles is created. The average profile of the new sequence is considered as the final profile for the road segment. The strength of the noise removal process is influenced by road conditions and its texture. This method very effective if there is less occlusion on the road. When, the road is populated with more occlusions, for instance, roads with a traffic jam, or roads under the shadow of trees, the system may result some noisy reference profiles. In such type of cases, the efficiency of the system falls.

III. ROAD PATTERN

We are required to find coordinates of the road median on an image to apply EKF to trace a road in satellite images. There is an initial point on the road is required so that EKF can start its operation. This initial point can be inputted by a human operator or through an automatic approach. Once initial point is inputted, the EKF starts its process and sequentially look to the next point on the road according to some defined time step.

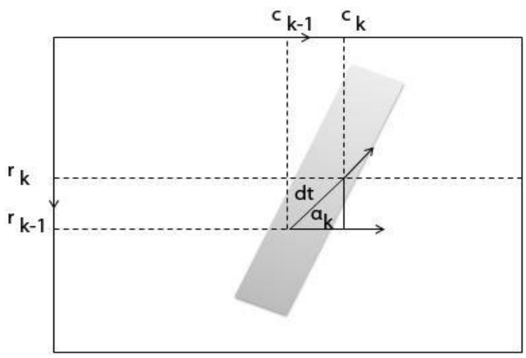


Figure 2 The Road Model.

The process takes the noisy measurement to get the best estimation of the state of the road at the given point. Therefore, an equation can be used to the system with the artificial time step as follows:

$$\boldsymbol{a_k = f\,(a_{k-1}) + m_k} \tag{1}$$

where a_k represents the position of the k^{th} point while tracing the median of the road, and m_k represents the process noise, measured from variation of the road position from one point to the next. The measurement vectorn_k is related to the state vector a_k and the measurement noise v_k through the following stochastic difference equation referred to as themeasurement equation:

$$n_k = h(a_k) + v_k \tag{2}$$

We used a 4-D state vector in the formulation of the road-tracing, as in [2], as follows:

$$a_k = [r_k \quad c_k \quad \alpha_k \quad \gamma_k]^T \tag{3}$$

where r_k and c_k shows the row and the column numbers of the center of the road, α_k is the direction of road, andγ_k is the change in direction of the road curvature in the k^{th} step. Fig. 1 shows the relationship between the road center coordinates at step k and the road center coordinates at step k−1. Applying the following relationship, the system equation becomes

$$a_k = \begin{bmatrix} r_k \\ c_k \\ \alpha_k \\ \gamma_k \end{bmatrix} = \begin{bmatrix} r_{k-1} - dt.\sin(\alpha_{k-1} + \gamma_{k-1}dt) \\ c_{k-1} - dt.\cos(\alpha_{k-1} + \gamma_{k-1}dt) \\ \alpha_{k-1} + \gamma_{k-1} \\ \gamma_{k-1} \end{bmatrix} + w_k \tag{4}$$

The measurement equation given by

$$n_k = H_k a_k + v_k \tag{5}$$

H_k can be defined by the following matrix

$$H_k = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix} \tag{6}$$

where v_k is the measurement noise found in the process of finding the measurement in the k^{th} step.

IV. EKF AND PF

4.1 Extended Kalman filtering

Extended Kalman filtering is used to solve non-linear time series [19] when the posterior density is taken as Gaussian. First, we will compute Φ, which holds the coefficients of the linear time update equations

$$\Phi_k = \frac{df_k(x)}{dx} | x = x'_{k-1} \tag{7}$$

The covariance matrix of the predicted state vector is given by

$$P_{k|k-1} = \Phi_k P_{k-1|k-1} \Phi_k + Q_{k-1} \tag{8}$$

After the state update, the EKF continues the iteration by solving the given update equations:

$$K_k = P_{k|k-1} J^T (J P_{k|k-1} J^T + R_k)^{-1} \tag{9}$$

where J is measurement matrix shown as follows

$$J = \begin{pmatrix} 1 & 00 & 0 \\ 0 & 10 & 0 \end{pmatrix} \tag{10}$$

and R_k is covariance matrix of measurement noise

$$R_k = \tau^2 \begin{pmatrix} sin^2(\alpha_k) & sin(\alpha_k)cos(\alpha_k) \\ sin(\alpha_k)cos(\alpha_k) & cos^2(\alpha_k) \end{pmatrix} \tag{11}$$

where τ^2 is the variance in the observation. The initial state of the Extended Kalman filter is set to $a_k = [r_k \quad c_k \quad \alpha_k \quad \gamma_k]^T$,where r_k and c_k shows the row and the column numbers of the center of the road, α_k is the direction of road, and γ_k is the change in direction of the road curvature in the kth step. Vosselman and Knecht [4] in road tracking, proposed covariance matrix Q_k of the process noise, decided by the difference between the constant road curvature and the actual curvature changes.

4.2 Particle filtering

We assume that the standard deviation $\tau = \sqrt{2}$ and so the observation is as follows:

$$P(z|x^i) \alpha \frac{1}{\sqrt{2\Pi}} exp\left(-\frac{d_i^2}{2\tau^2}\right) \tag{12}$$

where d_i is the Euclidean distance between the location of particle x^i and the observation. The particle filter arranges the weights of each particle in the entire process. Lee et al. [20] worked on Particle filtering in non-linear and non-Gaussian processes modeling. The filter figures the posterior density p ($P_k|z_k$) by the following particle set {s_k^i, w_k^i, i=1,2,...N} in every time step k, where w_k^i is weight of the particle s_k^i.Given the particle set {s_{k-1}^i, w_{k-1}^i, i=1,2,...N} at time k–1, the iteration k of the particle filter can be summarized as follows:

1. Build a density function $\{c_{k-1}^{i}\}$ on the particle set. Prepare N particles $\{x_{k-1}^{i},\ i = 1, \ldots, N\}$ according to thedensity function. Sample the i^{th} particle x_{k-1}^{i} according to a unvarying random number u^{i} on [0, 1] and explore for the first particle s_{k-1}^{i} in such a way so that $c_{k-1}^{i} \geq u^{i}$.
2. Modify every particle to create new particles $\{x_{k}^{i}$, i=1,…,N}. In the state updation process, the road curvature γ_k is affected by a zero mean Gaussian random variable.
3. For each particle estimate new weights, according to how easily they match the observation z_k. The weightis then normalized and is proportional to $P(z|x^{i})$. This is a way to create a new particle $\{s_{k}^{i}, w_{k}^{i}$, i=1,…,N}.

The approximated state at time k is therefore.

$$E(x_k) = \sum_{i=1}^{N} s_k^i w_k^i \tag{13}$$

V. TRACKING PROCESS

5.1 Stopping criteria

The stopping criteria in tracking the road, the observation of Vosselman and Knecht [4], is accepted. They define some threshold. If the coefficient is below the threshold, and some other criteria are met (e.g. a high contrast between the profiles), the observation is refused. The jump-over strategy is used while considering the small occlusions on the road, for example, cars and other vehicles. To skip road positions, where there is occlusion, the jump over scheme uses an incremented time interval, so that a state without any occlusions can be achieved. In real applications, road properties are complex enough.A road profile can be generated by cross-correlating a profile which is extracted from a non-road area with grey level. Moreover, the Bayesian filters might fail because the predicted position may not hold an observation profile that could match with the reference profile. For example, when occlusions are present on the road, and there is a small match between reference and observation profiles. There is a rejection of observation. Therefore the system then needs an interaction with human operator, resulting tracking process less efficient for the user.

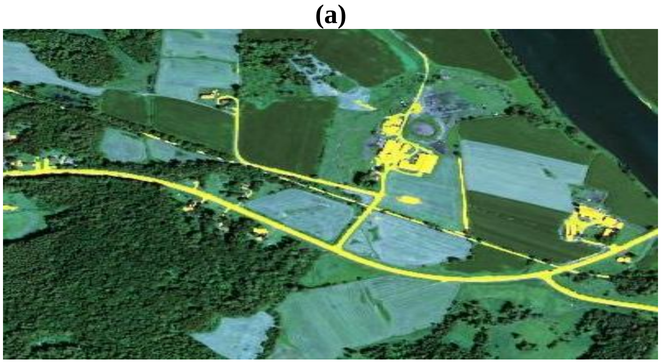
5.2 Improving efficiency

The algorithms of Vosselman and Knecht [4]Baumgartner et al. [13] used previously, it is required to extract a new reference profile each time when the old reference profile was discarded. We define a system in which all reference profiles are held and the road tracking process collects knowledge about the road status. The latest profile is keeps the highest priority while matching the profile. The Bayesian filter seeks the list of reference profiles for a match if matching is failed. To show the little change in the road texture, the reference profile is modified by matches attained through weighted sum technique. Here we proposed an algorithm that uses the observation-reference profile together, in combination. The search space *V*=<*X,Y,Θ*> is described by the current state a_k, where *X*, *Y* and *Θ* are limited by a small neighborhood of r, c and α respectively. LaBerge [21], propose an approach in which humans use multi-scale attention to concentrate on significant features and to mitigate the effects of distracters. We adopted a step prediction scheme to increase the efficiency of road tracking to model such behavior. The Bayesian filters, helps to calculate the time interval τ. The value of the initial prediction scale is set to 1.When there is a successful match occurs, the value of the scale parameter is incremented by 1. On the other hand, if fails, the prediction scale is again fixed to 1. Following this way, we can automatically adjust the time interval. If the road is very long, straight and homogenous in texture, the road tracking process can assume the next point on the road axis using a larger scale and dismissing some details on the road and hence enhancing the speed of the road tracking process.

VI. ROAD EXTRACTION RESULT

We have applied our method to a real satellite image. The satellite image is a taken from Indian Remote Sensing (IRS) satellite with 5-m spatial resolution. Our algorithm needs an initial point on a provided road segment, as an initial point, to start the road tracking process. This initial point can be entered by a human operator, or we can get it through an automatic method. We have used different parameters for EKF module and the PF module, because the jobs of these modules are different. Our work shows the process of extraction of road segment by the EKF module, until it meets the junction. The EKF delivers the process to the PF module. The algorithm continues its operation in the same fashion until it detects all the road segments. If a road intersection is encountered, the PF keeps looking for all road branches devised from that intersection. On the other hand, if a dead-end road is encountered, the PF module decides that there is an end of the road. The PF module stops the processing of dead end following of all branches using the branch validation criterion method. For measuring the results, we have employed an image generated by operator that have used as reference for a road network axis in our work. The results are measured with the help of evaluation metrics addressed correctness and completeness, as it has been used in [22] and [23].

(a)



(b)

Figure 3 a). High resolution image taken from satellite, **b).**Extracted road from high resolution satellite image.

Correctness indicates how much the extracted road match to a real road while completeness shows an amount of how much the extracted results are completed. We have used the EKF module to detect the measurement for correctness of our results. On the other, the center points gained from the PF module on considering areas have been rejected because they are noted picturing a clear road axis location.

6.1 Some Other Results

(a) **(b)**

Figure 4 a). Satellite Image **b).**Extracted Road.

VII. CONCLUSION

We introduced an algorithm based on the combination of the EKF and the PF for tracking the road from satellite images. This algorithm is tested on an IRS satellite image with 5-m spatial resolution. In this paper we have used an interaction model between human and computer to make the road tracking process effective. Our algorithm can reduce human labor. It also ensures accurate results. To match observation profiles to reference profiles we have used road tracking method, based on Bayesian filters. The tracker measures the result by using cross- correlation between road profiles extracted from previous and current position respectively. Furthermore, our algorithm stays robust no matter how drastic changes in the road direction and change in the road width. One limitation of our algorithm is that it has slow processing for the PF module. As algorithm uses the PF module only on road intersections and road obstacles, the slow processing of it does not influence the entire road tracking process. The proper inputting of the parameters of algorithm impacts the effectiveness of the road network extraction. Moreover, the algorithm is required to check its performance on complex urban, which may require the need of some modifications in the future work.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Heavy Metal Biosorption Using Cheap Biomass

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ABSTRACT

The metal taking capacity of several types of biomass, agro products and by-products has gained attention during recent years. In the present study, one such material i.e., coconut shell powder was chosen as the biosorbent for the removal of Cu(II) from aqueous solutions. The adsorption capacity of this sorbent was investigated by batch experiments. High adsorption (>90 %) is achieved in the present study.

***KEYWORDS**: Biosorption, Copper, Coconut shell powder*

I. INTRODUCTION

In recent years contamination of aquatic bodies by various pollutants has intensified the deterioration of several ecosystems. Among these heavy metals cause severe damage to the living systems at various levels. Exposure of the aquatic systems to heavy metal pollutants from various industrial operations like metal ore refining, electroplating, pigments, mining, battery and accumulator manufacturing has been a serious threat to the environment. The uptake of both metal and non-metal species by biomass is termed as biosorption. Work on the metal binding capacity of some type of biomass and agroproducts [1-3] has gained momentum recently. A number of agricultural waste and by-products like coffee beans, rice husk, cellulose extracted from rice husk (RH-cellulose), cellulose and lignin extracted from coirpith, tea waste, aspergillus niger, spent-grain, litter of natural trembling poplar (*Populus tremula*) forest, nutshells of walnut, hazelnut, pistachio, almond, and apricot stone [4-10] are studied in literature for their removal capacity Cu(II) ions and other heavy metals from aqueous solutions.

The use of coconut shell powder as an adsorbent material presents strong potential due to its high content of lignin, around 35-45% and cellulose around 23-43%. Because of its low cost, powder of coconut shell- *Cocos nucifera* is an attractive and inexpensive option for the biosorption removal of dissolved metals. Various metal binding mechanisms are thought to be involved in the biosorption process including ionexchange, surface adsorption, chemisorption, complexation, and adsorption complexation. [11-13]. Coconut shell powder is composed of several constituents, among them lignin acid and cellulose bear various polar functional groups including carboxylic and phenolic acid groups which are involved in metal binding [11, 14]. Cellulose and lignin are biopolymers and are considered appropriate for the removal of heavy metals. In the current work, coconut shell powder as biosorbent for Cu (II) ions from aqueous solutions was studied. The influence of parameters like pH and particle size is presented. The Scanning Electron Microscope (SEM) analyses are used for characterising coconut shell powder and experimental data obtained was correlated using adsorption equilibrium isotherms and kinetic models.

II. METHODS

2.1 Biosorbent material

The powder of coconut shell powder used in the present work was prepared in our laboratory using mechanical unit operations equipment like jaw crusher, hammer mill, rotap sieve shaker and standard sieves by the method described by Coconut Board of India.

2.2 Biosorption Experiments

Biosorption experiments were performed batch wise at (27^o C) in Erlenmeyer flasks, stirred in reciprocal shaker for 4 h. In all sets of experiments, accurately weighed coconut shell powder was thoroughly mixed in to 250 ml of aqueous metal solution. At regular intervals of time (15 min), a sample of the mixture is filtered to remove the fine particulates and the filtrate was analyzed by atomic adsorption spectrometer (AAS) for the concentration of metal species. The solution of metal species was prepared dissolving $CuSO_4.5H_2O$ (analytical grade supplied by Merck) in deionised water and pH adjustments were made using HCl and NaOH solution.

III. RESULTS AND DISCUSSIONS

3.1 Effect of pH

pH is an important parameter in determining biosorption levels. The effect of pH (in the range 5-9) on the uptake levels of powder of coconut shell from an aqueous solution is evaluated. The effect of initial pH is presented in Fig 1. The Cu (II) removal increased from 42 % at pH 5 to 96% at pH 9. There is no significant increase from pH 7 onwards. Both the surface functional groups present on the coconut shell powder and metal chemistry in solution relate to the dependence of metal uptake on pH. At low pH, the surface ligants are closely associated with the hydronium ions (H_3O^+) and restricted the approach of metal cations as a result of repulsive force [20]. Further, the pH dependence on the metal ion uptake by coconut shell powder can be justified by association-dissociation of certain functional groups like carboxylic and hydroxyl group present on biomass. At low pH, most of carboxylic group are not dissociated and cannot bind the metal ions, though they take part in complexation reactions. With these observations, further experiments are performed at pH 7 only.

3.2 Effect of particle size

Influence of the particle size of coconut shell powder used for uptake of Cu (II) was studied. The results presented in Fig. 2 show a gradual decrease and then increase in removal of Cu(II) with decrease in particle size. It is important to note that larger particles with spherical surfaces, present higher external mass transfer. In this case, higher metal adsorption from these particles is attributed to mass transport inside the sorbent particles [12]. At the same time as the particle size decreases the surface area for adsorption increases which in turn contribute to high adsorption at fine particle size. Optimum particle size can be obtained if precise contributions of mass transport and surface diffusion are ascertained. This has been not formed part of this work.

IV. CONCLUSIONS

Coconut shell powder was confirmed as a potential biosorbent in the removal of copper from aqueous solutions. Investigations showed that pH and particle size influence the uptake of Cu (II). The micrographs obtained by SEM analyzes before and after the uptake by coconut shell powder do not show any significant difference indicating the Cu bands and absence of Cl, K bands in EDS after metal uptake indicate that a possible ion exchange mechanism.

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MANET: Black Hole Node Detection in AODV

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ABSTRACT:
In today's world every user need to transfer data with one-other irrespective to individual's geographic location. Hence a Mobile Ad-hoc Network (MANET) has become a vital part of modern communication over wireless network. MANET helps to transfer data without fixed infrastructure and many autonomous nodes vigorously can become part of ongoing communication. Due to this, MANET gets attacked by malicious nodes very easily. Hence secure routing of data packet in MANET is essential task. There are number of attacks we have seen in MANET like Denial of Service attack, Jellyfish attack, Warm-Hole attack etc. In this paper we are concentrating on Black Hole attack in AODV i.e. Ad-hoc On Demand Distance Vector Routing. We are proposing authentication techniques based on Authenticated Node, Authentication on Path, Authentication Key Packet and Data Routing Information table (DRI) on each node.

By using authentication techniques we are trying to detect black hole in network so that we can transfer data packet over secure path.

KEYWORDS: *AODV routing protocol, Authentication Terminologies, Black Hole Attack, MANET (Mobile Ad-hoc NETwork), External or Internal attack, Active or Passive attack.*

I. INTRODUCTION

Wireless applications and devices(Laptops, Cell phones, Personal Computers etc) have mainly two modes of operations; one is in the presence of Control Module (CM) called as *Base Stations* and second is *Ad-Hoc connectivity* where there is no Control Module involved. The devices belong to wireless network exchanges data with each other without any wired connection between them. For communication between mobile devices, these nodes should belong to the transmission range of each other; if there is no direct connection from source to destination than intermediate nodes assist for transmission using hop by hop connections. Ad-hoc network having various characteristics [1] like non- infrastructure, autonomous node, dynamic in nature, scalable and many more which causes MANET to become popular in this modern era.

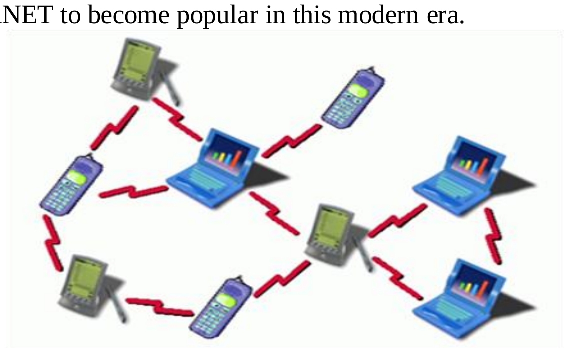


Figure 1. Mobile Ad-hoc NETwork

Mobile Ad-Hoc networks are full of *autonomous nodes* i.e. the nodes which are not having any central control node for their management. Due to the mobility of devices *dynamic topology* appears in wireless network. Communication can be carried out with mutual understanding among the nodes. There is no any restriction on

mobile node for leaving and entering in the network. These autonomous nodes can act as host/router or both at the same time. A *host* which demands for particular services from other nodes and a *router* node helps to forward the data to the neighboring nodes also discovering and maintaining routes for other nodes. The mobile nodes have *self-configuration* ability due to which they can organize themselves in any network without prior infrastructure. Ad-hoc networking is applied on battlefield or for military units where static infrastructure is impossible and stills the communication among the users within a transmission range is necessary [3].The Attributes of MANET like changing topology, lack of central monitoring and management, no security mechanisms, limited battery and open medium where all nodes can access data within the communication range without any transmission medium between them; any un trusted node can become part of ongoing communication and demolish current packet transmission by dropping the packets, by changing the data from packet headers or by presenting wrong information to the network. Hence MANET is enormously prone to get attacked by malicious nodes.

II. COMMUNICATION IN MANET

In MANET communication takes place using TCP/IP structure among its mobile users. Therefore traditional TCP/IP has been modified to achieve betterment in transmission [3].There are various routing protocols which are use to route the packet securely from source to destination over the communication channel. The protocols like AODV (Ad-hoc On Demand Distance Vector), DSR (Dynamic Source Routing), DSDV (Destination Sequenced Distance Vector) etc are some routing protocols which are useful over wireless communication. Major aim of routing protocol is to establish shortest path (i.e. with minimum hop count) between source and destination nodes also less bandwidth to be used to traverse packets in timely manner.Routing protocols in MANETs are organized into three different categories according to their functionality. The categories and the name of protocols in each category are listed down in Fig. 2:

1. Reactive protocols
2. Proactive protocols
3. Hybrid protocols

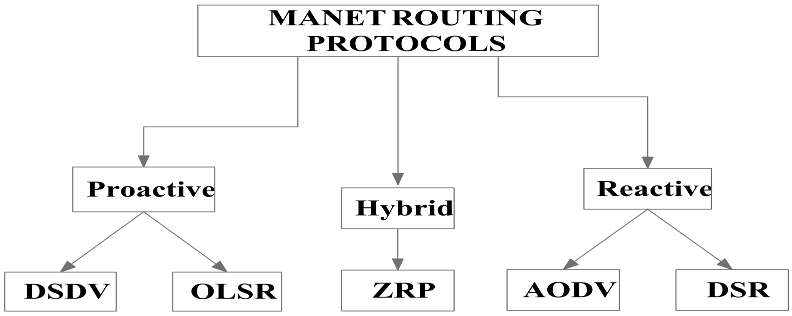


Figure 2. MANET routing protocols

1) Reactive Protocols:
Reactive protocols are known as *On Demand protocols*. These protocols are called reactive because they do not initiate route discovery by their own until any source node in the network request to find a route. These protocols setup routes when packet transmission demanded by users in the network.

2) Proactive Protocols:
A proactive protocol constantly maintains the updated topology of the network. Every node in the network knows about their neighboring nodes in advance. The routing information tables are maintained on each node and which are updated periodically. Whenever there is a change in the network topology, these tables are updated. The nodes exchange topology information with each other; any time when they needed.

3) Hybrid Protocols:
Hybrid protocol; it is a combination of strengthens of reactive and proactive protocol. It gives better results of transmission in MANET compare to other two protocols. It uses reactive or proactive approach as per the requirement of zones since it divides whole network in the small zones.

III. ATTACKS IN MANET

There are some flaws in MANET like [6]: No secure boundaries, No central management, Problem of scalability, Limited Resources, Dynamic topology, where it is hard to find out malicious nodes. Due to all this defects there are two main categories of attack one based *on the source of attack* i.e. External or Internal and other is based *on behavior of attack* i.e. Active or Passive [7]. In the fig. 3 and Fig.4 the circle represents different nodes in network which is shown by rectangle.

3.1.External and Internal Attacks: As shown in Fig 3 respectively;
External attacks: An External attacker from outside the networks tries to get access to the current network and once it becomes part of the network start interrupting ongoing transmission and performance of the whole network. External attacks can be prevented by implementing firewall, where the access of unauthorized person to the network can be avoided.

Internal attack: An attacker node is already works as internal node of network and also contributes in normal network activities. But after some transmission this node starts its malicious behavior. It is difficult to find internal malicious node of the network hence Internal attack is rigorous than external attack.

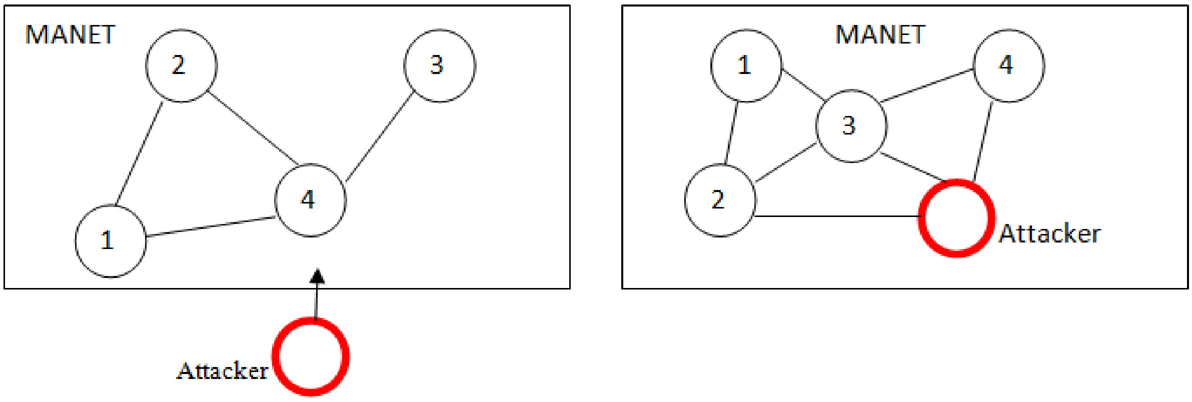


Figure 3. External and Internal attacks in MANET

3.2.Active and Passive Attacks: As Shown in Fig.4 respectively;
Active attack: It can be external or internal type attack. Being part of active network a node can destroy ongoing transmission by changing data, by stealing data or by denial of service.
Passive attack: In this attack the node does not introduce attack before getting the enough information about current network. The attacker node first observes whole network carefully by considering points like how nodes are communicating, what are the positions of the nodes.

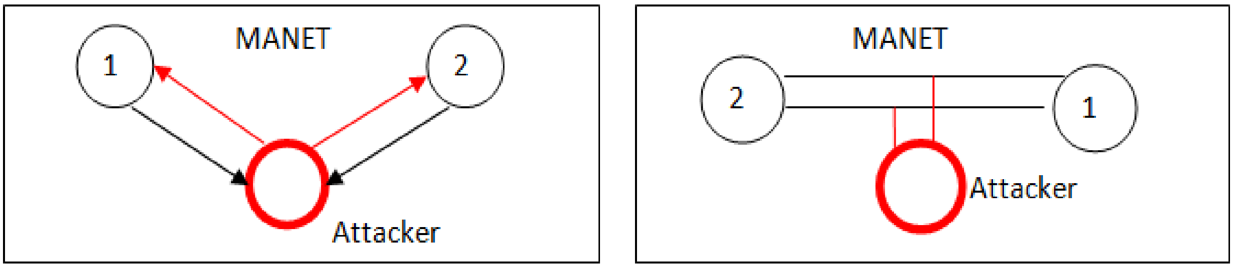


Figure 4. Active and Passive attacks in MANET

IV. BLACK HOLE ATTACK IN MANET

Black Hole is considered as an inside attack occurs in Network Layer and which is hard to find out also due to malicious node many damages takes place in the network [1] [4]. A black hole node sends fake routing information, claiming that it has an optimum route to reach to the destination requested by the source node and directs other good nodes to route data packets through it and consumes the transferred packets. Some major destruction generated by Black Hole is listed below:

- It increases network overhead; Due to unwanted transmission.
- It decreases the network's lifetime by boosting energy consumption unnecessarily.
- It destroys the network by dropping the critical data packets over the current communication channel.

As shown in Fig.5 the network having one black hole node; which shows fake route from source to destination and due to which the transmission error occurs and causes hazard in the mobile Ad-hoc network.

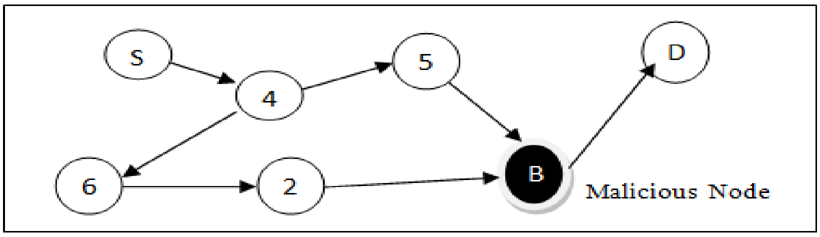


Figure 5. Black Hole in MANET

V. PROPOSED AUTHENTICATION TERMINOLOGIES

In our proposed system we are using AODV protocol and also different terminologies which help us to determined black hole in the network. We will work on it as reactive technique.

5.1. AODV (Ad-hoc On Demand Distance Vector) Protocol [7]

It is On Demand reactive protocol. It uses three types of messages: explained using Fig 6

[1] RREQ (Route REQuest): Source node which wants to communicate with destination node broadcasts RREQ message. Each RREQ packet has TTL (Time To Live) value which gives idea about how many hops needs to be traverse. Some fields of Route Request message packets are shown below;

Route Request TableFileds

Source_ address	**Source_ sequence**	**Destination_ address**	**Destination_ sequence**	**Broadcast_ ID**	**Hop_count**

[2] RREP (Route REPly): A node which has requested identity or which has information about it generates RREP message and unicast it using the reverse path which was generated at the time of RREQ to reach the initiator of this request. Some fields of Route Reply message packet are shown below;

Route Reply TableFileds

Source_ address	**Destination_ address**	**Destination_ sequence**	**Hop_count**	**Time to Live (Lifetime)**

[3] RERR (Route ERRor): Every node in the network periodically keeps updating its routing table by checking status of its neighboring nodes. If any node found its neighbor is down than it generates RERR message to update other nodes in the network.

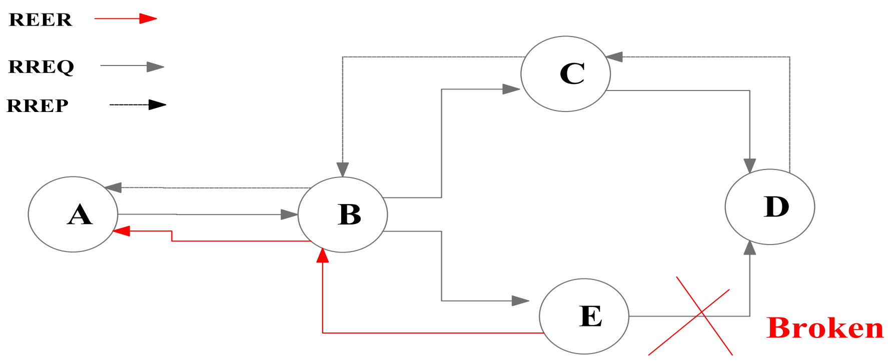


Figure 6. AODV protocol transmission with all type of messages

5.2. Proposed Terminologies

Following are some terminologies which we are using to transfer our very first data packet over the network using AODV protocol.

5.2.1 Authenticated Node (Authn)

If any node has already done successful transmission via its immediate node than the status of its Authn will be True. It means that path is secure for further transmission in same period.

As shown in Fig.7 **Authn(X,Y)** Sender : Node X Receiver : Node Y

Node Y is authenticated to Node X; it means Node X has at least one successful transmission completed through Node Y.

Hence Authn(X,Y) = T else Authn(X,Y) = F

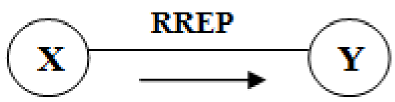


Figure 7. Transmission between Node X and Node Y

5.2.2. Authentication on Path (Authp):

When we are not getting an authentication of required neighbouring node that time we should carry Authentication of Path. We have to choose immediate neighbours of current node and if only one node is available than by considering mutual trust without waiting for any other option directly transfer packet to that node.

As shown in Fig.7 **Authp(X,Y)** **If Authn(X,Y) = F then Authp is carried out.**

Choose all path from Node Y i.e. Set of all Pi

If Pi = { } Then send to exact next node

5.2.3. Auth Key Packet (Authkey):

It is a packet used for authentication of destination. When intermediate nodes receives RREP message from any source node; the intermediate nodes will forward the acknowledgement packet along with some authentication majors. The authentication will be done using security questions or more information to authenticate the nodes on the route. We are considering MAC Address and also we will see Data Routing Information of each node along with normal routing table [3][6].In DRI table we will add the fields like node and the transmission taken *Through and From* that node. The DRI table will be updated periodically.

5.2.4. Acknowledgement:

After successful completion of first data packet acknowledgement is sent back to the source node.
If Ack = success

Ack(sucess) = {Ack 0, info of Authn(X,Y)}

If Transmission between Node X and Node Y is successful than ack will be sent to Node X also the status of Auth(X, Y) will be updated.

If

Than updated Auth(X,Y) = T

Figure 7. Successful transmission through Node X to Node Y

After following these steps source will receive Authkey packet from all the nodes which are on its path.

If Authkey packet differs considering its security means then the Black hole is detected.

Else data packet can be passed from the path.

5.3. Example for detection of Black hole using above technologies:

As shown in the following network; there are total six nodes which are connected.

Source Node = A   Destination Node = D

Let; Authn(A,B) = T Authn(F,D) = T   Means Successful data transmission already occurred.

Authn(B,C) = F Authn(C,F) = F Means Still any successful data transmission not occurred.

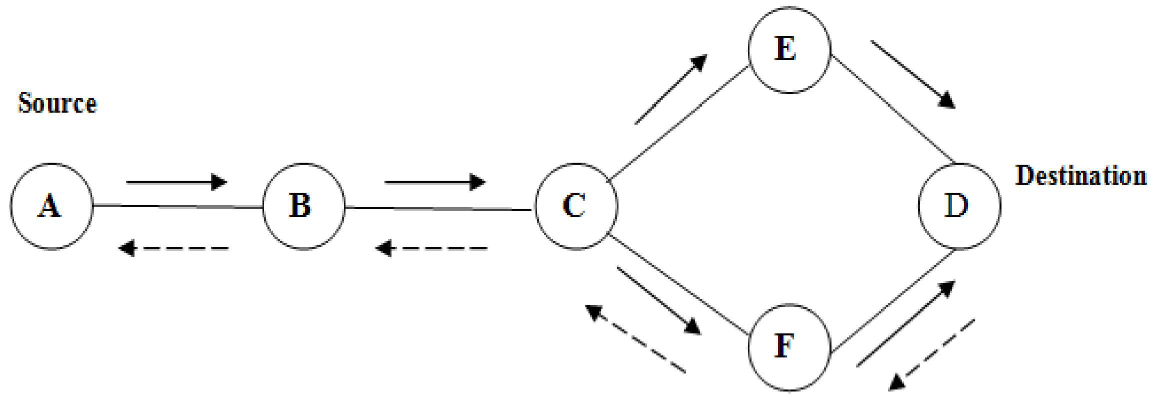
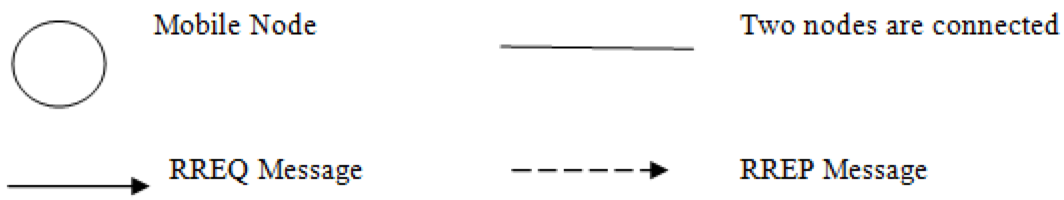


Figure 8. MANET Example with our Terminologies

Some notations we have used like:



Steps for solving:

1. Initial data packet transmission is initiated from source Node A.
2. Since Authn(A,B) = T

   Pass packet to Node B
3. Since Authn(B,C) = F we will go for Authp(B,C)

   Also $P_{B\ TO\ D} =$ { 0 }

   No other authenticated path exists from Node B hence pass packet to Node C by considering mutual trust.
4. Authn(C,F) = F and Authn(C,E) = F   Hence consider Authp

   Since $P_{C\ TO\ D} =$ {CFD,CED} Hence send packet to both the path.

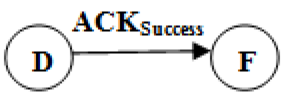
   After getting reply of Autkey packet from Node F and Node E.

5. Since Authn(F,D) = T

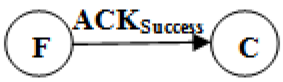
   Pass packet to F by considering Authp(C,F) and then Pass packet to D.

6. After successful transmission of data packet from Node A to Node B; routing tables of receiving nodes are updated.

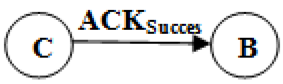
7. If there is any changes seen in authentication packet than that node can be consider as Black Hole in the network.



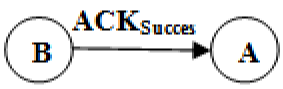
Node F updates its Authentication as; **Auth (F,D) = T**



Node C updates its Authentication as; **Auth (C,F) = T**



Node B updates its Authentication as; Auth **(B,C) = T**



Node B updates its Authentication as; Auth **(B,C) = T**

VI. CONCLUSION

Security of MANET is one of the vital features for its deployment. In our proposed system, we have analyzed the behavior and challenges of security threats in mobile Ad-Hoc networks with black hole detection technique. Although there are many solutions have been proposed but still these solutions are not perfect. If any solution works well in the presence of single malicious node, we cannot guarantee about its usefulness in case of multiple malicious nodes. By using our new terminologies ; we are trying to discover and analyze the impact of Black Hole attack in MANET using AODV. Our terminologies will help to detect malicious node. Using authentication techniques as mentioned above we are able to forward data packets over secure path to the intended destination.

VII. FUTURE WORK

In Future the aim is to build up simulations to analyze the performance of the proposed solutions using NS-2.34. After successful implementation of AODV protocol we will try to compare performances of other protocols like DSR, DSDV, TORA etc using proposed terminologies. We will consider parameters for study like end-to-end delivery, Packet loss etc by varying the number of nodes and also the pause time in simulation environment.

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IJCER ONLINE PEER REVIEWED JOURNAL International Journal of Computational Engineering Research

International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Eye Safe Laser Using Optical Parametric Oscillation

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ABSTRACT

It is found that laser with operating wavelengths in the region of approximately 0.4 µm to 1.4 µm (i.e. visible and near infrared) is the eye hazardous portion of optical spectrum, because in this region it is transmitted by the cornea and the lens serves to focus the laser beam on the retina. Thus, the actual laser power density entering the eye can be increased by some 10^5 by the time the light gets to the retina, and burn it without any time lag. This hazardous wavelength region often called ocular focus region. Whereas wavelengths beyond this region are absorbed in the cornea, lens, and vitreous humor of eye, and therefore laser cannot make direct impact on the retina. In this region our eye is relatively safe, and there is only thermal injury to eye. Therefore retinal damage is often more severe than corneal damage. Eye damage may not only result from laser light coming directly from the laser, but may also by light coming from secondary light path i.e. reflection, refraction, scattering etc. For extremely high-power laser, even diffuse reflections may be capable of causing eye damage.

KEYWORDS: *Eye safe laser, MPE for Eye, Optical Parametric Oscillator, KTP crystal.*

I. INTRODUCTION:

Laser application have proliferate in recent years and, as to be expected, their presence is no longer confined to the laboratory or places where access to their radiation can be controlled. Military operations are obvious applications where various devices such as laser range finders, target designators, and secure communications equipment elevate the risk of exposure, specifically eye exposure, to unacceptable levels. It is found that laser with operating wavelengths in the region of approximately 0.4 µm to 1.4 µm (i.e. visible and near infrared) is the eye hazardous portion of optical spectrum, because in this region it is transmitted by the cornea and the lens serves to focus the laser beam on the retina. Thus, the actual laser power density entering the eye can be increased by some 10^5 by the time the light gets to the retina, and burn it without any time lag. This hazardous wavelength region often called ocular focus region [1]. Whereas wavelengths beyond this region are absorbed in the cornea, lens, and vitreous humor of eye, and therefore laser cannot make direct impact on the retina. In this region our eye is relatively safe, and there is only thermal injury to eye. Therefore retinal damage is often more severe than corneal damage. The hazards from the laser vary with the wavelength, intensity, and duration of the output or length of exposure and it is difficult to generalize. However, operating procedures and precautions can be specified over the various ranges of outputs of available lasers. Lasers present potential safety hazards but can usually be guarded against with a few simple precautions [2].The effect of exposure to high power or prolonged exposure at low power over the region 0.4 µm to 1.4 µm where the front part of the eye is transparent, may be to damage the retina tissue and in particular the pigment epithelium, causing lesions and leading to permanent blindness. Additional damage may also occur due to absorption in the cornea and surrounding areas [3].

FIGURE 1. a) Construction of eye and eye injury by laser b) Eye transmission and absorption

Maximum Permissible values of Exposure

The effect of pulsed lasers is dependent on the intensity and duration of the pulse. For the same energy output the hazards due to Q-switched or mode-locked lasers are generally greater than pulsed outputs at the same energy output. Maximum permissible values of exposure (MPE) based on damage to the retina derived from measurements of damage over the visible region, are given in table-1 for cw laser and in table-2 for pulsed laser [4][5][6]. The corresponding maximum permissible exposure levels at the cornea in table-2 are derived from table-1 by multiplying the values by 5×10^5 based on the relaxed eye over the visible range. Where a series of repetitive pulses are used the peak pulse energy and the continuous energy levels should not be exceeded.

TABLE 1. Ocular MPE Values for cw Laser

Laser Type	Wavelength (µm)	MPE (watt/cm^2)	Exposure duration (sec)
He:Cd	0.4416	2.5×10^{-3}	0.25
Argon	0.4880, 0.5145	10^{-6}	$> 10^4$
HeNe	0.632	2.5×10^{-3}	0.25
HeNe	0.632	1×10^{-3}	10
HeNe	0.632	17×10^{-6}	$> 10^4$
Krypton	0.647	2.5×10^{-3}	0.25
Krypton	0.647	1×10^{-3}	10
Krypton	0.647	28×10^{-6}	$> 10^4$
InGaAlP	0.670	2.5×10^{-3}	0.25
GaAs	0.905	0.8×10^{-3}	> 1000
Nd:YAG	1.064	1.6×10^{-3}	> 1000
InGaAsP	1.310	12.8×10^{-3}	> 1000
InGaAsP	1.55	0.1	> 10
CO_2	10.6	0.1	> 10

TABLE 2. Ocular MPE Values for Pulsed Laser

Laser Type	Wavelength (µm)	Pulse length (sec)	MPE (J/cm^2)
ArF	0.193	2×10^{-8}	3×10^{-3}
KrF	0.248	2×10^{-8}	3×10^{-3}
XeCl	0.308	2×10^{-8}	6.7×10^{-3}
XeF	0.351	2×10^{-8}	6.7×10^{-3}
Ruby (free-running)	0.6943	1×10^{-3}	1×10^{-5}
Ruby (Q-switched)	0.6943	$5\text{-}100 \times 10^{-9}$	5×10^{-7}
Rhodamine 6G	0.500-0.700	$5\text{-}18 \times 10^{-6}$	5×10^{-7}
Nd:YAG (free-running)	1.064	1×10^{-3}	5×10^{-5}
Nd:YAG (Q-switched)	1.064	$5\text{-}100 \times 10^{-9}$	5×10^{-6}
CO_2	10.6	1×10^{-3}	100×10^{-7}

Below about 0.4µm and above about 1.4µm damage to the cornea is the principal hazard. Since focusing at the retina does not take place the threshold levels can be considerably relaxed; however, little available data exists on threshold values outside the visible region. Outside the visible light region below a wavelength of about 0.4µm the safe exposure level recommended by BS4803 (British Standard) should not exceed 130 J/m^2 per day, or 2.16 W/m^2 for 1 minute, or a corresponding higher density over a shorter period. At infrared wavelengths above about 1.4 µm the maximum density from a single pulse should be limited to 1kJ/m^2 and for continuous exposure the average level should be limited to 500 W/m^2 [5].

II. LASER EYE SAFETY:

The recommended eye protection for all people who work with lasers is a pair of goggles that are highly absorbing in the spectral region of the laser. Now this is rather simple for any UV to IR laser, as humans cannot see in these spectral ranges. However, it becomes much more difficult for visible lasers because the glasses that protect the user may also reduce the user's ability to see in the visible spectrum. According to Kuhn [1], the laser safety goggles are characterized by a minimum safe optical density D_λ defined as

$$D_\lambda = log_{10}\left(\frac{H_p}{MPE}\right)$$

Where H_p is the power density (or energy density) of the incident laser beam and MPE is the maximum permissible eye exposure (same unit as H_p)[3][6].

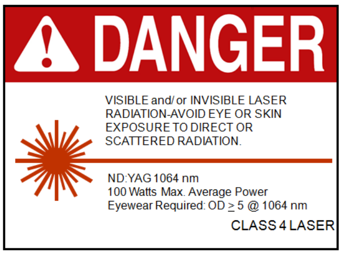

FIGURE 2. Laser Safety Eyewear and Warning Signs

It is essential that everybody concerned with the operation or use of lasers should have knowledge of their potential hazards and the safety procedures involved. A safety officer should be appointed, who should be responsible for records and safety procedures, and for liaising with the medical authorities undertaking surveillance. The safety officer should ideally be one of the operating personnel because of the highly specialist nature of the hazards involved, and work in collaboration with other safety officers. Where operation of an unenclosed or partly closed system (e.g. during maintenance) takes place, the region in which the laser is being operated should be clearly indicated. This should be as small as consistent with safety and contain only personnel working directly on lasers. In the case of industrial laser installation this is best achieved by initially installing the laser in a separate room. At all entrances to this region a cautionary sign should be displayed. Examples of signs recommended by The American National Standards Institute (ANSI) Standard Z136 [5] are illustrated in Figure-2.

During the last many years much effort have been made to develop eye safe lasers (i.e. using materials such as Er:YAG, Er:glass etc.), basically for rangefinders using single pulse of very high intensity, but at a eye-safe wavelength [7]. With lasers of this eye safe kind, range measurement capabilities of 10 km or more have been obtained. The main disadvantage of these rangefinders is their complexity, power efficiency and reliability [8]. Nd:YAG laser removes most of these discrepancies and therefore used as a superior rangefinder. The only problem in using Nd:YAG laser is, its emission in ocular region (i.e., 1.064 μm). Which is particularly in the near infrared region, where the laser often significantly powerful. Thus it is possible to acquire severe retinal damage from a laser beam that we cannot see. Optical parametric devices generate broadly tunable coherent optical radiation by the phase-matched nonlinear interaction of an intense laser beam in a suitable nonlinear crystal. In this process the high energy pump photon is converted into a pair of lower frequency signal and idler photons while conserving the total energy and momentum. Tunability of the signal-idler pair is usually achieved either by changing the crystal birefringence through its temperature dependence or by the angular dependence of the extraordinary index of the crystal. The practical optical parametric oscillator (OPO) device consists of a nonlinear crystal enclosed in an optical cavity resonant at either or both the signal and idler wavelengths and pumped by Nd:YAG laser [9][10].

III. SECOND ORDER NONLINEAR PROCESSES:

In the regime of conventional optics, the electric polarization vector $\boldsymbol{P}$ is simply assumed to be linearly proportional to the electric field strength $\boldsymbol{E}$ of an applied optical wave, i.e.

$$\boldsymbol{P} = \varepsilon_0 \chi E \qquad (1)$$

where ε_0 is the free-space permittivity, χ is the susceptibility of a given medium and a plot of $\boldsymbol{P}$ versus $\boldsymbol{E}$ is a straight line. The relation (1) is valid for the field strengths of conventional sources. The quantity χ is a constant only in the sense of being independent of $\boldsymbol{E}$; its magnitude is a function of the frequency. With sufficiently intense laser radiation this relation does not hold good and has to be generalized to equation (2), which can be written in the vector form, as by a power series

$$\boldsymbol{P} = \varepsilon_0[\chi^{(1)} \boldsymbol{E} + \chi^{(2)} \boldsymbol{EE} + \chi^{(3)} \boldsymbol{EEE} + \text{--------}] \qquad (2)$$

$$\begin{aligned} \vec{P}_i(\omega_j) = \varepsilon_0 \Big[& \sum_j \chi^{(1)}_{ij}(\omega_m) \boldsymbol{E}_j(\omega_m) + \sum_{jk}\sum_{(mn)} \chi^{(2)}_{ijk}(\omega_m, \omega_n) \boldsymbol{E}_j(\omega_m) \boldsymbol{E}_k(\omega_n) \\ & + \sum_{jkl}\sum_{(mno)} \chi^{3}_{ijkl}(\omega_m, \omega_n, \omega_o) \boldsymbol{E}_j(\omega_m) \boldsymbol{E}_k(\omega_n) \boldsymbol{E}_l(\omega_0) + \text{..........} \Big] \end{aligned} \qquad (3)$$

where $\chi_{ij}^{(1)}$ is a second – rank (linear) tensor (9 components *xx*, *xy*, *xz*, *yx*,……..), where $\chi_{ijk}^{(2)}$ is a third -rank (nonlinear) tensor (27 components, *xxx*, *xxy*, *xxz*, *xyx*,…….), and $\chi_{ijkl}^{(3)}$ is a forth-rank (nonlinear) tensor (81 components, *xxxx*,*xxxy*, *xxxz*, *xxyx*,……). The values of the tensor coefficients are functions of frequency and temperature. The subscripts *m*, *n*, and *o* etc. denotes different frequency components, and *i*, *j*, *k* and *l* are Cartesian indices that run from 1 to 3 [1][20]. For small field strength the polarization is proportional to the electric field ***E*** and is accounted for by the polarizatbility tensor $\chi_{ij}^{(1)}$. All of the optics discussed so far has been linear optics encompassed in the term $\varepsilon_0 \chi_{ij}^{(1)}(\omega_m) \boldsymbol{E}_j(\omega_m)$. This term represents optical phenomenon that are proportional to the electric field and are at the frequency of incoming wave.

The term $\chi_{ijk}^{(2)}(\omega_m, \omega_n) \boldsymbol{E}_j(\omega_m) \boldsymbol{E}_k(\omega_n)$ is responsible for all of the two-wave effects. This includes second harmonic generation (two fields at ω to make one at 2ω) and parametric oscillation (one field at ω_1 and other field at ω_2 to create fields at $\omega_1 - \omega_2$ and $\omega_1 + \omega_2$). This also includes optical mixing, and the Pocals effect (change of index of refraction with applied electric field). The nonlinear polarization tensor $\chi^{(2)}$ vanishes in the crystals that have a center of symmetry (i.e. crystal symmetry). In these crystals second harmonic generation is not possible. As a result of, many of the components of $\chi^{(2)}$ will be zero or equal to other components of the tensor. Thus the second-order polarization and the corresponding monochromatic components of the optical field:

$$\boldsymbol{P}^{(2)}(\omega = \omega_1 + \omega_2) = \varepsilon_0 \chi^{(2)}(\omega_1, \omega_2) \boldsymbol{E}(\omega_1) \boldsymbol{E}(\omega_2) \tag{4}$$

where $\chi^{(2)}$ denotes the second-order susceptibility that is a third-order tensor.

Desmond [19] simplified $\chi_{ijk}^{(2)}$, and replaced by a nonlinear optical coefficient d_{il} (Coulomb/Volt^2), according to the following relationship:

$$d_{il} = \varepsilon_0 \chi_{ijk}^{(2)} \qquad \begin{cases} l = 1,2,3,4,5,6 \\ jk = xx, yy, zz, yz, zx, xy \end{cases} \tag{5}$$

i.e., the nonlinear optical coefficient d_{ijk} is symmetric in *j* and *k* and according to Khun [1] $d_{ij} = \frac{1}{2} \chi_{ijk}^{(2)}$, here, ε_0, is the permittivity of free space, some authors excludes ε_0 from the *d* coefficient, in this case d [As/V^2] = 8.855×10^{-12} *d* [m/v]. The conversion from the cgs system to MKS units becomes d [As/V^2] = 3.68×10^{-15} *d* [esu]. In most practical situations the tensor equations containing d_{ijk} can be simplified to non-tensor form in which d_{ijk} is replaced by d_{eff}, is the effective nonlinear coefficient for the interaction dependent on crystal symmetry and propagation direction in the medium.

3.1 Second Harmonic Generation:

The simplest second-order process is that of second-harmonic generation (SHG). In this process, an intense laser beam of angular frequency ω_1 (= ω) is passed through a crystal having nonzero value of $\chi^{(2)}$, such that the beam emerging from the crystal contains the angular frequencies ω_1 of the input beam and also $\omega_2 = 2\omega_1$, twice the frequency of the input beam. This can be shown to occur by considering the second nonlinear polarization term $P^{(2)}$.

3.2 Optical Sum and Difference Frequency Generation:

In the second-harmonic generation, considered the combination (addition) of two photons of the same frequency to produce a single photon of twice the frequency. It can now to generalize this process to allow for the case in which the two photons have different frequencies ω_1 and ω_2. These include second harmonic terms (involving $2\omega_1$ and $2\omega_2$), and two new terms involving $\omega_1 + \omega_2$ and $\omega_1 - \omega_2$. The new term involving $\omega_1 + \omega_2$ generates a new frequency that is the sum of the two original frequencies and is thus known as *sum frequency generation*. The term involving the difference between the two frequencies, $\omega_1 - \omega_2$, is referred to as *difference frequency generation*. In the process of difference frequency mixing, the frequency ω_2 is amplified while the frequency ω_3 is being generated. In the process of optical parametric oscillation (OPO) the intense input laser beam at frequency ω_p is known as the *pump* frequency, when passes through a nonlinear material, generates the desired frequencies ω_s (signal frequency) and the frequency ω_i (idler frequency) [20].The amplification can be enhanced by placing the optical harmonic (nonlinear) crystal within an optical cavity in which the mirrors are specifically made reflective at either one of these two frequencies, or for both. Thus the intensity at those frequencies will build up within the cavity, by Fabry-Perot interferometer. Such an amplification process is known as an optical parametric oscillator (OPO). Of course, either ω_s or ω_i can be tunable laser to generate amplified tunable output. This process is used most often in the infrared frequency range, where tunable lasers are not as readily available as in the visible portion of the frequency spectrum [13]. The output of an optical parametric oscillator (OPO) is similar to that of a laser. The energy conservation requires that

$$\omega_p = \omega_s + \omega_i \tag{6}$$

Here ω_p, ω_s, and ω_i are the frequencies of the pump, signal and idler wave. For a given ω_p, there can be a continuous range of choices of ω_s and ω_i. This, in fact, is the origin of the tunability of the optical parametric oscillator. The specific pair of frequencies that will be emitted is dictated by the momentum conservation condition, or phase matching condition: $\boldsymbol{k}_p = \boldsymbol{k}_s + \boldsymbol{k}_i$, that must also be satisfied in order to ensure that the signal waves generated in different parts of the nonlinear crystal are in phase and add coherently [12]. For collinearly propagating waves this may be written

$$\left.\begin{aligned} \frac{n_p}{\lambda_p} &= \frac{n_s}{\lambda_s} + \frac{n_i}{\lambda_i} \\ \omega_p n_p &= \omega_s n_s + \omega_i n_i \end{aligned}\right\} \tag{7}$$

Here n_p, n_s and n_i are the refractive indices of the pump, signal and idler wave and λ_p, λ_s and λ_i there corresponding wavelengths respectively. The pump signal is usually provided by a laser and, therefore λ_p is fixed. However, if the refractive indices are varied, the signal and idler frequencies will tune. Under an appropriate arrangement for the angle (or temperature) of a given nonlinear crystal, the above two requirements (Eq. (6) & (7)) can be satisfied and oscillations at two different frequencies ω_s, and ω_i can be achieved. Based on this working condition, if we slightly change the angle or temperature of the crystal, the refractive index relation between these three waves will be changed; therefore the oscillating frequencies will be smoothly tuned to different values [10][14].

The requirements of nonlinear crystals for optical parametric oscillation are essentially the same as that for SHG. In other words, the nonlinear materials must be non-centrosymmetrical crystals, highly transparent for pump, signal, and idler beams, able to fulfill the phase matching by using angle-tuning or temperature-tuning. In principle, all commonly used SHG crystals used for OPO purpose. A possible simple implementation of the optical parametric oscillator is shown schematically in Figure-3.

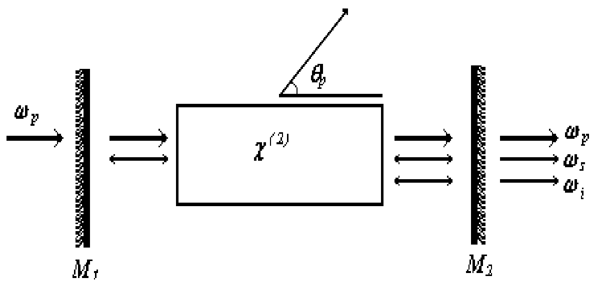

FIGURE 3. Singly-Resonant Optical Parametric Oscillator

It is consist of a suitably oriented nonlinear optical crystal in a Fabry-Perot cavity. The cavity mirrors are coated to transmit the pump wave and reflect either the signal wave only or both the signal and idler waves.

In the former case, the oscillator is known as the singly resonant oscillator, and, in the latter case, it is known as the doubly resonant oscillator. After passing through the output-coupling mirror the transmitted pump beam is blocked by a filter. The further separation between the signal beam and idler beam can be done by using appropriate spectral filters or optical dispersive elements. Various optical cavity designs, including stable, unstable, or metastable cavity configurations, can be employed for OPO purpose. The criteria of selection of cavity designs are same as that for laser cavity devices [20].

3.3 Nonlinear Optical Materials

For generating new frequencies from existing lasers via harmonic generation and difference generation, they must (1) be resistant to optical damage, (2) have high mechanical hardness, (3) exhibit good thermal and chemical stability, (4) be capable of being grown in useful sizes, and (5) have the appropriate phase-matching properties. The second harmonic crystals must have no inversion symmetry (i.e. non-centrosymmetric). Bulk second-order nonlinear materials are generally inorganic crystals. A number

Property	KTP	BBO	LBO	CLBO
Nonlinear coefficient (pm/V)	3.1	1.94	1.16	1.11
Transmission range (μm)	0.35 - 5.5	0.19 - 3.5	0.16 – 2.6	0.16 – 2.6
Damage threshold (GW/cm^2)	> 0.5	1.5	2.5	> 2.5
Angular acceptance (mrad-cm)	20	< 1	2	1.4
Spectral acceptance (mm-cm)	0.5	0.5	0.8	1
Walk-off angle (degree)	1.3	5.5	<1	1.8
Damage resistance to moisture	High	Low	Low	Medium

Table-3. Properties of some important nonlinear crystals[6]

of semiconductors are useful for second harmonic generation when used in waveguides. The nonlinear crystals can be classified into two groups according to their physical properties. Crystals grown from water solutions are fragile, hygroscopic, and sensitive to thermal shock. The crystals of this group, to which KDP and its isomorphs belong, are somewhat difficult to handle because the crystals are soft, and the polished faces may be fogged if they are held with bare hands or exposed to humid atmosphere. On the other hand, the crystals are easy to grow, they are available in large sizes, and they are of excellent optical quality. Crystals grown from the melt are relatively hard, nonhygroscopic and less sensitive to thermal shock. Important members of this group crystals are $LiNbO_3$ (LBO) , $Ba_2NaNb_5O_{15}$ (BBO) and $KTiOPO_4$ (KTP). KTP possesses good optical properties, a large acceptance angle, large temperature acceptance, a large nonlinear coefficient, and high optical damage thresholds [9] [10].

IV. CONCLUSION

In summary laser safety research must involve investigation of the effects of laser exposure in the visible and near-infrared. Many civilian and military laser devices involve both visible and near infrared laser sources. Accidental exposure under these conditions may involve a wide range of exposure from acute retinal exposure well above the Maximum Permissible Exposure (MPE), therefore it is required to use precautions. Thus Optical parametric devices generate broadly tunable coherent optical radiation by the phase-matched nonlinear interaction of an intense laser beam in a suitable nonlinear crystals such as KTP etc. In this process the high energy pump photon is converted into a pair of lower frequency signal and idler photons while conserving the total energy and momentum. Tunability of the signal-idler pair is usually achieved either by changing the crystal birefringence through its temperature dependence or by the angular dependence of the extraordinary index of the crystal. The practical optical parametric oscillator (OPO) device consists of a nonlinear crystal enclosed in an optical cavity resonant at either or both the signal and idler wavelengths and pumped by Nd:YAG laser.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Mobile Learning for Education: Benefits and Challenges

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ABSTRACT

Education and training is the process by which the wisdom, knowledge and skills of one generation are passed on to the next. Today there are two forms of education and training: conventional education and distance education. Mobile learning, or "M-Learning", offers modern ways to support learning process through mobile devices, such as handheld and tablet computers, MP3 players, smart phones and mobile phones.This document introduces the subject of mobile learning for education purposes. It examines what impact mobile devices have had on teaching and learning practices and goes on to look at the opportunities presented by the use of digital media on mobile devices. The main purpose of this paper is to describe the current state of mobile learning, benefits, challenges, and it's barriers to support teaching and learning. Data for this paper were collected through bibliographic and internet research from January to March 2013. Four key areas will be addressed in this paper: 1. An analysis of Mobile Learning. 2. Differentiating E-Learning from Mobile Learning 3. Value and Benefits of Mobile Learning 4. Challenges and Barriers of Mobile Learning:Study showed that M-Learning as a Distance learning brought great benefits to society include : Training when it is needed, Training at any time; Training at any place; Learner-centred content; Avoidance of re-entry to work problems; Training for taxpayers, and those fully occupied during university lectures and sessions at training centres; and The industrialisation of teaching and learning. And also, notebooks, mobile Tablets, iPod touch, and iPads are very popular devices for mobile learning because of their cost and availability of apps.

KEYWORDS : *Education, Learning, M-Learning, Mobile, Teaching,*

I. INTRODUCTION

The term **M-Learning** or "Mobile Learning", has different meanings for different communities, that refer to a subset of E-Learning, educational technology and distance education, that focuses on learning across contexts and learning with mobile devices. Mobile learning has many different definitions and is known by many different names, like M-Learning, U-Learning, personalized learning, learning whilemobile, ubiquitous learning, anytime / anywhere learning, and handheld learning. One definition of mobile learning is, "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies" (*MOBIlearn*., 2003). In other words, with the use of mobile devices, learners can learn anywhere and at any time (Crescente and Lee, 2011). Mobile learning is considered to be the ability to use mobile devices to support teaching and learning.

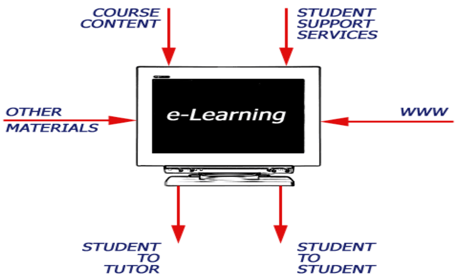
'Mobile learning' is certainly not merely the conjunction of 'mobile' and 'learning'; it has always implicitly meant 'mobile E-Learning' and its history and development have to be understood as both a continuation of 'conventional' E-Learning and a reaction to this 'conventional' E-Learning and to its perceived inadequacies and limitations. It is the 'mobile' aspect of mobile learning that makes it stand apart from other types of learning, specifically designing learning experiences that exploit the opportunities that 'mobility' can offer us. M-Learning focuses on the mobility of the learner, interacting with portable technologies, and learning that reflects a focus on how society and its institutions can accommodate and support an increasingly mobile population.This is because mobile devices have features and functionality for supporting learners. For example, podcasts of lectures can be made available for downloading. Learners are to expect to engage with these learning resources whilst away from the traditional learning spaces.Over the past ten years mobile learning has grown from a minor research interest to a set of significant projects in schools, workplaces, museums, cities and rural areas around the world. The M-Learning community is still fragmented, with different national perspectives, differences between academia and industry, and between the school, higher education and lifelong learning sectors (Singh, 2010).

The research that has been done on the use of mobile apps like these has been very promising. For example, a recent study funded by the Department of Education, looked at the link between learning, and the PBS Kids educational gaming app, Martha Speaks Dog Party. The study found that after children had used the app every day for two weeks, the vocabulary of Title 1 children between three and seven years old improved by as much as 31 percent. A similar study, conducted at the Abilene Christian University, centered upon the use of the Statistics 1 app. Students used it in and out of the classroom and remarked that they understood the content better, and were more motivated to do well, when using the app. The instructors agreed with this observation, and added that the students were also better prepared for classes. According to a report by Ambient Insight in 2008, "the US market for Mobile Learning products and services is growing at a five-year compound annual growth rate (CAGR) of 21.7% and revenues reached $538 million in 2007. The data indicates that the demand is relatively immune from the recession." (Adkins, 2008). The findings of the report indicate that the largest demand throughout the forecast period is for custom development services, content conversion, and media services and that the healthcare sector accounts for 20% of the total US market for mobile learning.

1.1.EDUCATION; CURRENT AND FUTURE

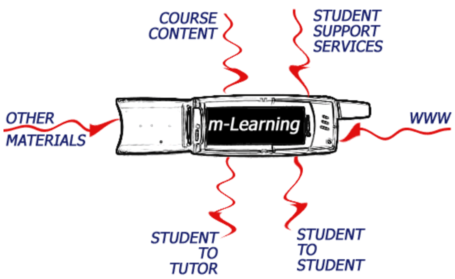
There is now little doubt that the World Wide Web is the most successful educational tool to have appeared in a long time. It combines and integrates text, audio and video with interaction amongst participants. It can be used on a global scale and is platform independent. While largely an asynchronous medium, it can be used also for synchronous events. It is not surprising, therefore, that trainers, lecturers, distance education providers and teaching institutions at all levels are increasingly using the Web as a medium for delivery. The statistics showed that: The number of Americans accessing the mobile web went up 107% last year; Mobile Web Access is growing around 15-20% a month; Mobile internet growth is 8x greater than PC-based growth; and Mobile social networking sites are getting more popular, mobile Facebook has 4 million users a day (Adkins, 2008).In this section we will map the evolution from the wired virtual learning environment of today, to the wireless learning environment of tomorrow. The wired learning environment of today might be presented diagrammatically thus:

Figure 1: Wired Virtual Learning Environment of Today



The study seeks to put in place a new virtual learning environment which might be represented thus:

Figure 2: Wireless Virtual Learning Environment of Tomorrow



The studies should evaluate each of these technology models on the six major dimensions of distance education provision:

- The provision of course content to off-campus students
- The provision of feedback to off-campus students
- The provision of student support services to off-campus students
- Links to the WWW and other resources
- Student-to-student interactivity
- Student to tutor and institution interactivity.

Each of these dimensions should be analyse and evaluate on a four point grid for decision makers:
1) Student userfriendliness 2) Didactic effectiveness
3)Technical feasibility 4)Cost effectiveness.

1.2.Current Capabilities And Applications Of Mobile Phone

Subject	E-Learning	M-Learning
Place	lecture in classroom or internet labs	learning anywhere, anytime
Pedagogical Change	More text- and graphics based instructions	More voice, graphics and animation based instructions
	lecure in classroom or in internet labs	learning occurring in the field or while mobile
Instructor to Student Communication	Time-delayed (students need to check e-mails or web sites	Instant delivery of e-mail or SMS
	passive communication	Instant communication
	Asynchronous	Synchronous
	Scheduled	Spontaneous
Student to Student Communication	Face-to-Face	Flexible
	Audio- teleconference common	Audio- and video-teleconference possible
	e-mail-to-e-mail	27/4 instantaneous messaging
	private location	no geographic boundaries
	travel time to reach to internet site	no travel time with wireless internet connectivity
	dedicated time for group meetings	Flexible timings on 24/7 basis
	poor communication due to group consciousness	Rich communication due to one-to-one communication, reduced inhibitions
Feed back to student	1-to-1 basis possible	1-to-1 basis possible
	Asynchronous and at times delayed	Both asynchronous and synchronous
	Mass/standardized instruction	Customized instruction
	Benchmark-based grading	Performance & improvement-based grading
	Simulations & lab-based experiments	Real-life cases and on the site experiments
	Paper based	Less paper, less printing, lower cost
Assignments & Tests	In-class or on computer	Any location
	Dedicated time	24/7 Instantaneous
	Restricted amount of time	Any amount of time possible
	Standard test	Individualized tests

	Usually delayed feedback	Instant feedback possible
	Fixed-length tests	Flexible-length/number of questions
Presentations, Exams & Assignments	Theoretical and text based	Practical oriented exams direct on site, hands-on based
	Observe and monitoring in lab	Observe in the field and monitoring from remote location
	Class-based presentations	1-to-1 presentations with much richer communication
	Usually use of one language	Automatic translation for delivery of instructions in many languages (possible)
	Mostly individualized, component based group work	Simultaneous collaborative group work
	Paper-based assignment delivery	Electronic-based assignment delivery
	Hand-delivery of assignments at a particular place and time	E-delivery of assignments at any place and time
	Instructor's time used to deliver lectures	Instructor's time used to offer individualized instructions and help

Mobile devices, and their technologies and systems, are eroding established notions of time as a common structure that had previously underpinned social organization and the consensual understanding of the world.Time-keeping is being replaced by the 'approx-meeting' and the 'multi-meeting' (Plant, 2000), 'socially negotiated time' (Sørensen *etal,* 2002), the 'micro coordination of everyday life' alongside the 'softening of schedules' (Ling, 2004) afforded by mobile devices and Nyiri (2006:301) says, "with the mobile phone, time has become personalized". Whereas previously our social and business relations had to be organized and synchronized by absolute clock time, now mobile technologies allow us to renegotiate meetings and events on-the-fly.However, Basic mobile phone features are: Making and receiving calls; Sending and receiving text messages; and Basic office tools e.g. calculator.Advanced mobile phone features include: Bluetooth; Camera capable of taking stills and more commonly now video; e-book readers, games; Recording audio; GPS / location aware; and Web browser to connect to the internet.

Mobile learning can happen anywhere: in a classroom, at the dining room table, on a bus, in front of a science exhibit, and anywhere. Portability is not as important as the ability of the learner to connect, communicate, collaborate, and create using tools that are readily at hand. We have got them working as part of the M-Learning project. We are using the seductive power of these new technologies to re-inspire young learners who are dropping out of traditional learning. Research and development has been ongoing for the last two years and many learners have already been trying out these approaches and contributing to their development.

1.3.How Is That Different from E-Learning?

E-Learning has come to define any dissemination of educational knowledge over the Internet. This makes E-Learning a subset of technology-based training. It also incorporates a number of learning activities conducted on the Internet, of which mobile learning is one part.Many authors (e.g., Mostakhdemin-Hosseini and Tuimala, 2005) view Mobile Learning simply as the natural evolution of E-Learning, which completes a missing component such as the wireless feature, or as a new stage of distance and E-Learning (e.g., Georgiev, et al. 2004). M-Learning is often described as occupying a sub-space within the E-Learning space, which is in turn a sub-part of digital learning.

1.4.Differentiating E-Learning from Mobile Learning

E-Learning can be real-time or self-paced, also known as "synchronous" or "asynchronous" learning. Additionally, E-Learning is considered to be "tethered" (connected to something) and presented in a formal and structured manner. In contrast, mobile learning is often self-paced, un-tethered and informal in its presentation(see Table 1).

Table 1: Differences between E-Learning and M-Learning

Because mobile devices have the power to make learning even more widely available and accessible, mobile devices are considered by many to be a natural extension of E-Learning (Sharma & Kitchens, 2004).

1.5.THE VALUE OF MOBILE LEARNING (Savill, 2010):Tutors who have used M-Learning programs and techniques have made the following value statements in favor of M-Learning.

- It is important to bring new technology into the classroom.
- Devices used are more lightweight than books and PCs.
- Mobile learning can be used to diversify the types of learning activities students partake in (or a blended learning approach).
- Mobile learning supports the learning process rather than being integral to it.
- Mobile learning can be a useful add-on tool for students with special needs. However, for SMS and MMS this might be dependent on the students' specific disabilities or difficulties involved.
- Mobile learning can be used as a 'hook' to re-engage disaffected youth.

1.6.BENEFITS OF M-LEARNING (Elias, 2011; Crescente and Lee, 2011):

- Relatively inexpensive opportunities, as the cost of mobile devices are significantly less than PCs and laptops
- Multimedia content delivery and creation options
- Continuous and situated learning support
- Decrease in training costs
- Potentially a more rewarding learning experience
- Improving levels of literacy, numeracy and participation in education amongst young adults.
- Using the communication features of a mobile phone as part of a larger learning activity, e.g.: sending media or texts into a central portfolio, or exporting audio files from a learning platform to your phone.

1.7.CHALLENGES OF M-LEARNING:

Technical challenges for M-Learning include:

- Connectivity and battery life
- Screen size and key size (Maniar and et. Al. 2008)
- Meeting required bandwidth for nonstop/fast streaming
- Number of file/asset formats supported by a specific device
- Content security or copyright issue from authoring group
- Multiple standards, multiple screen sizes, multiple operating systems
- Reworking existing E-Learning materials for mobile platforms
- Limited memory (Elias, 2011)
- Risk of sudden obsolescence (Crescente and Lee, 2011)

1.8.Social and educational challenges for M-Learning include:

- Accessibility and cost barriers for end users: Digital divide.
- How to assess learning outside the classroom
- How to support learning across many contexts
- Content's security or pirating issues
- Frequent changes in device models/technologies/functionality etc.
- Developing an appropriate theory of learning for the mobile age
- Conceptual differences between E-Learning and M-Learning
- Design of technology to support a lifetime of learning (Sharples, 2000; Moore, 2009)
- Tracking of results and proper use of this information
- No restriction on learning timetable
- Personal and private information and content
- No demographic boundary
- Disruption of students' personal and academic lives (Masters, K.; Ng'ambi D. , 2007)
- Access to and use of the technology in developing countries (Masters, K., 2007)
- Risk of distraction (Crescente and Lee, 2011).

In addition to these challenges, there are some barriers to mobile learning include the high costs associated with equipment, connectivity, maintenance, technical support and teacher training; Health-related issues; a lack of policy support and governmental investment; and/or a lack of interest and awareness on the part of policymakers and the public; and negative social attitudes that see mobile phones as disruptive devices that students use primarily to play games, chat with friends and potentially engage in inappropriate behaviors such as cheating and cyber-bullying.

1.9.MOBILE TECHNOLOGIES FOR M-LEARNING:

Mobile technologies are an attractive and easy means to maintain literacy skills and gain constant access to information. They are affordable, can be easily distributed and thus hold great potential for reaching marginalized groups and providing them with access to further learning and development. Mobile technologies facilitate distance learning in situations where access to education is difficult or interrupted because of geographical location or due to post-conflict or post-disaster situations.

Mobile devices and personal technologies that can support mobile learning include:

- E-book
- Out start, Inc.
- Handheld audio and multimedia guides, in museums and galleries
- Handheld game console, modern gaming consoles such as Sony PSP or Nintendo DS
- Personal audio player, e.g. for listening to audio recordings of lectures (podcasting)
- Personal Digital Assistant, in the classroom and outdoors
- Tablet computer
- UMPC, mobile phone, camera phone and Smart Phone

Technical and delivery support for mobile learning include:

- 3GP For compression and delivery method of audiovisual content associated with Mobile Learning
- GPRS mobile data service, provides high speed connection and data transfer rate
- Wi-Fi gives access to instructors and resources via internet
- Cloud computing for storing and sharing files

And also, We need baseline requirements for mobile technologies that support learning outside of school settings. These technologies should be:

1) **Highly portable:** The technology is available whenever the user needs to learn.
2) **Individual:** The technology can be personalized to suit the individual learner's abilities, knowledge and learning style, and is designed to support personal learning rather than general office work.
3) **Unobtrusive:** The learner can capture situations and retrieve knowledge without the technology becoming overly noticeable or imposing on the situation.
4) **Available:** The learner can use the technology anywhere, to enable communication with teachers, experts and peers.
5) **Adaptable:** The technology can be adapted to the context for learning and the learner's evolving skills and knowledge.
6) **Persistent:** The learner can use the technology to manage learning throughout a lifetime, so that the learner's personal accumulation of resources and knowledge will be immediately accessible despite changes in technology.
7) **Useful:** The technology is suited to everyday needs for communication, reference, work and learning.
8) **Easy to use:** The technology is easily comprehended and navigated by people with no previous experience using it.

On the other hand, Douch et al. (2010) indicated that mobile technologies can improve professional development and teacher training in several areas:

I) Communication: Mobile devices can be used in conjunction with wireless broadband and video-call services like Skype to facilitate communication between teachers and mentors.
II) Self-assessment: Video cameras can be used to record lessons, allowing teachers to reflect on their teaching practice and identify specific areas for improvement.
III) Innovation: Mobile technologies can be used in teacher education programs to challenge teachers to think creatively about mobile learning and develop the confidence to try new ideas.
UNESCO and MLW 2013 UNESCO hold the Second UNESCO Mobile Learning Week (MLW) from 18 to 22 February 2013 at its Headquarters in Paris, France. The event aims to explore mobile learning as a unique and significant contribution to achieving the Education for All (EFA) goals of increasing education access, quality and equality. MLW 2013 focuses on three particular EFA goals as they relate to mobile learning:

- Improving levels of adult and youth literacy: how mobile technologies can support literacy development and increase reading opportunities?

- Improving the quality of education: how mobile technologies can support teachers and their professional development?
- Achieving gender parity and equality in education: how mobile technologies can support equal access to and achievement in basic education of good quality for all, in particular for women and girls?

II. DISCUSSION

Mobile learning is emerging as one of the solutions to the challenges faced by education. With a variety of tools and resources always available, mobile learning provides increased options for the personalization of learning. Mobile learning in classrooms often has students working interdependently, in groups, or individually to solve problems, to work on projects, to meet individual needs, and to allow for student voice and choice. With access to so much content anytime and anywhere, there are plenty of opportunities for formal and informal learning, both inside and outside the classroom.Study showed that notebooks, mobile Tablets, iPod touch, and iPads are very popular devices for mobile learning because of their cost and availability of apps. They are used for collecting students' responses (clickers), reading electronic books and websites, recording reflections, documenting field trips, collecting and analyzing data, and much more. One of the causes of acceptance mobile learning is that it uses devices:

- ✓ which citizens are used to carrying everywhere with them,
- ✓ which they regard as friendly and personal devices,
- ✓ which are cheap and easy to use,
- ✓ which they use constantly in all walks of life and in a variety of different settings, except education." (Keegan, 2005:3)

but, The future of mobile learning depends largely on the level of social acceptance it receives.On the other hand, Users in developing countries have the same need for M-Learning to be mobile, accessible and affordable, as those in developed countries do. The very significance of M-Learning is its ability to make learning mobile, away from the classroom or workplace. These Wireless and mobile technologies enable learning opportunities to learners who do not have direct access to learning in these places. Many learners in developing countries have trouble accessing the internet, or experience difficulty in affording technology that enables learning in an E-Learning environment. Mobile devices are a cheaper alternative compared to traditional E-Learning equipment such as PC's and Laptops(master, 2004). The reason for the failure of mobile learning to emerge from its project status and take its place in mainstream education and training is well known. It is that mobile learning is not considered by the telecommunications operators to be a valid and attractive revenue stream. Progress is being made in a wide range of mobile applications, but education and training lag behind.

The first of solution is the use of mobile learning for academic administration on mobile phones. If it could be established that mobile learning was to become the established method for universities and colleges to communicate urgent information to their student body, a very large revenue stream would be opened up. It can be taken as a given that all students in all universities and colleges possess a mobile phone which they consult constantly. All students enrolled in higher and further education institutions today have frequent needs for information from their institutions about timetable changes, assessment deadlines, feedback from tutors and other urgent administrative details. The use of mobile telephony is a much more efficient and quicker means of communication that postal contact or email. Once this has been achieved the use of mobile learning for academic contact in colleges and universities can be added. Mobile learning academic summaries comprising 4 to 5 screen summaries of content, examination hints, assessment questions for course revision, guidelines for particularly difficult parts of a course or counseling provision for students in need will be of great benefit to all students, and can be developed for and sent out to either all students or students in a particular year or class grouping.

A final tier of the strategy for the incorporation of mobile learning in mainstream education and training is represented by the development and offering to students of full modules by mobile learning. With the arrival of 3G technologies viable course modules can be developed. Offering these modules, with assignment submission, tutor contact, examination and assessment provision will provide further evidence of the validity of mobile learning as an attractive provider of revenue streams to mobile operators.

III. SUGGESTIONS:

In an epoch where humanistic values are decrementing and vision towards social progress is disintegrating, our need to promote responsible education and learning is more crucial than ever.

The advent of mobile phones presents a great opportunity and offers a timely challenge to re-define and transform our educational paradigms. As wine fans claim "we cannot pour fresh wine in old bottles", likewise, mobile learning too requires a new philosophical framework and new educational paradigms if it is to flourish. Only then will it become ubiquitous. Below, Hence, is recommended that policy-makers:

1. Leverage existing investments
Policy-makers should take stock of existing ICT investments and approaches, and devise strategies to complement rather than replace the current infrastructure.
2. Localize policies
Policy-makers should consider the local contexts of the country or region when creating new policies or adapting existing ones, as strategies that work for one country may not be appropriate in another.
3. Support open technical standards
Policy-makers should encourage the use of open, standards-based platforms for mobile learning applications, to increase access and streamline the development process.
4. Promote intersectional cooperation and multi-stakeholder partnerships
Policy-makers should promote cooperation between different branches of government and encourage partnerships between stakeholders from a variety of sectors and levels.
5. Establish policies at all levels
Policy-makers should create or revise mobile learning policies at both the national and local levels, regardless of whether education is decentralized. National policies should provide overarching structure and guidance, while local policies direct implementation in individual districts or institutions.
6. Review and update existing policies
Policy-makers should revisit existing policies, particularly at the local level, that may be overly restrictive in regard to the use of mobile technology at schools and universities. National policies may need to be clarified or revised to give better guidance to districts and institutions.
7. Ensure inclusive education
Policy-makers should ensure that mobile learning policies promote gender equality and accessibility for learners with disabilities. This effort is essential to meeting EFA goals of providing quality education to all learners worldwide.
ICT is a powerful vehicle for enhancing learning, and mobile devices form an essential part of that vehicle. If current ICT strategies for education begin to include mobile devices along with digital learning materials, support for teachers, and guidelines on best practices, mobile learning will soon become an important part of education.

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A Novel Approach for Converting Relational Database to an Object Oriented Database: Data Migration and Performanace Analysis

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ABSTRACT

The object-oriented data model is predicted to be the heart of the next generation of database systems. Users want to move from old legacy databases into applying this new technology that provides extensibility and exibility in maintenance. However, a major limitation on the wide acceptance of object-oriented databases is the amount of time and money invested on existing database applications, which are based on conventional legacy systems. Users do not want to lose the huge amounts of data present in conventional databases. This paper presents a novel approach to transform a given conventional database into an object-oriented database. It is assumed that the necessary characteristics of the conventional database to be re-engineered are known and available. The source of these characteristics might be the data dictionary and/or an expert in the given conventional database. We implemented a system that builds an understanding of a given conventional database by taking these characteristics as input and produces the corresponding object-oriented database as output. Finally, we handle the migration of data from the conventional database to the constructed object-oriented database.

KEYWORDS: *algorithms, data migration, forward engineering, object-oriented databases, reengineering of legacy databases, relational databases.*

I. INTRODUCTION

During the last two decades, Relational Database Management System (RDBM) has been established as the technology, handling databases up to terabytes. Relational DBMSs have been extremely successful in the market; however RDBMS lack the mechanisms to deal with complex structured data. Their tabular approach does not allow a suitable modeling of complex hierarchical objects. Most of the applications such as Geographical Information System, CAD, Multimedia, and Engineering etc. are characterized by having to manage complex, highly interrelated information, which was difficult to manage in RDBMS. To combat the limitations of RDBMS and meet the challenge of the increasing rise of the internet and the Web, programmers developed object-oriented databases in 1980 [7].

In recent years, database research has concentrated on object-oriented data models, which allow to store highly structured data. With regard to the data structuring concepts offered, an object-oriented data model can be looked upon as an extension of the nested relational model, [5] which allows to store relations as attribute values. However, the relational model only permits the alphanumeric data management.

II. OVERVIEW OF OODBMS

An OODBMS is the result of combining object oriented programming principles with database management principles. Object oriented programming concepts such as encapsulation, polymorphism and inheritance are enforced along with regular database management concepts such as the Atomicity, Consistency, Isolation and Durability (ACID properties) which lead to system integrity, support for an *ad hoc* query language and secondary storage management systems which allow for managing very large amounts of data.. OODB [6] is a system while supporting all the functionality of a relational database system (including queries, transactions, backup and recovery mechanisms), also offers an Object oriented programming language interface, user defined data types, object identifiers and the ability to manage objects persistently. Features that are common in the RDBMS world such as transactions, the ability to handle large amounts of data, indexes, deadlock detection, backup and restoration features and data recovery mechanisms also exist in the OODBMS world.

Following figure shows the features of Object oriented Database [8]. A primary feature of an OODBMS is that accessing objects in the database is done in a transparent manner such that interaction with persistent objects is no different from interacting with in-memory objects.Database operations typically involve obtaining a database root from the OODBMS which is usually a data structure like a graph, vector, hash table, or set and traversing it to obtain objects to create, update or delete from the database. When a client requests an object from the database, the object is transferred from the database into the application's cache where it can be used either as a transient value that is disconnected from its representation in the database or it can be used as a mirror of the version in the database in that updates to the object are reflected in the database and changes to object in the database require that the object is refetched from the OODBMS.

III. ANALYSIS OF PROBLEM

This Paper presents an approach to transform a given relational database into an object-oriented database by mapping the relational schema to object oriented schema and migrating data from relational database to object oriented database. A System for realtional to object oriented database (SRTOOD) is a interactive application that implements an interactive static schema mapping and data mapping process. It produces a machine-readable schema mapping database and generates source code for the class declarations and for automatic creation of object instances based on the mapping database. The user can then intervene and accept, modify, or reject the suggestion. Very few commercial systems try to provide object-oriented access to existing relational data.In order to achieve the objective of an application, the schema mapping process should generate a C# class that contains the class declarations corresponding to the re-engineered relational schema. Application programs can then use the C# classes to construct object oriented database and run-time data mapping system to migrate the relational database.

IV. PROPOSED WORK

The work consists of practical approach to map a relational database schema to object oriented database schema. After mapping relational schema to object oriented schema, the construction of database schema class creation is carried out. And finally the data from relational databases is migrated to the object oriented database system.

Data mapping is concerned with the process of migrating the data from a relational database (in the form of tuples) into complex objects in an object oriented database. It provides a persistent view of the relational database by doing a one-time port of the data into a data store managed by a full-edged object-oriented database management system. It has the advantage that once the data has been ported, no dynamic data mapping is required between tuples and objects, thus removing the run-time overhead. However, unlike relational database management systems, most object-oriented database management systems do not have any loading routines. The main reason is the complexity of the data caused by embedded objects, relationships, inheritance, and so on. Therefore, efficient routines are needed for bulk loading data from a relational database into an object-oriented database.

V. EXPERIMENTAL MODEL

The system architecture has two major components.The first one is concerned with the mapping of the existing relational schema to an object-oriented schema. Schema mapping is a one-time static operation. The result of carrying out this schema mapping is a mapping database that contains information about the new object classes that have been generated and the manner in which these could be associated with existing relational tables. The information includes definition of object classes, associations, inheritance relationships, and aggregation relationships. Moreover, it contains additional information in order to allow creation of objects from a combination of one or more tuples from the relational database. Most of the information required for the schema mapping comes from the catalog of the relational database. An important constraint satisfied by the schema mapping presented in this dissertation is that the original relational schema is not modified in any manner.

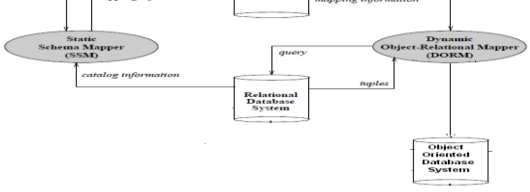

Figure 1: System Architecture

This ensures that existing relational database applications are not affected by the mapping process and thus satisfy the goals of using an object wrapper, as described in the previous section. While the first component is concerned with the schema mapping, the second component is concerned with the data mapping. Unlike schema mapping, data mapping is a dynamic process in that the data in the realational database is migrated to object oriented database in the form of an object.

VI. PERFORMANCE ANALYSIS

The mapping between the relational tuples and the objects corresponding to the generated object schema is described.. Since there are two phases in the schema mapping process, two data mapping strategies have been specified. After the class hierarchy is constructed, it is time to migrate the current relational database contents into the corresponding object-oriented database. This is accepted as the most important and vital step in the whole re-engineering process.Once system is developed then we will got the result. From the result,we can analyse that the requirements gets fullfilled or not. the implementation of propose experimental model consist of Elimination of 2NF relations,Elimination of widow relations, Elimination of orphan relations, Elimination of BLOB attributes, Identification of classes, Identification of associations,Identification inheritance,Identification of aggregation and Data Mapping is carried out or not.

A.Grid Data Relational Schema

For testing the computational models with our experimental model, we are going to use Grid Data Relational Schema.The Naval Environmental Oceanographic Now-vcasting System (NEONS) is a geophysical relational database designed by the Naval Oceanographic and Atmospheric Research Laboratory (Jurkevics 1992). NEONS is a large database containing a variety of data such as grid model output, satellite images, and so on. The portion of the database to be considered here corresponds to grid data. Grid data contains atmospheric and oceanographic numerical model outputs, user-defined parameters, and gridded climatology data. The collection of data values corresponding to the grid points in a rectangular grid comprises a grid eld.

B. Computational Analysis

Here we have considered three data migration models for computational analysis

1. Conceptual Model
2. Logical Model
3. Physical Model

we are going to test these models with Grid Data Relational Schema one by one.

1.Conceptual Model

The conceptual model has to be one of the most under utilised yet most beneficial resources in any data migration.A conceptual model works by recording very high level business objects and defining their relationships. A conceptual data model identifies the highest-level relationships between the different entities.

2.Logical data model

Logical data models should be based on the structures identified in a preceding conceptual data model, since this describes the semantics of the information context, which the logical model should also reect. Even so, since the logical data model anticipates implementation on a specific computing system, the content of the logical data model is adjusted to achieve certain eficiencies.The term 'Logical Data Model' is sometimes used as a synonym of 'Domain Model' or as an alternative to the domain model.

3.Physical Model

Physical data model represents how the model will be built in the database. A physical database model shows all table structures, including column name, column data type, column constraints, primary key, foreign key, and relationships between tables.

VII. COMPARISON BETWEEN THE EXPERIMENTAL ANALYSIS AND COMPUTATIONAL ANALYSIS

Here proposed experimental model compared with computational model through the following table.

Table1: Comparision At Different Schema Inputs to Proposed Method

Operations	Conceptual Model	Logical Model	Physical Model	Proposed Model
Elimination of 2NF relations	√	√	×	√

Elimination of widow elations	√	√	×	√
Elimination of orphan elations	√	√	×	√
Elimination of BLOB attributes	×	×	×	√
Identifying classes	√	√	√	√
Identifying associations	×	×	√	√
Identifying inheritance	×	×	√	√
Identifying aggregation	×	×	×	√
Data Mapping	√	√	√	√

From the above table we can justify that our proposed method based on experimental model is perform well as compared to the computational model because proposed method having the passes all the parameters in comparision with computational model model.

VIII. CONCLUSION

This paper implements an approach to transform a given conventional relational database into an object-oriented database. We implemented a system that builds an understanding of a given conventional database by taking these characteristics as input and produces the corresponding object-oriented database as output. Finally, we handle the migration of data from the conventional database to the constructed object-oriented database.

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Automatic Generation Control of Three Area Power Systems Using Ann Controllers

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ABSTRACT

This paper presents the use of one of the methods of artificial intelligence to study the automatic generation control of interconnected power systems. In the given paper, a control line of track is established for interconnected three area thermal-thermal-thermal power system using generation rate constraints (GRC) & Artificial Neural Network (ANN). The proposed control has been designed for a three-area interconnected power system that two areas include steam turbines , artificial neural network (ANN) controller, which controls the inputs of each area in the power system together, is considered. The working of the controllers is simulated using MATLAB/SIMULINK package. The outputs using both controllers are compared and it is established that ANN based approach is better than GRC for 1% step load conditions. The performance of the power system is simulated by using GRC and ANN controller, separately. By comparing the results for both cases, the performance of ANN controller is better than GRC.

KEYWORDS: *Load Frequency Control(LFC), Automatic Generation Control(AGC), ANN Controller, Area Control error(ACE), Narma controller, Tie-line, Control System Tool, MATLAB / SIMULINk.*

I. INTRODUCTION

One of the important issues in the operation of power system is Automatic Generation Control (AGC). It helps in supplying adequate and consistent electric power with good quality. It is the secondary control in LFC which re-establishes the frequency to its nominal value (50 Hz) and sustains the interchange of power between areas (in case of more than one control area). For this the load demand in the generator prime mover set is increased or decreased in the form of kinetic energy, resulting in change of frequency. The primary and tertiary control is performed by speed governors and economic dispatch respectively. The transient in primary, secondary and tertiary control is of the order of seconds and minutes respectively.Automatic generation control (AGC) is defined as the regulation of power output of controllable generators within a prescribed area in response to change in system frequency, tie-line loading or a relation of these to each other, so as to maintain the scheduled system frequency and / or to establish the interchange with other areas within predetermined limits **[2]**.Thus, a plan is required to maintain the frequency and desired tie line power flow as well to accomplish zero steady state error. Different types of. The most common of the controllers employed for AGC is Integral controller which is very simple to implement and gives better performance. But its performance goes down as the system becomes more and more complex. Therefore Artificial Intelligent controllers like Neural control approach is more suitable in this respect as It has advance adaptive control configuration **[3]**. In this paper, the performance evaluation Artificial Neural controller for three areas interconnected thermal-thermal-thermal power plant is proposed.

The beginning of artificial intelligence (AI) techniques persisting of neural networks has elucidated many problems. This technology mainly helps in those kinds of systems which are operating nonlinearly over the operating range. ANN has also been used in frequency controller design for Multi area AGC scheme in deregulated electricity market [4], [5]**.** These networks have been used for pattern recognition, function approximation, time series prediction and classification problems for quite some time. Even, ANNs have been successfully applied to the AGC problem with rather promising results [6], [7], [15].In this paper, a three area interconnected power system [1] is selected and Load Frequency Control (LFC) of this system is done using an ANN controller [7], [8], [15]. Each area needs its system frequency to be controlled [9], [10], [11]. Artificial Neural Network (ANN) controller has advanced adaptive control configuration, faster control [3] and continues to function without needing any decision support software in case of a failure. The performance of ANN controller is compared with conventional Integral controller.

II. MODELING INCLUDING GRC

In power system having steam plants [16], power generation can change only at a specified maximum rate. The generation rate (from safety consideration of the equipment) for the units is quite low. If these constraints are not considered, system is likely to chase large momentary disturbances. This results in undue wear and tear of the controller. When GRC is considered the system dynamic model becomes non-linear and linear control techniques cannot be applied for the optimization of the controller settings. If the generated rates are included in the state vector, the system order will be altered. Instead of augmenting them, while solving the state equations, it may be verified at each step if the GRCs are violated. Another way of considering the GRCs for all the areas is to add limiters to governors as shown in figure below, i.e. the maximum rate of valve opening or closing is restricted by limiters.

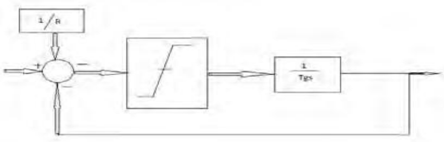

Fig 1: Governor model with GRC

The GRC result in larger deviations in ACEs as the rate at which generation can change in the area is constrained by limits imposed. Therefore the duration for which power needs to be imported increases considerably.

III. ARTIFICIAL NEURAL NETWORK

The foundation of Artificial neural networks(ANN) are the simple models for neurons and their links can be successful for learning and decision making if the model is pattern based (the Perceptron model) and/or is memory storing and recall process (the Hopfield network). They have numerous applications even outside of neuroscience. Some basic features of neural networks are:

i) Noisy data can be used in the problem.

ii) The network can `trained' on set of sample solutions for producing good performance.

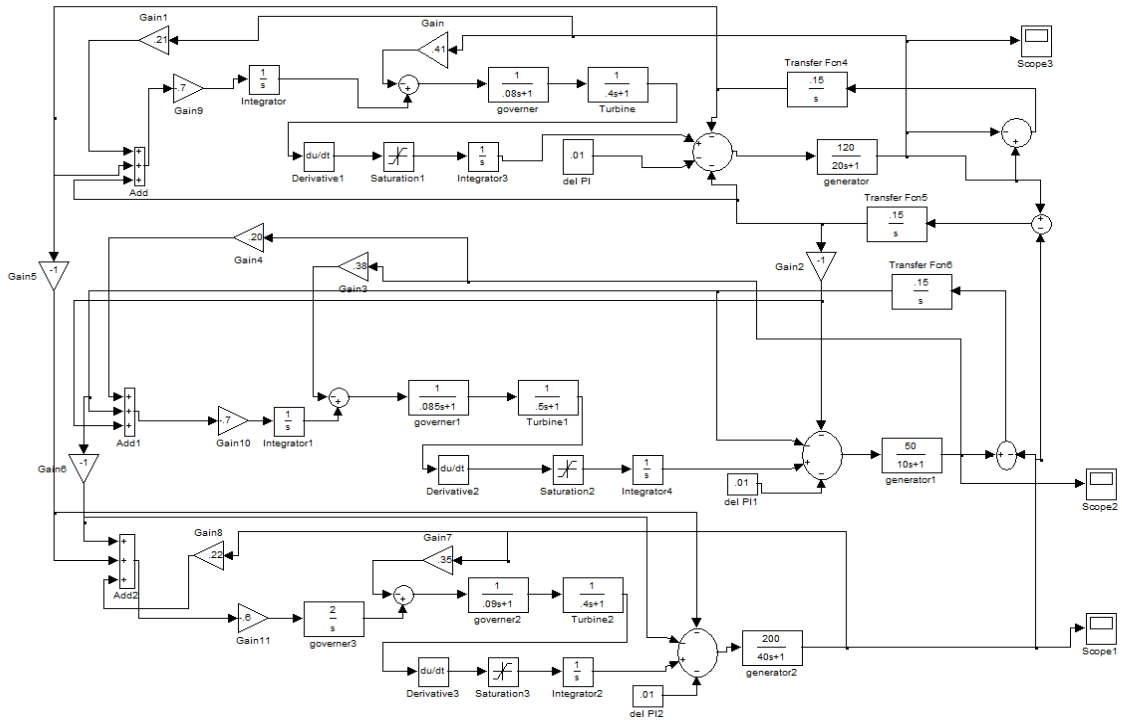

Fig 2: Simulink model of three area interconnected power system with non reheat turbine using GRC

ANN is a system having elements called as neurons which processes the information and this information is transmitted by means of connecting links associated with weights, which is multiplied to the incoming signal (net input) for any typical neural net, and the output signal is obtained by applying activations to the net input.The block diagram of system added ANN architecture is shown in fig. 3

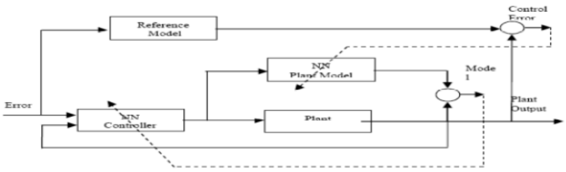

Fig.3 System added ANN architectur

3.1.Narma-L2 Control

ANN controller architecture employed here is Non-linear Auto Regressive Model reference Adaptive Controller[13]. Computations required for this controller is quite less. It is simply a rearrangement of the neural network plant model, which is trained offline, in batch form. It consists of reference, plant output and control signal. The plant output is forced to track the reference model output. Here, the effect of controller changes on plant output is predicted. It permits the updating of controller parameters. In the study, the frequency deviations, tie-line power deviation and load perturbation of the area are chosen as the neural network controller inputs. Control signals applied to the governors in the area act as the outputs of the neural network. The data required for the ANN controller training is obtained by designing the Reference Model Neural Network and applying to the power system with step response load disturbance. ANN controller used is a three-layer perceptron with one input, 15 neurons in the hidden layer, and one output. ANN Plant model is a three-layer perceptron with one input, 15 neurons in the hidden layer, and one output. The activation function of the networks neurons is train-lm function. 100 training samples have been taken to train 10 number of epochs. The proposed network has been trained by using the learning performance.Learning algorithms causes the adjustment of the weights so that the controlled system gives the desired response. (Fig. 4).

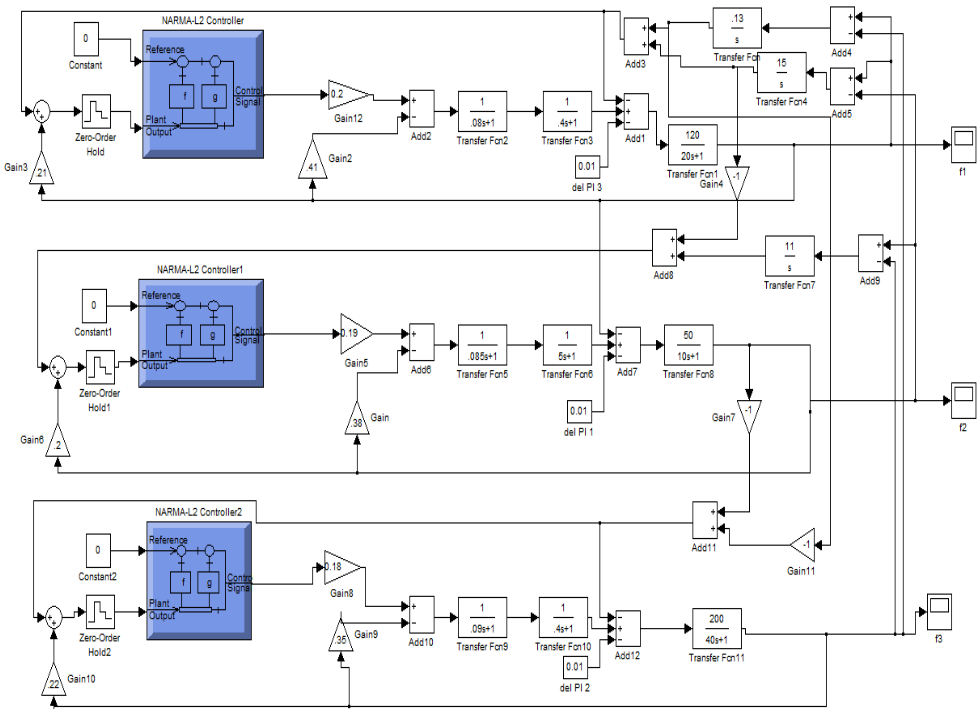

Fig 4: Simulink model of three area interconnected thermal with NARMA Controller

IV. SIMULATION AND RESULT

In the present work, a thermal-thermal-thermal interconnected power system has been developed using ANN controllers and integral controllers to demonstrate the performance of load frequency control using MATLAB/SIMULINK package. Fig. 5, 6, 7respectively represent the plots of change in system frequency and tie-line power respectively for 1% step load variation.

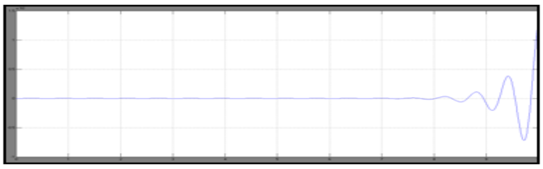

Fig 5: Waveform of f1 with Auto scale using NARMA controller

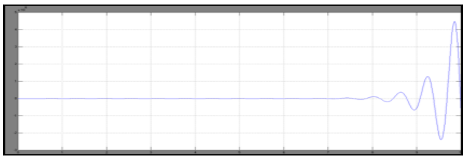

Fig 6: Waveform of f2 with Auto scale using NARMA controller1

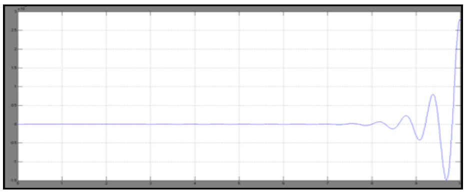

Fig 7: Waveform of f3 with Auto scale using NARMA controller2

4.1 Plant Identification Of Window

Then Import Data from Array & Structure with sampling interval (0.02 sec) with input array (simout1) & output array (simout2) with 100 training samples.

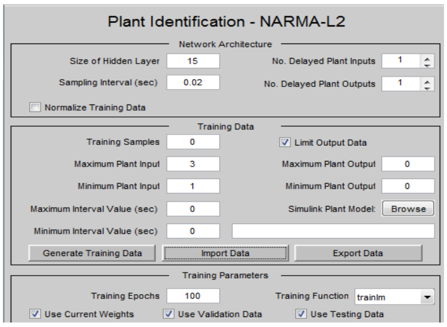

Fig 8: Plant Identification of controller

4.2 Import Data Window

Here simout1 act as a input array and simout2 act as a output array. Then import data from array and structure with sampling interval (0.02 sec) with input array (simout1) and output array (simout2) with 100 training. These terms import from workspace.

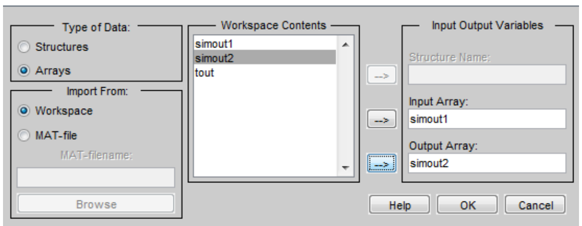

Fig 9: Import Data controller

4.3 Plant Input-Output Data Of Window

This data shows that plant input and plant output puts very small variation.

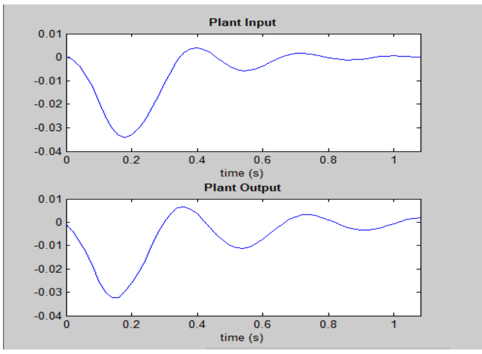

Fig 10: Plant Input-output Data controller

Now after accept data Train network then Apply & Ok

4.4 Neural Network Trained Tool Window

According to this parameter all the contents are visible and it also shows Performance, Training state and Regression. Here epochs of this parameter showing 1 epochs during plot interval

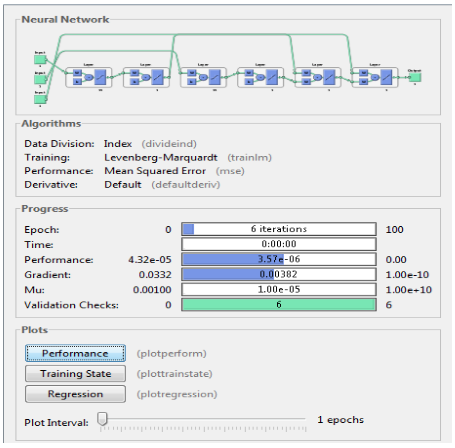

Fig 11: Neural Network trained Tool controller

4.5 Performance Window

This data showing training, validation and testing data through workspace. It shown the best validation performance through the epoch's period.

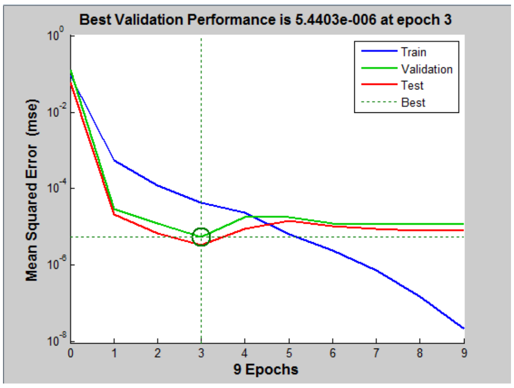

Fig 12: Performance controller

4.6 Training State Window

The Training state of any workspace shows the different no. of epochs in any power system.

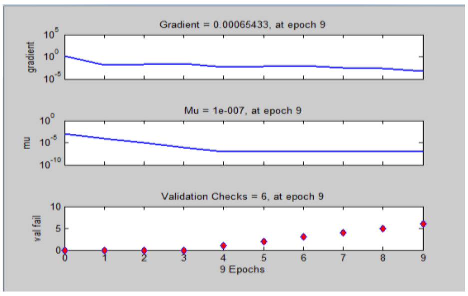

Fig 13: Training State controller

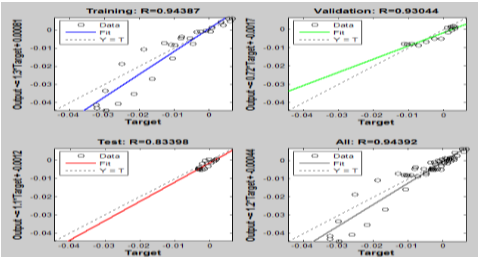

Fig 14: Regression controller

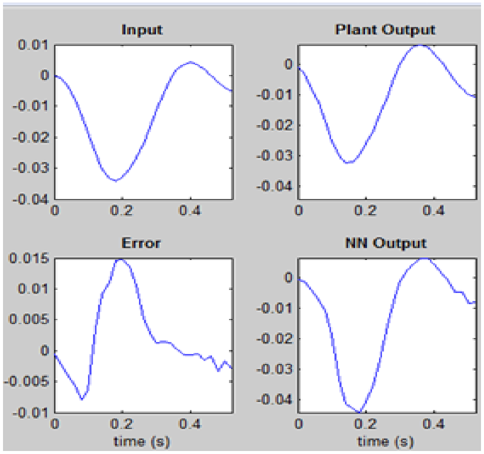

Fig 15: Training data

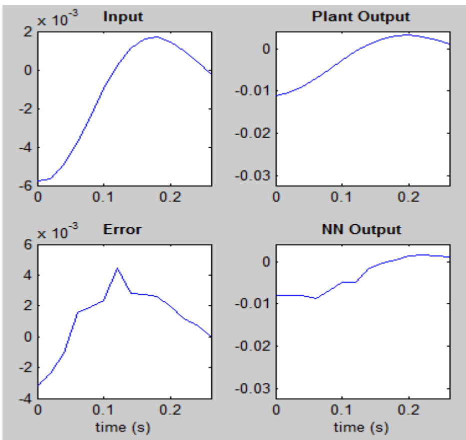

Fig 16: Validation Data

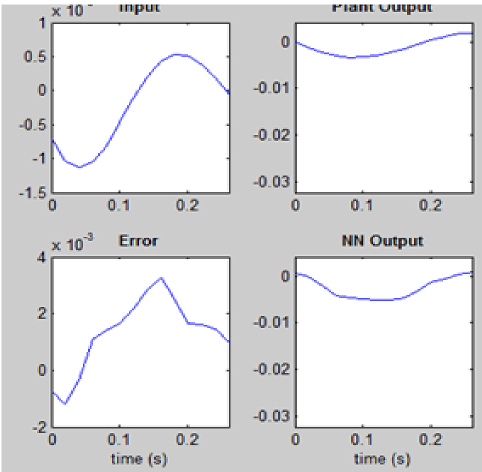

Fig 17: Testing Data

V. CONCLUSIONS

From the responses obtained, it is clear that use of ANN controller improves dynamic performance and reduces the overshoots w.r.t frequency deviation in each of the areas. Therefore, the intelligent control approach using ANN concept is more accurate and faster. And also it gives better results even when GRC are considered.

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An Effort to Improve Cohesion Metrics Using Inheritance

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ABSTRACT

Software metrics are used to assess and improve the quality of Software Product. Class Cohesion is degree of relatedness of class members and important measurement attribute of quality of a software product. But most of the existing cohesion tools and approaches do not consider inherited elements. But to measure overall design of product it is necessary to include all inherited elements. In this paper we calculate all existing metrics on implemented elements as well as on inherited elements to measure quality of design.

KEYWORDS: *Software metrics, Cohesion.*

I. INTRODUCTION

Concept of Software cohesion was started in 1970's by Stevens et al. [7] who wants inter module metrics for procedural Software's. Software cohesion is a measure of degree to which elements of a module belong together and measured at class level and it is most important Object Oriented Software attribute.

1.1. Types of cohesions:

Method Cohesion: Method is a module or bracketed piece of code that implement some functionality. Method cohesion focuses on the methods you write inside the class. Classical cohesion adapts seven degree of cohesion summarized from worst to best:

Coincidental Cohesion	Worst Cohesion
Logical Cohesion	
Temporal Cohesion	
Procedural Cohesion	
Communicational Cohesion	
Sequential Cohesion	
Functional Cohesion	Best Cohesion

Table 2: Classification Classical Cohesion

1.2.Class Cohesion: Classes are the fundamental units of object-oriented programs, and provided as the units of encapsulation promoting their modifiability and reusability. Class cohesion measure quality of classes by measuring binding of the elements defined with in the class. Inherited instance variables and inherited methods are not considered. Member methods are elements of a class and perform a common task and allow you to systematize class reasonably. Cohesiveness of a class depends upon its representation of its object as single, meaningful data abstraction. Cohesion of a class is rated as separable if its objects signify various unconnected data abstractions combined in one ne object. In this case instance variables and methods of class are partitioned into sets such that no method of one set uses instance variable or invoke method of a different set. For example if you have ten methods that act as utilities for network operations, you can very well split the class into two classes: one serving the utilities and the other, network operations. After split each separated class represent single data abstraction.

II. MAJOR EXISTING COHESION METRICS

Classes are basic units of Object oriented Software and should be designed to have good quality. Improper modeling produce improper responsibilities and assignment and result will be low cohesion. In order to assess class cohesion in object oriented systems we have several metrics. Cohesion Metrics measure togetherness of method of a class. A highly cohesive class performs one function. Most of the Cohesion Metrics are based on LCOM (lack of cohesion in methods) metrics defined by Chidamber and Kemerer[Chidamber 91] and it is also refined by many others. The Chidamber & Kemerer metrics suite originally consists of 6 metrics for each class: WMC, DIT, NOC, CBO, RFC and LCOM1. Suite has later been amended by RFC´, LCOM2, LCOM3 and LCOM4 by other authors.

- **LCOM1:** LCOM1 was introduced in Chidamber & Kemerer metrics suite. This metric calculate the number of pairs of methods in class using no instance variable in common.

LCOM1 = P – Q, if value of result is positive. LCOM1 = 0 if value of subtraction is negative.
0 indicates that class is cohesive and LCOM1 > 0, indicates that the class needs or can be split into two or more classes.

- **LCOM2**:P is Number of pairs of methods that do not share attributes and Q = Number of pairs of methods that share attributes.

LCOM2=P-Q if P-Q>0 and otherwise LCOM2=0

- **LCOM3: =**LCOM3 is proposed by Li & Henry, 1993 and calculated by number of disjoint components in the graph that represents each method as a node and the sharing of at least one attribute as an edge.

- **LCOM4:** LCOM4 measures the number of "connected components" in a class. A connected component is a set of related methods (and class-level variables).

LCOM4=1 indicates a cohesive class, which is the "good" class.
LCOM4>=2 indicates a problem. The class should be split into so many smaller classes.
LCOM4=0 happens when there are no methods in a class. This is also a "bad" class.

- **LCOM5:** LCOM5 is purposed by Henderson-Sellers.

LCOM5 = (a – kℓ) / (ℓ – kℓ),
ℓ => number of attributes,
k=> number of methods,
a => summation of the number of distinct attributes accessed by each method in a class.

- **Coh:** Coh is variation in LCOM5.

Coh = a / kℓ or Coh = 1 – (1 – 1/k)LCOM5

- **TCC (Tight Class Cohesion):** TCC is defined as the percentage of method pairs that are directly related. Consider a class with n public methods. Let NP be the maximum number of public method pairs:

NP = maximum number of possible connections= N * (N-1) / 2 where N is the number of methods
NDC = number of direct connections (number of edges in the connection graph)
Tight class cohesion TCC = NDC/NP

- **LCC (Loose Class Cohesion):** LCC is defined as the relative number of indirectly connected public methods. NIC is number of direct or indirect connections between public methods.

NID = number of indirect connections.
LCC= NIC/ NP

III. INHERITANCE AND COHESION

Inheritance is a key concept in object-oriented programming and implementing the inheritance relations in a software system properly is expected to improve the quality of the system. [12] But most of the existing metrics tools do not consider inherited methods. But design of full project depends upon both inherited as well as implemented methods. To measure overall design complexity both study of both elements is required. Therefore there is need to examine cohesion with or without inherited elements.

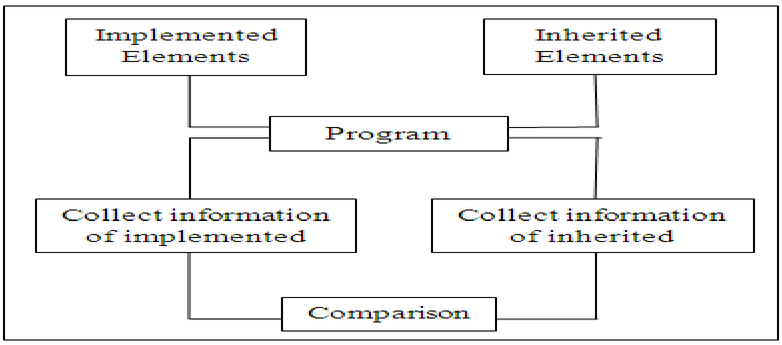

Fig. 1: Procedure Followed in this paper

Three Cases discussed in this paper are:

Case1:

```
Using System;
Class Base
{
Protected int Volume;
Public out()
{
Console.writeline("this is base class");
}
}
Class Sub: Base
{
Public Conevol()
{
Float Radius, Height;
Console.writeLine("enter radius of cube");
Radius= Console.readLine;
Console.writeLine("enter height of cube");
Height= Console.readLine;
Volume=1/3*22/7*Radius*Radius*Height;
}
Public Cylindervol()
{
Float Radius, Height;
Console.writeLine("enter radius of cylinder");
Radius= Console.readLine;
Console.writeLine("enter height of cylinder");
Height= Console.readLine;
Volume=22/7*Radius*Height;
}
Public Prismvol()
{
Float Width, Height, Lenght;
Console.writeLine("enter width of prism");
Width= Console.readLine;
Console.writeLine("enter height of prism");
Height= Console.readLine;
Console.writeLine("enter length of prism");
```

```
Length= Console.readLine;
Volume= Length*Width*Height;
}
}
Class mainclass
{
Public static void Main()
{
Sub sub=new Sub();
sub. out();
sub. Conevol();
sub. Prismvol();
}
}
```

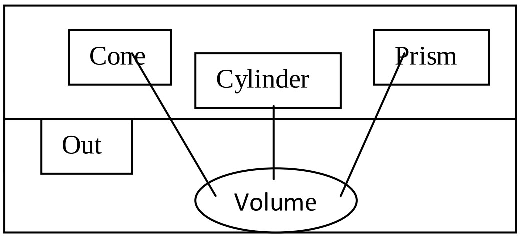

Fig. 2: Diagrammatic representation for Case1

In this example Cone, Prism and Cylinder are implemented elements of sub class that share a common attribute Volume that is element of super class here cohesion is low if only implemented elements are considered because there is no connection between implanted methods if we exclude inherited elements. Out is method of super class and there is no link of out with any other implemented or inherited element. Values of TCC and LCC are zero if we exclude inherited elements.

Implemented Elements	Inherited Elements	Metrics
3	3	LCOM1
3	0	LCOM2
3	2	LCOM3
3	2	LCOM4
0	1/3	LCOM5
1	7/9	Coh
0	½	TCC
0	2/6	LCC

Table 4: Result for Cohesion metrics including and excluding inherited elements

Case2:

```
Using System;
Class Base
{
int Area;
protected square()
{
int side;
Console.writeLine("enter side of square");
```

```
side= Console.readLine;
Area= side*side;
Console.writeLine("Area of square is="Area);
}
protected rectangle()
{
int length, breath;
Console.writeLine("enter sides of rectangle");
lenght= Console.readLine;
breath = Console.readLine;
Area= lenght*breath;
Console.writeLine("Area of rectangle is="Area);
}
}
Class Sub: base
{
Public method1()
{
Console.writeLine("subclass method1");
}
Public method2()
{
Console.writeLine("subclass method2");
}
}
Class test
{
Public static void main()
{
Sub sub= new sub();
sub.square();
sub.method1();
sub.method2();
}}
```

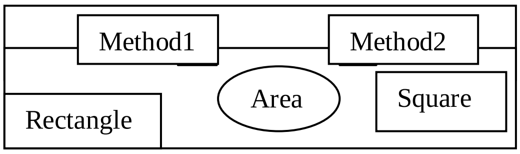

Fig. 3: Diagrammatic Representation for Case2

In this program Method1 and Method2 are implemented method in sub class and rectangle and square are method of inherited class that shares a common super class variable Area. In this example cohesion of sub class elements is almost zero So if we include inherited elements in calculating cohesion of this code results are better.

Implemented Elements	Inherited Elements	Metrics
1	5	LCOM1
1	4	LCOM2
2	3	LCOM3
2	3	LCOM4
0	2/3	LCOM5
1	½	Coh
0	1/6	TCC
0	1/6	LCC

Table 5: Result for Cohesion metrics including and excluding inherited elements

Case3:

```
using System;
namespace InheritanceApplication
{
   class Shape
   {
      protected int width;
      public void setWidth()
      {
         width = w;
      }
Class Rectangle: Shape
{
protected int height;
 public void setHeight(int h)
   {
     Height= h;
    }
Public area()
{
Return (width * height);
}
Public volume()
{
Return (1/2(width + height));
}
}
class RectangleTester
   {
      Public static void Main()
      {
         Rectangle Rect = new Rectangle();
         Rect.setWidth(5);
         Rect.setHeight(7);
         Console.WriteLine("Total area: {0}",  Rect.Area());
         Console.WriteLine("Total area: {0}",  Rect.volume());
         }
```

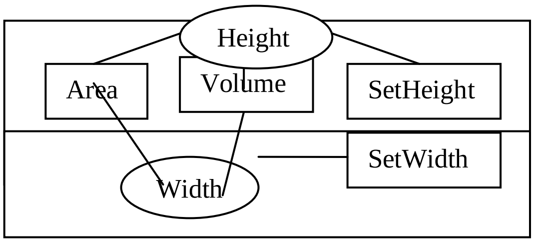

Fig. 4 Diagrammatic Representation for Case3

In this case Area, Volume, Setheight and height are implemented elements. Width and Set width are elements defined in base class. Design of this program is better than other cases. Cohesion of this program is good in both cases but value of LCC indicates design quality of this program.

Implemented Elements	Inherited Elements	Metrics
0	1	LCOM1
0	0	LCOM2
1	1	LCOM3
1	1	LCOM4
0	0.333	LCOM5
1	0.75	Coh
1	0.8333	TCC
0.666	1	LCC

Table 5: Result for Cohesion metrics including and excluding inherited elements

CASE1:

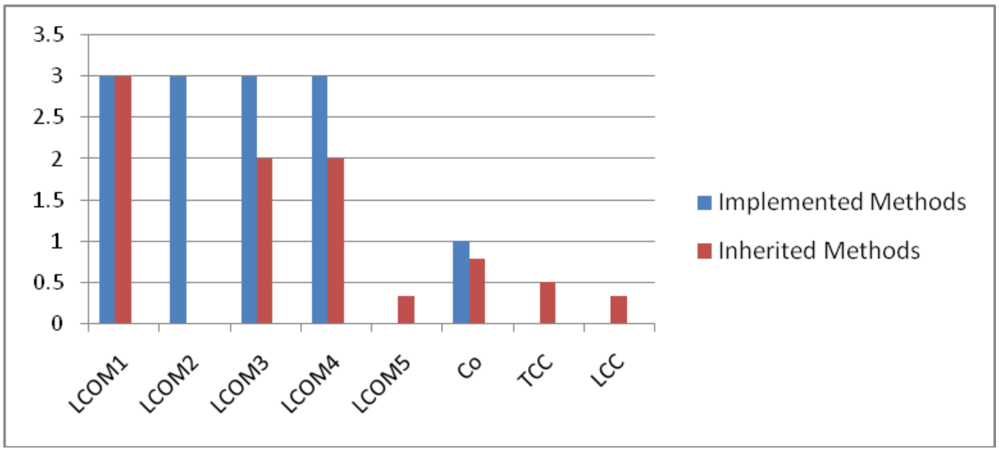

Fig.5: Graphical representation of results of Case1

CASE2:

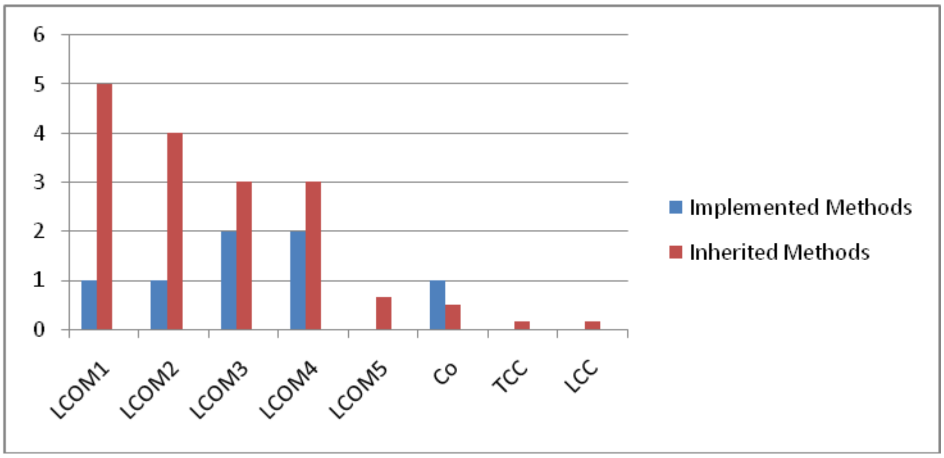

Fig.6: Graphical representation of results of Case2

CASE3:

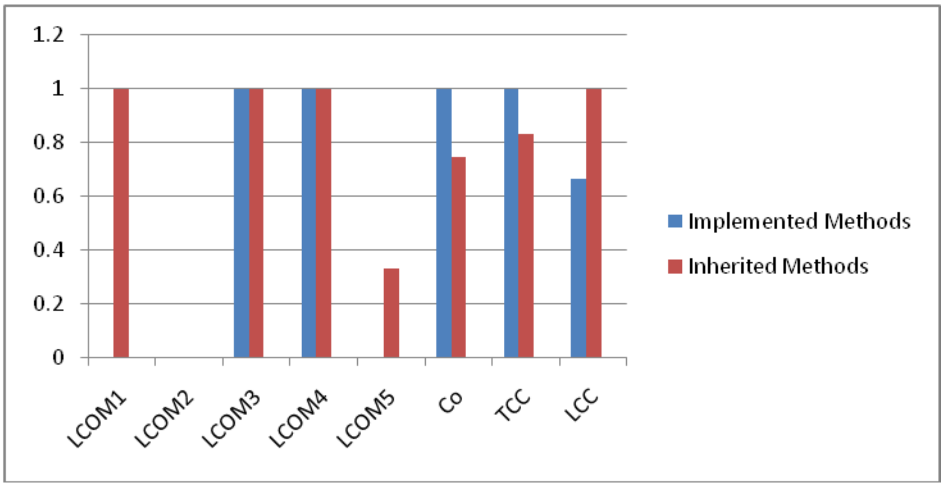

Fig. 7: Graphical representation of results of Case3

IV. CONCLUSION AND FUTURE WORK

By including inherited elements cohesion can be increased or decreased depending upon design structure of super class and sub class. Additional efforts are requires to measure design complexity by including inherited elements. TCC and LCC are used to measure design complexity of software.

This study will help to improve the applicability of existing cohesion metrics to measure the requirement of refactoring the classes. LCC helps to assess reusability of code. There are some aspects related to inheritance that are not discussed in this paper for example: Concept of public, private, protected and internal elements require investigation. Concept of direct or indirect call by instance variable should be considered.

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A Novel Approach for Design and Verification of 4-Bit Asynchronous Counter Using Reversible Logic Gates

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ABSTRACT:

Reversible logic has extensive application in emerging nanotechnologies. Design of reversible sequential circuits are presented that are optimized for the number of reversible gates and the garbage outputs. The optimization of the number of the reversible gates is not sufficient since each reversible gate is of different computational complexity, and thus will have a different quantum cost and delay. While the computational complexity of the reversible gates can be measured by its quantum cost, the delay of a reversible gate is another parameter that can be optimized during the design of a reversible sequential circuit. In this work, we presents novel designes of reversible latches that are optimized in terms of quantum cost, delay and the garbage outputs. The optimized designs of reversible latches presented in this work are the T latch and SR latch. The choice of reversible gates and design approach to carefully select a reversible gate for implementing a particular logic function will significantly impact the quantum costm, delay and garbage outputs of the reversible design. As compared to the best reported designs in literature, the proposed reversible sequential latches are better in terms of quantum cost, delay and garbage outputs.

KEYWORDS: *Quantum cost, Quantum Delay, Reversible, Garbage, Ancilla, Optimization, flip-flop, Complexity.*

I. INTRODUCTION

An n-input n-output function F is said to be reversible if there is a one-to-one correspondence between the inputs and the outputs. Therefore, the input vector can be uniquely determined from the output vector. One of the major goals in VLSI circuit design is reduction in power consumption. Laundauer in 1960's said that irreversible hardware computation regardless of its realization technique, results in energy dissipation due to the information loss. If we design complex circuits then the heat dissipation will be increased and the loss of each bit dissipates at least KTln2 joules of energy(heat), where is the Boltzmann's constant and T is the absolute temperature at which operation is performed.Today's computers erase a bit of information every time they perform a logic operation. These logic operations are therefore called "irreversible." This erasure is done very inefficiently, and much more than *kT* is dissipated for each bit erased. Today, because we are dissipating much more than *kT*, we can do this by improving conventional methods, i.e., by improving the efficiency with which we erase information.

An alternative is to use logic operations that do not erase information. These are called reversible logic operations, and in principle they can dissipate arbitrarily little heat. As the energy dissipated per irreversible logic operation approaches the fundamental limit of ln 2 x *kT*, the use of reversible operations is likely to become more attractive.

II. REVERSIBLE LATCHES

Reversible Latches are designed using Reversible Logic gates [1]. Reversible Logic gates are basic building blocks of design a reversible logic circuits. We present novel design of reversible latches that are being optimized in terms of quantum cost, delay and the number of garbage outputs compare existing version [2].

2.1 SR latch

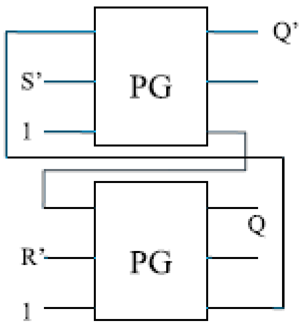


Fig:1 SR latch

Optimized design of SR latch designed using peries Gate (PG) [1] . Comparison of existing SR latch and we proposing Latch is shown above.

Table:1 comparison between existing and proposed reversible SR latch

	Quantum cost	Quantum delay	Garbage outputs	Fixed input
Existing SR latch	10	5	2	2
Proposed SR latch	8	4	2	2
Improvement in %	20	20	-	-

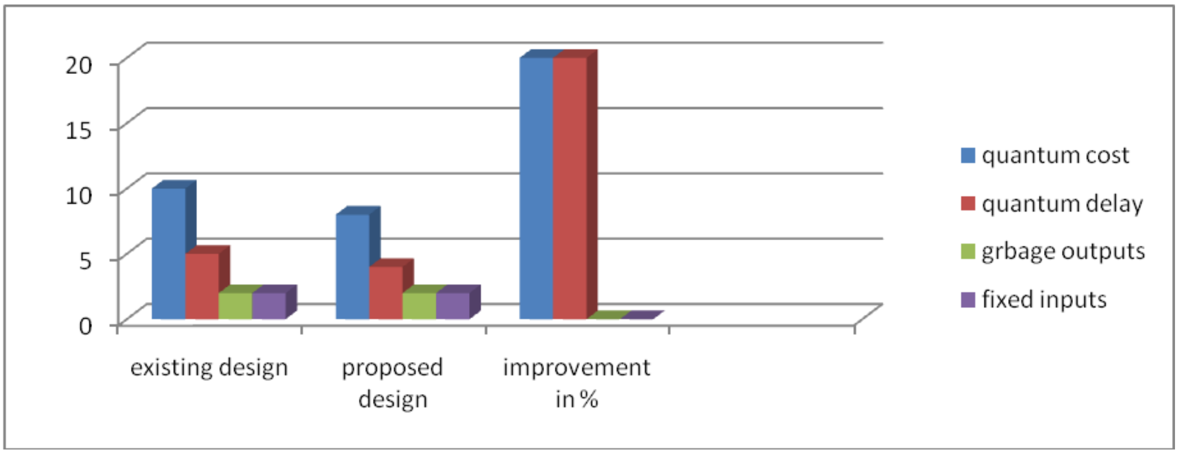


Fig: 2 comparison chart for reversible SR latches

2.2 T-latch

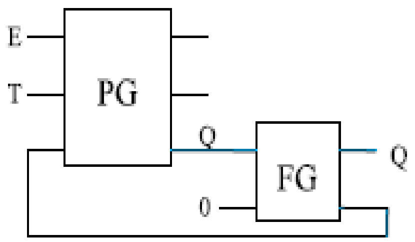


Fig:3 proposed design of reversible T latch

Optimized design of T-latch designed using peries Gate (PG) [1] . Comparison of existing T- latch and we proposing Latch is shown above.

Table:2 ccomparion of T latches in terms of QC,QD and GO

	Quantum cost	Quantum delay	Garbage outputs	Fixed inputs
Proposed design	5	5	2	1
Existing design	7	7	2	1
Improvement in %	29	29	-	-

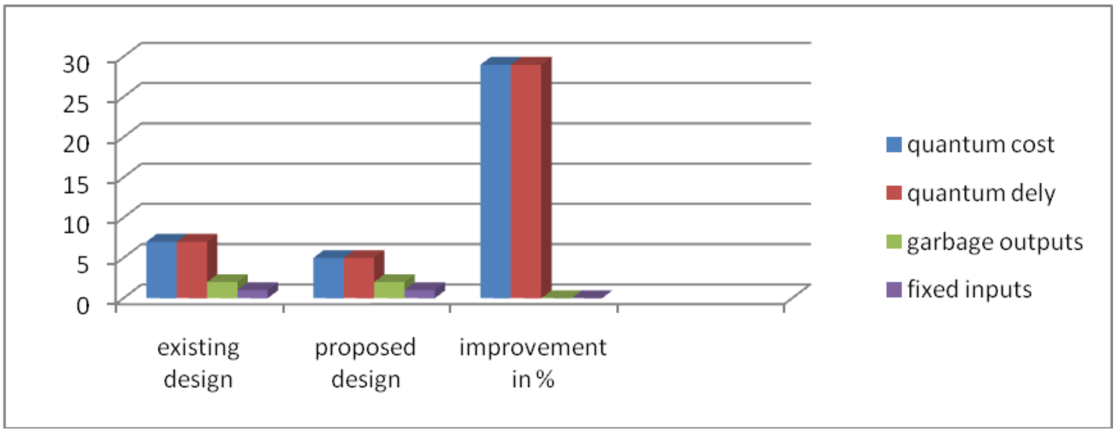


Fig:4 comparison chart for T latches

III. FLIP-FLOP

Flip-flop is a one bit storage device. And also one of example of sequential circuit. For designing counter flip is a basic element.

3.1 T-Flip-flop

In this section we propose the construction of Master-Slave T Flip-Flop using reversible gates. The truth table is shown in the Table 3. The design is shown in the Figure 5. We added a Feynman gate to get the desired functionality of fanout. The comparison of the proposed design with the existing ones is shown in the Table 4.There is no explicit mention of the reversible edge triggered T Flip-Flop. If we do the naive construction by replacing every irreversible gate by appropriate reversible gate, then the number of gates in the existing design has quantum cost 17, quantum delay 16 and the garbage outputs will be 4. The proposed design has [3], of QC,QD and GO. The comparison is shown in the Table 4.

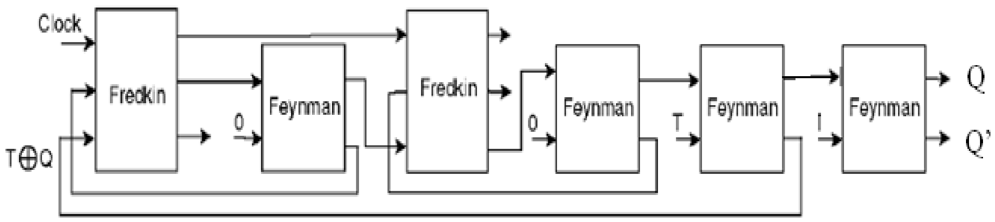


Fig: 5 proposed design of reversible T flip-flop

Table:3 Truth table for T flip-flop

clk	T	Q	Q+
0	1	0	0
↑	0	0	0
↑	0	1	1
↑	1	0	1
↑	1	1	0

Table: 4 comparision of proposed and existing design of reversible T flip-flops

	Quantum cost	Quantum delay	Garbage outputs	Fixed inputs
Existing design	17	16	4	4
Proposed design	14	14	3	3
Improvement in %	18	13	25	25

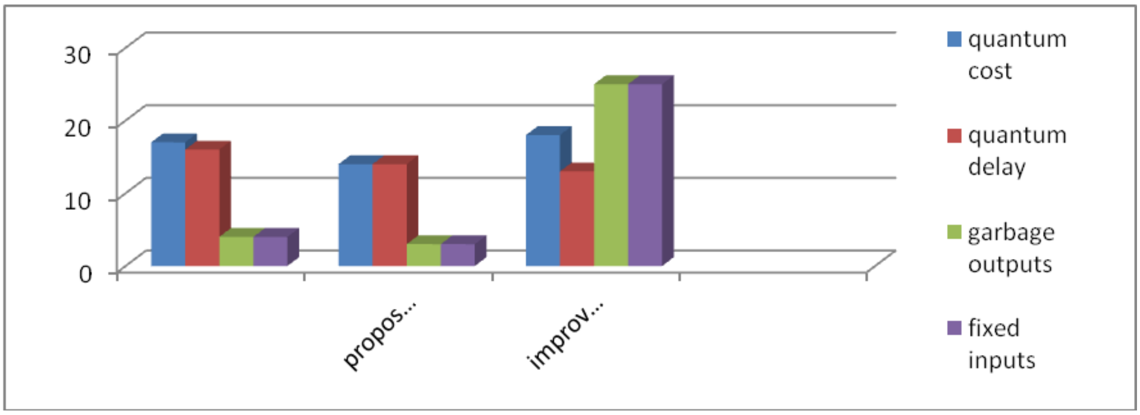


Fig: 6 comparision chart between existing and proposed reversible T flip-flops

IV. DESIGN OF REVERSIBLE 4 BIT BINARY COUNTER

The treditional 4 bit binary counter consists of four T flip-flops. From the above designed counter is the optimized in terms of quantum cost, quantum delay, garbage outputs and also designed with optimied D latches,D flip-flops and T flip-flops. There is no reversible 4 bit binary counter, present designed counter is existing as well as proposed counter.

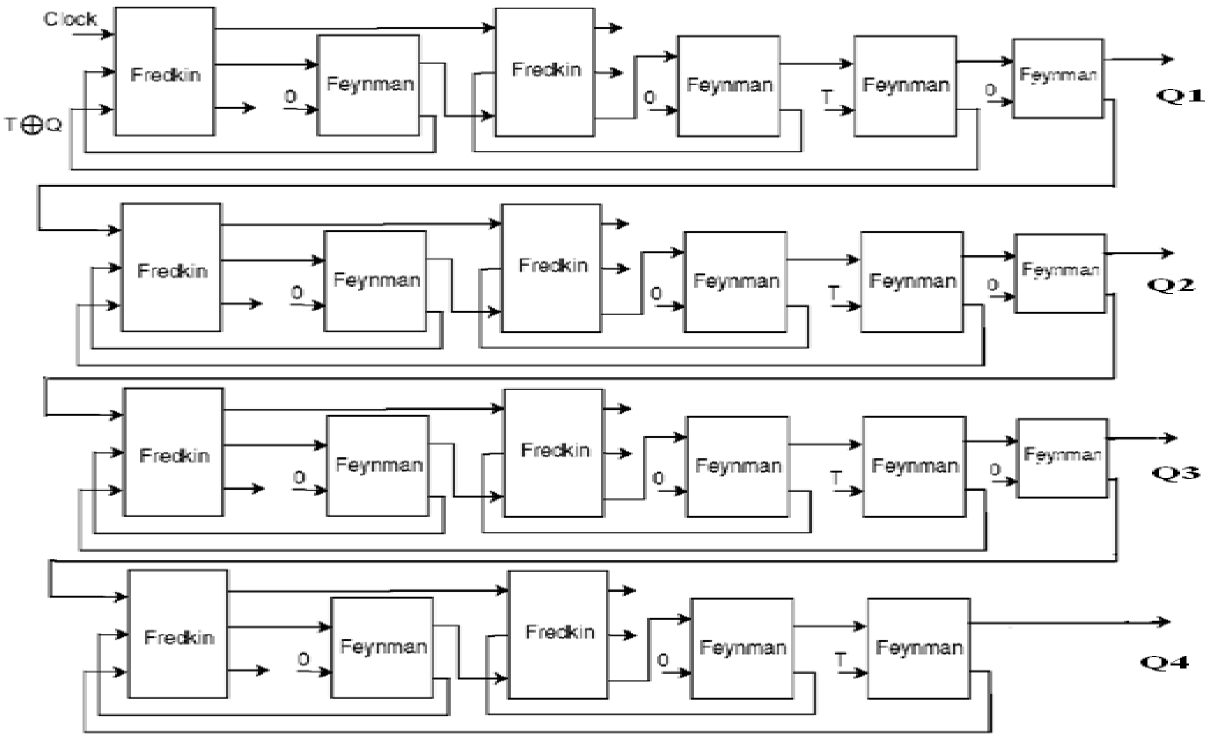


Fig: 7 proposed design of 4 bit binary counter

In case of taking the existing latches and flip-flops to design 4 bit binary counter the comparision we can observe as shown in following table in terms of quantum cost, quantum delay, garbage outputs and fixed inputs.

Table:5 proposed design of reversible 4 bit binary counter table of content

parameter	Existing design	Proposed design	Improvement in %
Quantum cost	150	58	62
Quantum delay	147	55	63
Forced inputs	34	18	48
Garbage outputs	40	12	70

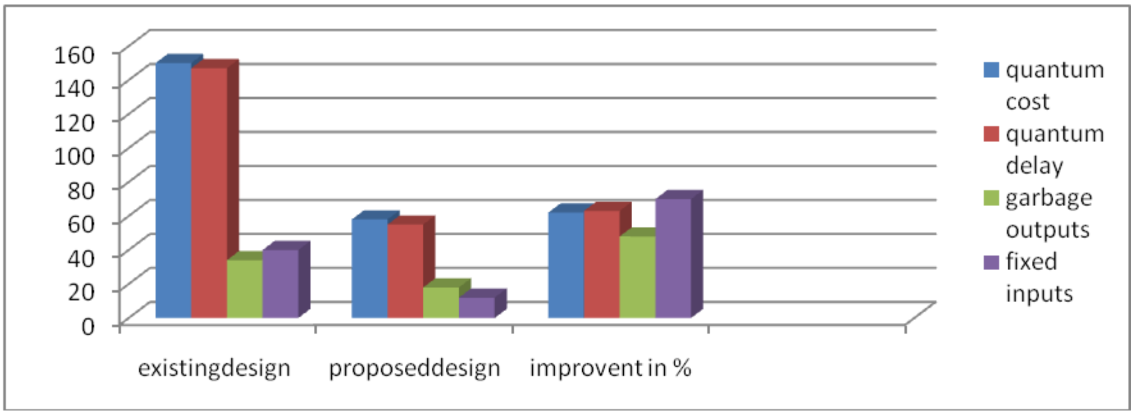
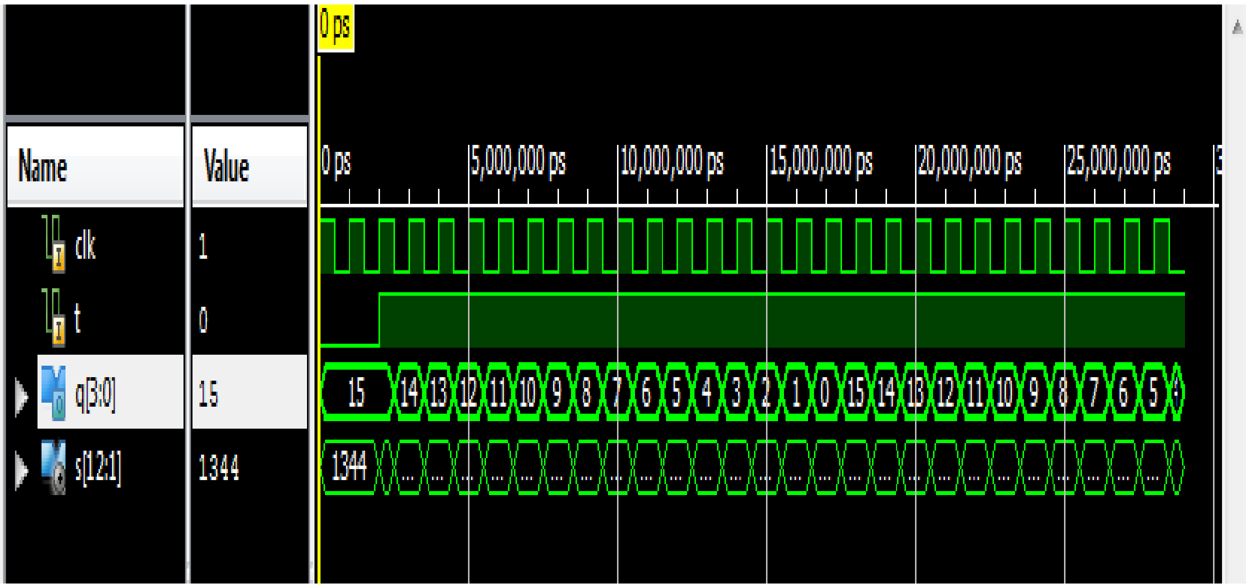


Fig:8 comparision chart between existing and proposed reversible 4-bit binary counter

V. SIMULATION RESULTS



A binary counter consists of a series connection of complementing flip-flops, with the output of each flip-flop connected to the input of next higher order flip-flops. The count starts binary 1111 and decrements by 1with each count pulse input after the count of 0000 the counter go back to 1111 to repeat the count.

VI. CONCLUSION

In this work, we have presented novel designs of reversible latches which are optimized in terms of quantum cost, delay and garbage outputs. We conclude that the choice of reversible gates and the design approach to carefully select a reversible gate for implementing a particular logic function will significantly impact the quantum cost, delay and garbage outputs of the reversible design.As compared to the best reported designs in literature, the proposed reversible sequential latches are better in terms of quantum cost, delay and garbage outputs. Further advancement of the proposed work is to use the proposed latches and flip-flops towards the design of complex sequential circuits.

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Cloud Computing Security: Abuse and Nefarious Use of Cloud Computing

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ABSTRACT:

Cloud computing is an emerging and promising computing model that provides on-demand computing services which eliminates the need of bearing operational costs associated with deploying servers and software applications. As with any technology, cloud computing presents its adopters with security and privacy concerns that arise from exposing sensitive business information to unauthorized access. This paper will explore and investigate the scope and magnitude of one of the top cloud computing security threats "abuse and nefarious use of cloud computing" and present some of the attacks specific to this top threat as it represents a major barrier for decision makers to adopting cloud computing model. Also, this paper aims to serve as an introductory research effort to warrant more extensive research into this top threat and help researchers to make recommendations to business organizations as to whether or not their data are vulnerable to such threat when deciding to join the cloud.

KEYWORDS: Abuse and nefarious use of cloud computing, Cloud computing security threats, Private cloud, Public cloud, Virtualization.

I. INTRODUCTION

Cloud computing is one of the revolutionary technologies that is expected to dominate and reshape the information technology industry in the near future. This emerging computing technology provides highly scalable computing resources (e.g. information, applications, and transactions) in a way that is accessible, flexible, on-demand, and at a low cost [1]; it provides unique opportunities for organizations to run business with efficacy and efficiency by allowing businesses to run their applications on a shared data center thus eliminating the need for servers, storage, processing power, upgrades, and technical teams. Furthermore; in cloud computing model, business organizations do not need to purchase any software products or services to run business because they can simply subscribe to the applications in the cloud; those applications normally are scalable and reliable and ultimately allow business leaders to focus on their core business functions to enhance performance and increase profitability. Many organizations have become interested in the cloud computing concept due to many compelling benefits presented by this emerging computing paradigm [2].

Cloud computing vendors are offering scalable services and applications via centralized data centers utilizing thousands of server computers which provide easy access to computing resources anytime and anywhere [2]; the capability of cloud computing to quickly scale and provide access to computing services and resources anytime and anywhere, allowing organizations to quickly respond to changing business needs without the expenditures of time, space, money, personnel, and other resources needed for traditional infrastructures for example, New York newspaper organization were able to convert 11 million scanned and archived hard copies into portable document format (PDF) files in 24 hours by renting 100 servers from Amazon's cloud services at a cost to the organization was approximately $250. Alternative methods for the conversion would have required cost and taken weeks or even months to complete [3].while cloud computing offers enormous potential for reducing costs and increasing an organization's ability to quickly scale computing resources to respond to changing needs, there are risks associated with cloud computing.

Specifically, cloud computing may mean that an organization relinquishes control, resulting in exposure to breaches in confidentiality, losses in data integrity and availability. However; as with any technology, cloud computing has its own disadvantage such as releasing control of maintaining confidentiality, integrity, and availability of sensitive business data; In general, most cloud computing consumers want to be assured that cloud providers have effective security policies and controls in place to comply with data protection standards and meet regulatory compliance requirements prior to making a decision to migrate their data or applications to the cloud.

II. CLOUD DEPLOYMENT MODELS

According to [4] there are four cloud deployment models regardless of the service model adopted (Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS)):

2.1. Public Cloud. This is also called external cloud sometimes and it basically involves an organization that sells readily available cloud services to the general public. Business organizations with sensitive corporate data are reluctant to adopt this model because it increases the threat of exposing confidential data to unauthorized access by third parties and potential cyber criminals. The advantage of using the public cloud is that an organization itself does not have to manage the cloud computing infrastructure nor maintain operational activities. The disadvantage of utilizing the services from a public cloud provider is that it is entirely dependent upon another business entity that is offering resources through public cloud [5].

2.2. Private Cloud. Also referred to as internal cloud which means that cloud infrastructure and services are explicitly made available for a single organization. This deployment model can be located on premise or off site as it can also be managed by the organization itself or can be outsourced to a third party. Privately-hosted cloud services tend to be more costly but safer than other deployment models because organizations can retain control of their sensitive data and applications and implement their own security measures. The advantage for maintaining the private cloud is that an organization can retain full control of all the computing resources (e.g. applications, data, and systems) related to a cloud infrastructure. The disadvantage of such a deployment model is that an organization has to invest significantly in computing and storage resources and bear the cost of maintaining all software and computing platforms.

2.3. Community Cloud. Organizations who share the same concerns and goals (e.g. security controls, privacy concerns, organizational mission, and regulatory compliance requirements) can join this deployment model to share the cloud infrastructure which could exist on-premise or off-premise as it could be managed by a third party as well.

2.4. Hybrid Cloud. This deployment model can span two or more other deployment models such as private, public, or community. In this model, data and applications are still standardized and enabled by a proprietary technology. The benefit of this model is that it offers a blend of cost effectiveness and scalability without exposing sensitive business data to external threats. This is possible because the hybrid model allows organizations to maintain their mission-critical applications in a private cloud (which provides security and control of in-house computing resource) and migrates their non-critical applications and platforms to the public cloud. Data availability, control, and performance are some of the disadvantages that can arise from adopting the hybrid cloud model. Figure (1) below is a visual model defined by the National Institute of Standards and Technology (NIST) illustrating the three cloud service models and the four deployment models:

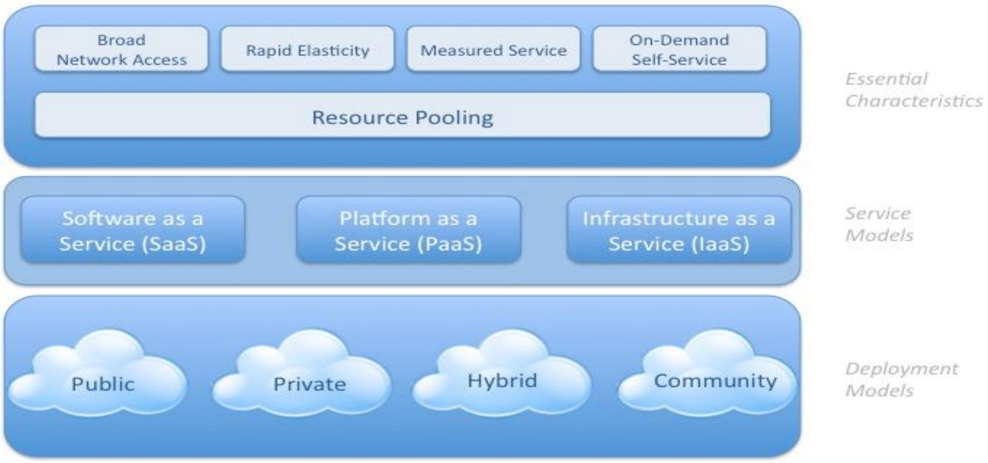

Figure 1. NIST visual model of cloud computing definition

III. CLOUD COMPUTING SERVICE MODELS

[4] States that the cloud computing technology comprises three fundamental classifications which are commonly referred to as "SPI Model" where "SPI" refers to "Software", "Platform", "Infrastructure" respectively. Below is a definition of each service model:

3.1. SaaS. In this model, the cloud provider has control of the underlying cloud infrastructure such as servers, operating system, processing, storage, and even the applications capabilities. Cloud provider has the responsibility of managing application capabilities while allowing cloud customers to use and access the application capabilities from their own devices via a thin client interface such as a web browser. Cloud subscribers who adopt this service model will generally have the least control over cloud applications while they have very limited freedom in changing user specific configuration settings [4]; a good example for this type of service model is the Gmail application which is a web-based e-mail provided by Google as a SaaS.

3.2. PaaS. This computing model is similar to the previous one in that cloud consumers do not have any control over the underlying cloud infrastructure such as network, servers, storage, processing, and applications. This model allows cloud customers to deploy their own application (created by customer) onto the cloud infrastructure that enables them to control and mange those applications. Furthermore; cloud clients do not need to purchase or manage the cloud computing infrastructure while they are provided with capabilities to develop and use software applications. For example, Google has a PaaS that allows clients to run their web applications on the Google App Engine using an internet browser such as Internet Explorer [6].

3.3. IaaS. This is the foundation of cloud services because it provides capabilities for cloud consumers to deploy fundamental computing resources such as operating systems, applications, servers, bandwidth, storage, and processing. As with the other two models, this model does not demand cloud consumers to manage or control the underlying cloud infrastructure. For example, Amazon EC2 allows individuals and businesses to run their own applications on machines that can be rented with preconfigured and selected operating system [6].

IV. CLOUD COMPUTING THREATS

Security researchers as well as industry experts strongly predict that cloud computing will be the "next big thing" due to its compelling cost saving advantage and on-demand web based nature which allows business organizations to focus on their core business competencies; however, these computing possibilities do not come risk free because they expose organization's sensitive data to cyber threats and open the door for new attack vectors. In fact; migrating to the cloud magnifies risks to confidential data because business information resources are exposed to third parties (cloud providers) who themselves may pose a risk from their internal employees and thereby increasing the possibility of insider threat.

Moreover; the real threat arises from the fact that service provider has the privilege of accessing sensitive business data and may be allured to misuse or abuse this privilege or even access data in an unauthorized manner. Therefore cloud consumers have to take the risk of entrusting service providers with their sensitive information assets and hope that the cloud service providers have security measures in place to restrict employee access to information thereby reduce risk of insider threat to a minimum. One of the unique security risks associated with the use of cloud services is that of virtualization; cloud computing utilizes virtual machines to run different multiple instances on the same physical machine [7]. Those instances have to be isolated to prevent malicious hackers from eaves dropping or taking control of host machine. Although cloud providers such as Amazon have VM monitors in place to detect such malicious or illegal activity; however, this security measure cannot fully address the security requirements necessary to block or prevent compromised VMs from extracting and leaking information to cyber criminals.

- Top Cloud Computing Security Threat: Abuse and Nefarious Use of Cloud Computing: According to[8], abuse and nefarious use of cloud computing is considered as the top security threat to cloud computing because cloud providers do not enforce any strong registration process where any person with a valid credit card can register to receive cloud services; this huge flaw in the registration system coupled with weak fraud detection capabilities lends cloud computing models such as IaaS and PaaS to malicious attacks by criminals who can leverage those technologies and target cloud providers.

  To make matters worse, and according to [8], some cloud service providers offer readily available free limited trial period of cloud services which presents a perfect opportune time for cyber criminals to join the cloud and possibly misuse and abuse their access privilege to cloud services. Cloud computing model by its very nature involves multiple data centers across possibly multiple locations and each data center is dedicated to many customers and their data needs; this in turn makes investigating and detecting unauthorized or inappropriate activity significantly difficult in a cloud environment. Attackers can exploit this threat and launch an attack called "cloud computing malware injection attack" by creating their own implementation module (e.g. PaaS or SaaS) within the cloud environment and trick the cloud system to treat that malicious instance as a valid instance for the particular service module; once adversary is capable of doing this trick, the cloud system will automatically redirect valid user requests to the service module run by attackers [9]. As a case in point, hackers can host malicious data and possibly convince users of Amazon Elastic Cloud Compute (EC2) to run images on a virtual machine by giving the image a name that sounds official such as "Fedora-core" [10].

  In fact; [11] were able to use the Amazon EC2 service as a case study and demonstrated information leak by first mapping internal cloud infrastructure, identify the possible location of a target virtual machine, and then continue to create instances of Virtual Machines (VM) until one is created adjacent to the target VM; once the target VM has been located and identified, hackers can compromise that VM and use it to leak information. They showed that investing a few dollars to buy an instance of a VM with Amazon EC2 service can have a % 40 chance of successfully placing a malicious VM on the same physical machine as the target customer. Moreover; cyber hackers can masquerade themselves as legitimate cloud users and abuse this feature to launch spam campaigns, run botnets, and brute force attacks. Figure (2) below shows different components of security requirements within a cloud platform which makes security a more challenging task for cloud providers given that there are four deployment methods and three cloud computing models.

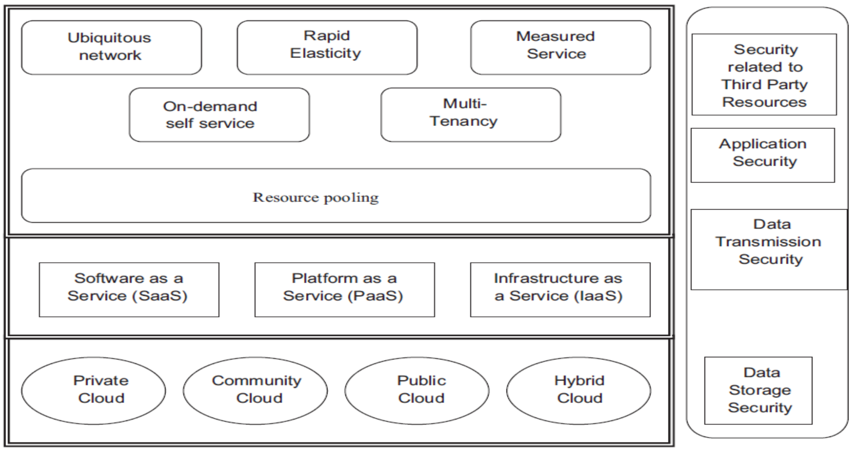

Figure 2. Complexity of security in a cloud environment [7]

- Applicability of "abuse and nefarious use of cloud computing" to "PaaS":

The threat of abusing cloud services is somewhat unique in that it involves the risk of insider threat as well as the risk posed by cyber criminals to join the cloud and misuse its services; cloud providers can be a big risk on organizational information assets if they do not enforce stringent security procedures to regulate employee access to sensitive business data. With the increased adoption of cloud services, cloud provider employees are prone to be targeted by malicious hackers given the fact that "PaaS" model involves storing and processing sensitive organizational resources such as intellectual property, trade secrets, and customer confidential information on the provider's servers; therefore cloud providers have to practice due diligence to minimize the risk of insider threat and detect unauthorized access from internal employees [12].

The other security risks stems from the fact that " PaaS" is readily available for the public which provides an opportunity for hackers to try the service with the intent of circumventing provider's security controls and ultimately compromise sensitive business data illegally; arguably, "PaaS" can be used as a "Hacking as a Service" because cloud computing is increasingly becoming an ecosystem that involves numerous services, interactions, interdependencies, and its many deployment models with different structures (SaaS, PaaS, and IaaS).

PaaS is particularly susceptible to nefarious cyber threats because it allows "legitimate" cloud customers to deploy their own- created applications on a platform that is supported by the cloud provider. For example, many cloud vendors (e.g. Google App Engine& Sun Microsystems) facilitate the deployment of applications and APIs that are written in Java, Python, or .Net on their computing platform [13].Furthermore; Cloud providers allow their customers to deploy and control their applications and configure the hosting environment, this feature, in turn, could be exploited by attackers to inject malicious code into the hosting environment and eventually infect the underlying cloud infrastructure. A representative example of this threat is the Amazon EC2 cloud based service that was used by cyber criminals whom ran a botnet called "Zeus crimeware" for command and control purposes [14]

V. ATTACKS RELATING TO "ABUSE AND NEFARIOUS USE OF CLOUD COMPUTING" THREAT

5.1. Host Hopping Attacks. This attack exploits one of the most defining characteristics of cloud computing: resource sharing; this attack can be launched by hackers if cloud provider does not enforce strict mechanism to isolate shared resources such as memory, storage, and reputation of different customers or hosts [15]. Failing to separate tenants (customers) can certainly facilitate this type of attack and thereby allow malicious hackers to hop on other hosts to compromise other customers' data and gain illegal access to it. This attack can be particularly dangerous for public clouds and the PaaS model where multiple clients share the same physical machine. Attackers can cause severe damage that could range from compromising sensitive customer data to interrupting service for cloud providers and distorting their image and reputation.

5.2. Malicious Insider and Abuse of Privileges. The shared and multi-tenancy nature of cloud computing creates a fertile ground for insider threat and promotes risk of "privilege abuse" to confidential customer information. Hosting sensitive information from multiple clients on the same physical machine certainly entices users with high privilege roles such as system administrators and information security managers to abuse their privileged access to clients' sensitive data and the possibility of leaking or selling that information to competitors or other parties of interest. The possibility, and hence impact, of this risk can be further amplified if cloud provider does not enforce strict definition of roles and responsibilities or does not apply the "need to know" principle [15]. Also, it's worth noting that with the increased adoption of cloud computing services; cloud computing employees are becoming a target of cyber criminals as an effort to gain unauthorized access to sensitive business data in the cloud. Unfortunately, most organizations that experience this type of insider attacks choose not to publicize the issue and "sweep it under the rug" due to reputation and customer trust concerns; not to mention that they may face legal and regulatory compliance issues.

5.3. Identity Theft Attacks. Malicious hackers can easily set up accounts with cloud providers to use cloud resources by simply paying for the usage without any restrictions or limits from cloud vendors on resource consumption or workloads. Attackers can exploit this advantage to use and compromise customer's critical information and sell it for a price. Furthermore; cyber criminals could also set up rogue clouds and entice individuals to host their sensitive data and provide cloud computing services such as e-mail applications. Once individuals entrust their confidential data with rogue cloud providers, their identity is at risk and can be compromised and thereby can lead to identity theft and financial fraud.

5.4. Service Engine Attacks. The service engine is a highly customized platform that sits above the physical layer and characterizes the underlying cloud architecture; this service engine is normally controlled by cloud provider to mange customer resources but it can be rented by potential customers who wish to use and adopt the IaaS model. hackers can abuse this feature by subscribing to the IaaS model and renting a virtual machine that would be hosted and controlled by the service engine; then they can use the VM to hack the service engine from the inside and use the service engine to their advantage where it may contain sensitive business information through other VMs from other cloud subscribers. In other words, hackers can escape the isolation feature that separates data belonging to different cloud customers and possibly breach and compromise their confidential data [15].

VI. CONCLUSION

The foregone discussion explored the security aspects of cloud computing; specifically shed light on one of the top cloud computing security threats "abuse and nefarious use of cloud computing". The research indicated that cyber criminals have already exploited and misused cloud computing due to weak registration procedures of obtaining cloud computing services and lack of effective security controls; also, hackers are able to abuse cloud services by obtaining unauthorized and illegal access to other customer's confidential data residing on the same cloud platform. As a result, scholars are encouraged to conduct more extensive research to reveal more information about the risks and impact of this threat on sensitive business data; additionally, cloud security providers need to implement and deploy more proactive security techniques to prevent unauthorized and illegal access to sensitive organizational information residing on the cloud.

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Investigation Analysis on Design and Modification of a Conventional Floating Dome Digester

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ABSTRACT:

A 2 m^3 floating dome anaerobic digester has been developed and its performance is compared with that of conventional mild steel dome biogas digester The overall objective of carrying the work is to construct the transparent dome type biogas plant for better performance of the digester tank and to optimize the biogas generation under normal operating conditions. The experimental setup consists of a conventional biogas plant in which analysis is carried out to check the performance of the plant. Apart from that the biogas plant is modified from conventional mild steel dome type digester to transparent fibre type dome plant to capture the green house effect and the results are compared with the conventional biogas plant in order to check the performance of the modified biogas plant.The experimental setup consists of two plants which are located at Vyara region 60 km away from Surat. The two plants are studied under normal operating conditions in which one of the plant acts as reference to the modified plant. The reference plant is a conventional biogas plant with floating drum type digester having mild steel as a digester dome whereas the modified biogas plant is also a floating drum type digester plant with transparent fibre material as the dome.

KEYWORDS:*ANAEROBIC DIGESTER, TRANSPARENT FIBRE DOME, MILD STEEL DOME.*

I. INTRODUCTION:

There are a number of different types of biogas plants that can be used to treat different types of biomass, and each has its advantages and shortcomings In industry, so-called filter plants are sometimes used such as those using UASB (Upflow Anaerobic Sludge Blanket), which can treat biomasses with a low dry matter content. The advantage of this type is that the (hydraulic) retention time (the time a given biomass stays in the reactor before it is pumped out again) is very short, often only a few hours or a couple of days, and that the reactor tank therefore does not need to be quite so large. This type can also take relatively high COD load of 5-30 kg COD/m3/day In the following, only the floating dome digester type will be discussed, as this is the type most commonly for the decomposition of both agricultural residues and sewage sludge. Anaerobic digestion (AD) is the conversion of organic material directly to gas, termed biogas, a mixture of mainly methane (CH_4) and carbon dioxide (CO_2) with small quantities of other gases such as hydrogen sulphide (H_2S) (1), ammonia (NH_4), water vapour, hydrogen (H_2), nitrogen (N_2) etc. AD is the process of decomposition of organic matter by a microbial consortium in an oxygen-free environment. It is a process found in many naturally occurring anoxic environments including watercourses, sediments, waterlogged soils.

II. DESIGN AND CONSTRUCTIONAL DETAILS OF BIO-GAS PLANT

There are 3 main connecting parts:

1. Mixing chamber
2. Digester chamber
3. Expansion chamber

2.1 Mixing chamber:

The mixing chamber is one where animal excrement is mixed with water before it is poured into digester chamber. In the mixing pit, the substrate is diluted with water and agitated to yield homogeneous slurry. The fibrous material is raked off the surface, and any stones or sand settling to the bottom are cleaned out after the slurry is admitted to the digester. The useful volume of the mixing pit should amount to 1.5-2 times the daily input quantity.

Figure 2.1 Mixing chamber

The figure 2.1 shows the mixing chamber in which the Cow dung and water are mixed in equal proportions before passed into the digester tank. A rock or wooden plug can be used to close off the inlet pipe during the mixing process. A sunny location can help warm the contents before they are fed into the digester in order to preclude thermal shock due to the cold mixing water. In the case of a biogas plant that is directly connected to animal housing, it is advisable to install the mixing pit deep enough to allow installation of a floating gutter leading directly into the pit. Care must also be taken to ensure that the low position of the mixing pit does not result in premature digestion and resultant slurry formation.

2.2 Digester chamber

Digester chamber is one where excrement and water are fermented. Methane and other gases will be produced in the chamber and these gases will push manure and slurry at bottom of the floor into expansion chamber.

Figure2.2: Digester tank

The figure 2.2 shows the digester tank in which the manure is passed through the inlet chamber into the tank where fermentation of anaerobic digestion takes place. The inlet chamber opens from below into the digester which is a huge tank with a dome like ceiling. The ceiling of the digester has an outlet with a valve for the supply of biogas

2.3 Expansion chamber

Expansion chamber is one which collects excess manure and slurry. When gas is being used, manure and slurry will flow back into digester chamber to push gas up for usage. When the excess manure exceeds the volume of the chamber, the manure will be drained out. This system is called dynamic system, when gas is produced inside the pit, the gas pressure will push manure and slurry at the bottom of the pit to flow up into expansion chamber. When this gas is used the slurry in the expansion chamber will flow back into the digester chamber to push the gas up for usage. This happens consistently.

III. DESIGN/CONSTRUCTION

3.1 Construction Materials (For 2-Cubic-Meter Digester)

- Bricks approximately 700
- Cement, 6 bags.
- Sand, 74 cft.

- Crush 9 cft.Steel sheets for gas cap 20’x4’ of 16 gauge.
- RCC pipe of 6 inch diameter, 12 feet.
- Angle iron 2 inch, 10 feet.
- Mild steel rods, approximately 18. feet (for bracing)
- GI pipe ½ inch dia, and fitting as per requirement.
- Plastic pipe ½ inch dia, as per requirement.
- Stove 1 No.
- Waterproof coating (paint, tar, asphalt, etc.), 4 liters (for gas cap).

3.2. Preparation of Foundation and Walls

- Dig a pit 1.5 meters in diameter to a depth of 2.4 meters.
- Line the floor and walls of the pit with baked bricks and bound it with lime mortar or clay. Any porousness in the construction is soon blocked with the manure/water mixture. (If a water table is encountered, cover the bricks with cement.)
- Make a ledge or cornice at two-thirds the height (226cm) of the pit from the bottom. The ledge should be about 15cm wide for the gas cap to rest on when it is empty
- Extend the brickwork 30-40cm above ground level to bring the total depth of the pit to approximately 3 meters.
- Make the input and output piping for the slurry from ordinary 20cm clay drainpipe. Use straight input piping. If the pipe is curved, sticks and stones dropped in by playful children may jam at the bend and cannot be removed without emptying the whole pit. With straight piping, such objects can fall right through or can be pushed out with a piece of bamboo.
- Have one end of the input piping 90cm above ground level and the other end 70cm above the bottom of the pit.
- Have one end of the output piping 40cm above the bottom of the pit opposite the input pipe and the other end at ground level.
- Put an iron or wire strainer (copper screening) with 0.5cm holes at the upper end of the input and the output pipes to keep out large particles of foreign matter from the pit.
- Construct a center wall that divides the pit into two equal compartments. Build the wall to a height two-thirds from the bottom of the digester (226cm). Build the gas cap guide in the center top of the wall by placing vertically a 7cm X 2.5 meters long piece of metal piping.
- Provide additional support for the pipe by fabricating a cross brace made from mild steel.

3.3 Prepare the gas cap drum

- Form the gas cap drum from mild steel sheeting of any thickness from .327mm (30 gauge) to 1.63mm (16 gauge).
- Make the height of the drum approximately one-third the depth of the pit (0.75 meters).
- Make the diameter of the drum 10cm less than that of the pit Using a flange, attach a 7.5cm pipe to the inside top center.
- Fix the lower end of the pipe firmly in place with thin, iron tie rods or angle iron. The cap now looks like a hollow drum with a pipe, firmly fixed, running through the center.
- Cut a 3cm diameter hole, in the top of the gas cap.
- Weld a 3cm diameter pipe over the hole.
- Fix a rubber or plastic hose--long enough to allow the drum to rise and fall--to the welded gas outlet pipe. A valve may be fixed at the joint.
- Paint the outside and inside of the drum with a coat of paint or tar.
- Make sure the drum is airtight. One way to check this is to fill it with water and watch for leaks.
- Turn the gas cap drum so that the outlet pipe is on top and slip the 7.5cm pipe fixed in the gas cap over the 7cm pipe fixed in the center wall of the pit. When empty, the drum will rest on the 15cm ledges built on either side. As gas is produced and the drum empties and fills, it will move up and down the center pole.
- Attach handles to either side of the drum.
- Weld a 10cm wide metal strip to each of the tie rod supports in a vertical position. These "teeth" will act as stirrers. By grasping the handles and rotating the drum it is possible to break up troublesome scum that forms on the slurry and tends to harden and prevent the passage of gas.

Figure 3.1 Different components of the digester tank

The figure 3.1 shows the different components of digester tank. The tank is built with a central pipe fitted to the dome and is rounded. The digester tank is a completely closed (oxygen free) system that receives and biologically treats manure with naturally occurring organisms. After the construction of entire anaerobic digester, the digester is replaced by fibre dome digester and the percentage composition of methane content of both the digesters has been evaluated.

Figure 3.2: Mild steel dome and Fibre dome

The figure 3.2 shows the mild steel dome and transparent fibre dome .The mild steel dome gets rust easily and gets corroded because of rust formation where as the transparent fibre dome is having grater design flexibility and high tensile strength and is durable to use. The heat restoring capacity is more in transparent fibre dome compared to that of mild steel dome.

- The major advantages of transparent fibre dome digesters are:

1. Lighter, enabling convenient transportation and requires less construction time.
2. Well sealed and air proof assures 100% gas tightness.
3. Retains heat rather than conducts it, absorbs heat better than metal.
4. Less expensive.
5. High strength to weight ratio
6. Greater design flexibility
7. It does not rust, rot, corrode or swell and is maintenance free.

IV. PERFORMANCE PREDICTION OF TRANSPARENT FIBRE DOME DIGESTER:

After the design setup has been made, the biogas sample is collected from the transparent fibre dome digester and is sent for gas chromatography analysis to determine the percentage composition of methane content. From this analysis it shows that the dome having the transparent fibre has rich methane content when compared with the conventional mild steel dome. The results reviewed that the transparent type of digester has more methane yield than that of mild steel dome type of digester because of that the transparent fibre type of dome digester has maintained good digestion temperatures inside the digester tank as of methanogens inside the digester are actively formed by the anaerobic digestion process. The results reviewed that methane composition is increased from 63.40% to 64.22% which holds good as of performance is considered .The greater methane yields results in better performance of the plant and proves to be more effective when compared to that of mild steel dome digester.

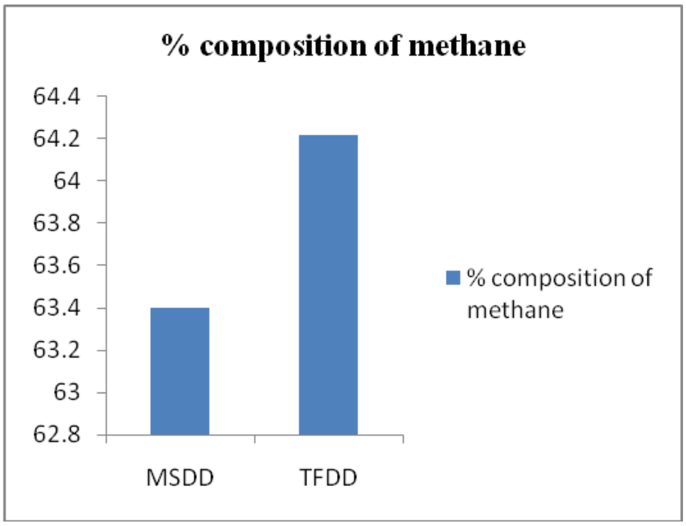

Figure 4.1: Methane yield composition from the two digesters

V. CONCLUSION

As from the studies the biogas plant operates better at higher temperatures which should be in the range of 30°c to 40°c (mesopholic).so the introduction of a fibre dome digester can make the plant to restore the heat during sunlight because of its transparent properties and the temperature regimes can be increased compared to that of mild steel in cold climatic conditions. The major disadvantage of conventional biogas plant is that labor intensive, high transportation cost and is 40% more expensive than transparent fibre dome digesters. The main drawback of mild steel dome digester is of its rust formation and gets corroded easily. So keeping these points in view and studying the fibre dome digester properties the plant is modified from conventional mild steel to transparent dome type digester.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

THD Minimization of a Cascaded Nine Level Inverter Using Sinusoidal PWM and Space Vector Modulation

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ABSTRACT:

Multi-level inverters offer several advantages such as a better output voltage with reduced total harmonic distortion (THD), reduction of voltage ratings of the power semiconductor switching devices and also the reduced electro-magnetic interference problems etc. Multilevel inverters synthesis the AC output voltages from various DC voltages. Space Vector Modulation (SVM) is one of the most popular PWM techniques used in multilevel inverters. SVM provides a best space vector performance, sequences of different space vectors suitable for voltage source inverter is identified. In this paper a 9 level cascaded H-bridge inverter model for space vector PWM is established and simulated using MATLAB/SIMULINK software and its performance is compared with sinusoidal PWM. The simulation study reveals that space vector PWM utilizes dc bus voltage more effectively and generates less THD when compared with sine PWM.

KEYWORDS: *Multilevel Inverters, THD, Sinusoidal Pulse Width Modulation (SPWM), Space Vector PWM.*

I. INTRODUCTION

The multilevel inverters have drawn tremendous interest in the power industry that is well suited for use in reactive power compensation. The increasing number of energy sources and controlled AC drives requires new strategies for the operation and management of the electricity grid in order to maintain or even to improve the power supply reliability and quality [1]. Controlled AC drives in the megawatt range are usually connected to the medium-voltage network. For these reasons, a new family of multilevel inverters has emerged as the solution for working with higher voltage levels [2]. These inverters are suitable in high-voltage and high-power applications due to their ability to synthesize waveforms with better harmonic spectrum and attain higher voltages with a limited maximum device rating [3], the increased power ratings and reduced electromagnetic interference (EMI) emission that can be achieved with the multiple DC levels that are available for synthesis of the output voltage waveforms [4].Pulse-width modulation (PWM) techniques are gaining importance to control the multilevel inverters for multi megawatt industrial applications, recently.

The output voltage waveforms of the multilevel inverters can be generated at low switching frequencies with high efficiency, low distortion and also harmonics are shifted towards higher frequency bands. Many of the PWM techniques have been developed to achieve the following advantages [6]:

- wide linear modulation range,
- less switching losses,
- less total harmonic distortion (THD) in the spectrum of switching waveform,
- Easy implementation and less computation time.

One of the most popular PWM techniques in the multilevel inverters is Space Vector Pulse Width Modulation (SVPWM).

It was originally developed as a vector approach to PWM for three-phase inverters. Typical claims made for SVPWM include the following [7]:

- It achieves the wide linear modulation range associated with PWM third-harmonic injection automatically, without the need for distorted modulation.
- It has lower baseband harmonics than regular PWM or other sine based modulation methods optimizes harmonics.
- Only one switch changes state at a time.
- It is fast and convenient to compute.

II. MULTILEVEL INVERTER

Multilevel inverters easily produce high-power, high voltage output with the multilevel structure because of the way in which device voltage stresses are controlled in the structure. Increasing the number of voltage levels in the inverter, without requiring higher ratings on individual devices, can increase the power rating. The unique structure of multilevel voltage source inverters allows them to reach high voltages with low harmonics without the use of transformers or series-connected synchronized switching devices. As the number of voltage levels increases, the harmonic content of the output voltage decreases significantly [6],[10],[11]. The multilevel inverters synthesize a near sinusoidal voltage from several levels of DC voltages. As the number of levels increases, the output has more steps, resembling a staircase wave that approaches a desired waveform. The harmonic content of the output decreases as the number of levels increases [6], [12]. As the number of levels increases, the output voltage that can be spanned by summing multiple voltage levels also increases [12], [7], [8]. The multilevel inverter can be classified into three types: i) diode clamped multilevel inverter ii) flying capacitors multilevel inverters and iii) cascaded multilevel inverter.

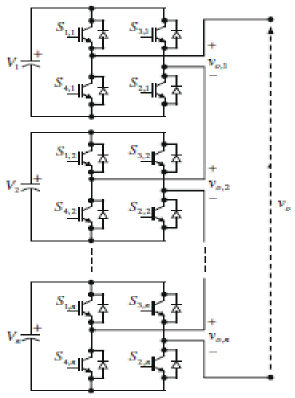

Fig. 1 configuration of cascaded m level inverter

Fig. 1 shows the configuration of cascaded multilevel inverter, the full bridge configuration with a separate DC source, which may be batteries, fuel cells or solar cells and are connected in series [5],[9]. Each full bridge inverter (FBI) unit can generate a three level output: $+V_{dc}$, 0 or $-V_{dc}$ by connecting the DC source to the AC load side by different combinations of the four switches S_1, S_2, S_3 and S_4.Using the top level as the example, turning on S_1 and S_4 yields $+V_{dc}$ output. Turning on S_2 and S_3 yields -Vdc output. Turning off all switches yields 0 volts output. The AC output voltage at other levels can be obtained in the same manner. The number of voltage levels at the load generally defines the number of FBIs in cascade. If N is the number of DC sources, the number of output voltage levels is m=2N+1.

The number of FBI units *N* is (m-1)/2 where m is the sum of the number of positive, negative and zero levels in multilevel inverter output. The number of converters *N* also depends on: 1) the injected voltage and current harmonic distortion requirements 2) the magnitude of the injected voltage required and 3) the available power switch voltage ratings [8]. The chosen inverter structure is simple since no real power needs to be supplied other than the losses. The DC sources are floating and no transformer is required for coupling to the transmission system. For each FBI unit, the current rating is the nominal current of the transmission system. The AC load rating and therefore the DC source rating depend upon the total compensation voltage required, the number of converters and the sharing of the load voltage among individual units.

The main features of cascaded multilevel inverters are:

- For real power conversions from DC to AC, the cascaded inverters need separate DC sources. The structure of separate DC sources is well suited for various renewable energy sources such as fuel cell, photovoltaic and biomass.
- Least number of components is required to achieve the same number of voltage levels.
- Optimized circuit layout and packaging are possible
- Soft-switching techniques can be used to reduce switching losses and device stresses.
- The modular structure of the inverter leads to advantages in terms of manufacturing and flexibility of application.

III. SPACE VECTOR MODULATION

Space Vector Modulation (SVM) is quite different from PWM methods. It is a more sophisticated technique for generating sine wave that provides a higher voltage to the motor with lower total harmonic distortion. Space Vector PWM (SVPWM) method is an advanced; computation intensive PWM method and possibly the best techniques for variable frequency drive application. The circuit model of a typical three-phase inverter is shown in Fig. 2. S_1 to S_6 are the six power switches that shape the output, which are controlled by the switching variables a, a', b, b', c and c'. When an upper switch is switched on, i.e., when a, b or c is 1, the corresponding lower transistor is switched off, i.e., the corresponding a', b' or c' is 0. Therefore, the on and off states of the upper switch S_1, S_3 and S_5 can be used to determine the output voltage. SVPWM is a different approach from PWM modulation.

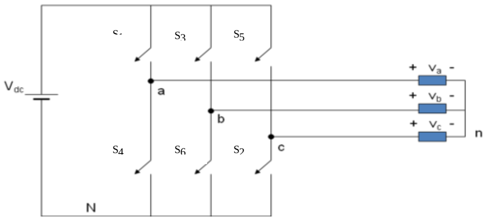

Fig. 2 Typical Three-Phase Inverter

In this modulation technique the three phase quantities can be transformed to their equivalent two-phase quantity either in synchronously rotating frame (or) stationary frame. From these two-phase components, the reference vector magnitude can be found and used for modulating the inverter output. The process of obtaining the rotating space vector is explained in the following section, considering the stationary reference frame.

3.1 Switching states of space vector modulation

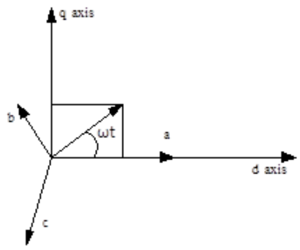

Fig. 3 Relationship of abc and dq reference frame

Considering the stationary reference frame let the three-phase sinusoidal voltage component be,

$V_a = V_m \sin\omega t$ (1)

$V_b = V_m \sin(\omega t-2\pi/3)$ (2)

$V_c = V_m \sin(\omega t+2\pi/3)$ (3)

The α-β components are found by Clark's transformation. Space Vector Modulation refers to a special switching sequence of the upper three power transistors of a three-phase power inverter. The stationary dq reference frame that consists of the horizontal (d) and vertical (q) axes as depicted in Fig.3. From Fig. 3, the relation between these two reference frames is below

$$V_{dq0} = Ks\ V_{abc} \quad (4)$$

$$K_s = 2\backslash 3 \begin{pmatrix} 1 & -1\backslash 2 & -1\backslash 2 \\ 0 & -\sqrt{3\backslash 2} & -\sqrt{3\backslash 2} \\ 1\backslash 2 & 1\backslash 2 & 1\backslash 2 \end{pmatrix} \quad (5)$$

$$V_{dqo} = [V_d V_q V_o]^T \quad \& \quad V_{abc} = [V_a V_b V_c]^T \quad (6)$$

In fig.3 this transformation is equivalent to orthogonal projection $[a\ b\ c]^T$ onto the two dimensional vector perpendicular to the vector $[1\ 1\ 1]^T$ in a three dimensional system. Six non-zero vectors and two zero vectors are depicted. Six non-zero vectors (V_1-V_6) shape the axes of a hexagonal as in Fig.4, and supplies power to the load. The angle between any adjacent two non-zero vectors is 60 degrees.

Meanwhile, two zero vectors (V_0 and V_7) and are at the origin and apply zero voltage to the load. The eight vectors are called the basic space vectors and are denoted by (V_0,V_1,V_2,V_3,V_4,V_5,V_6,V_7). The same transformation can be applied to the desired output voltage to get the desired reference voltage vector, V_{ref} in the d-q plane. The objective of SVM technique is to approximate the reference voltage vector V_{ref} using the eight switching patterns. One simple method of approximation is to generate the average output of the inverter in a small period T to be the same as that of V_{ref} in the same period. 6 active vectors are (V_1,V_2,V_3,V_4,V_5,V_6). DC link voltage is supplied to the load. Each sector (1 to 6): 60 degrees. Two zero vectors are (V_0 and V_7). They are located at origin. No voltage is supplied to the load.

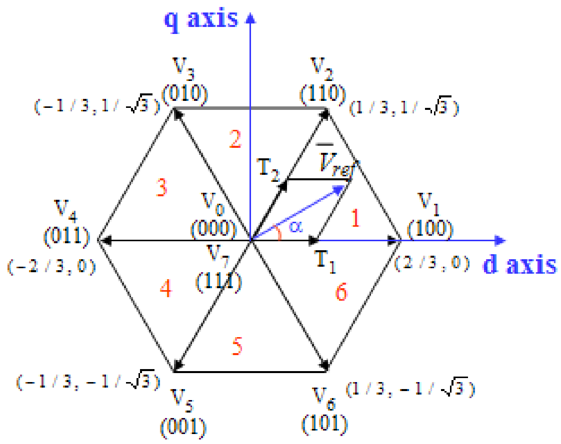

Fig .4 basic switching vectors and sectors

For 180° mode of operation, there exist six switching states and additionally two more states, which make all three switches of either upper arms or lower arms ON. To code these eight states in binary (one-zero representation), it is required to have three bits (2^3 = 8). And also, as always upper and lower switches are commutated in complementary fashion, it is enough to represent the status of either upper or lower arm switches.

Table-1 Switch states for three phase inverter

Voltage Vectors	Switching Vectors			Line to neutral voltage			Line to line voltage		
	a	b	c	V_{an}	V_{bn}	V_{cn}	V_{ab}	V_{bc}	V_{ca}
V_o	0	0	0	0	0	0	0	0	0
V_1	1	0	0	2/3	-1/3	-1/3	1	0	-1
V_2	1	1	0	1/3	1/3	-2/3	0	1	-1
V_3	0	1	0	-1/3	2/3	-1/3	-1	1	0
V_4	0	1	1	-2/3	1/3	1/3	-1	0	1
V_5	0	0	1	-1/3	-1/3	2/3	0	-1	1
V_6	1	0	1	1/3	-2/3	1/3	1	-1	0
V_7	1	1	1	0	0	0	0	0	0

S_1 through S_6 are the six power transistors that shape the output voltage. When an upper switch is turned on (i.e., a, b or c is "1"), the corresponding lower switch is turned off (i.e., a', b' or c' is "0").Eight possible combinations of on and off patterns for the three upper transistors (S_1, S_3, S_5) are possible.

IV. SIMULATION RESULTS

The main aim of any modulation technique is to obtain variable output having maximum fundamental component with minimum harmonics. The objective of Pulse Width Modulation techniques is enhancement of fundamental output voltage and reduction of harmonic content in Three Phase Voltage Source Inverters. In this paper different PWM techniques are compared in terms of Total Harmonic Distortion (THD). Simulink Models has been developed for SPWM, SVPWM, and the Simulation work is carried in MATLAB /Simulink.

4.1 Simulation Sinusoidal PWM

In Sinusoidal PWM three phase reference modulating signals are compared against a common triangular carrier to generate the PWM signals for the three phases. Fig.5 shows the Simulink of cascaded nine level inverter with sinusoidal pulse width modulation scheme. Simulation has been carried out by varying the modulation index between 0 and 1.

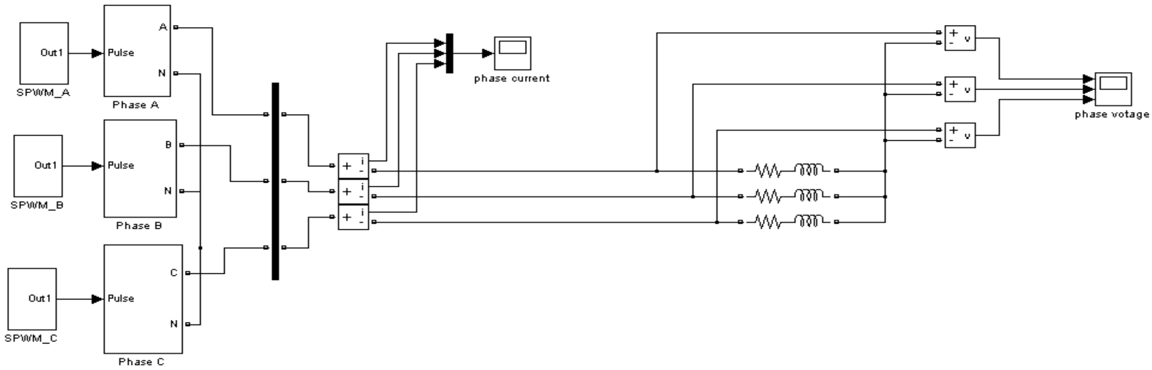

Fig.5 Simulink of cascaded nine level inverter with SPWM

4.2 Simulation Space vector modulation

Space vector PWM is an advanced technique used for variable frequency drive applications. It utilizes dc bus voltage more effectively and generates less THD in the Cascaded H Bridge Inverter. SVPWM utilize a chaotic changing switching frequency to spread the harmonics continuously to a wide band area so that the peak harmonics can be reduced greatly. Figs.6 and 7 shows the Simulink of cascaded nine level inverter with space vector pulse width modulation scheme and switching strategy of SVPWM. Simulation has been carried out by varying the modulation index between 0 and 1.

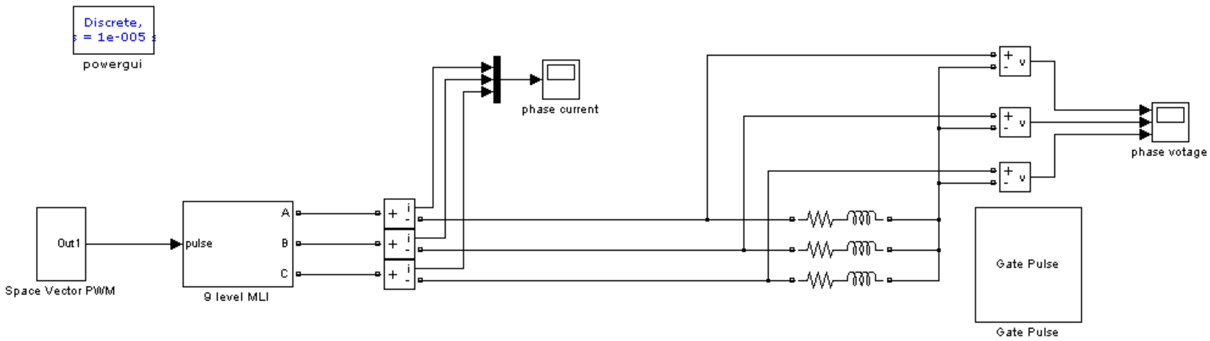

Fig.6 Simulink of cascaded nine level inverter with SVPWM

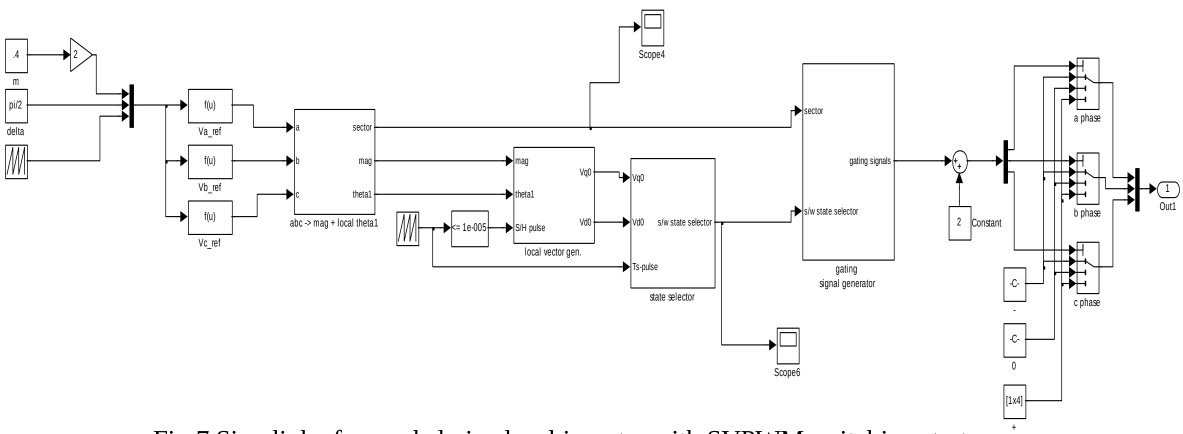

Fig.7 Simulink of cascaded nine level inverter with SVPWM switching strategy

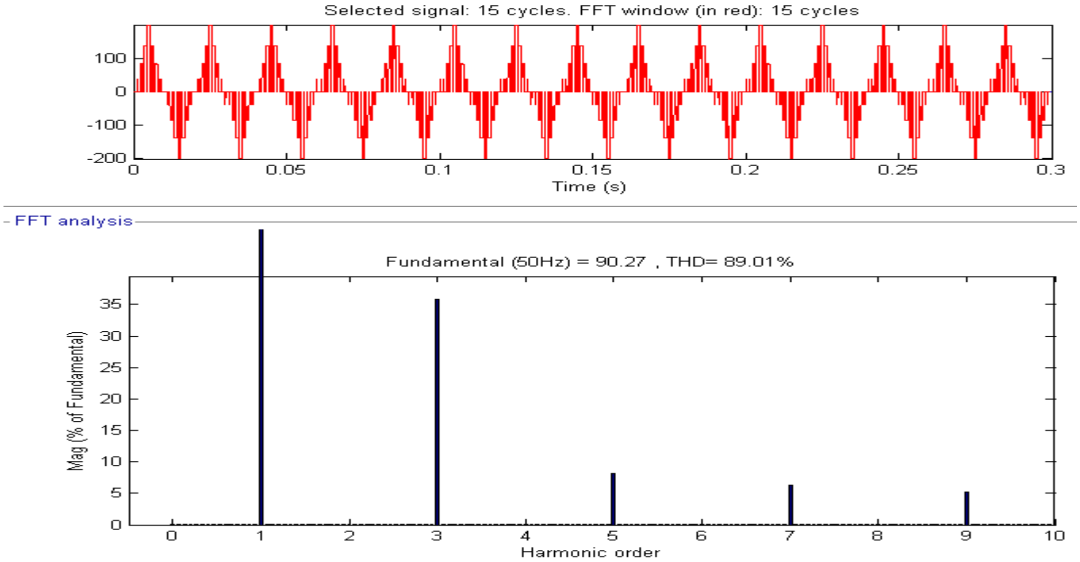

Fig.8. FFT and THD analysis of cascaded nine level inverter using SPWM with m_a=0.8

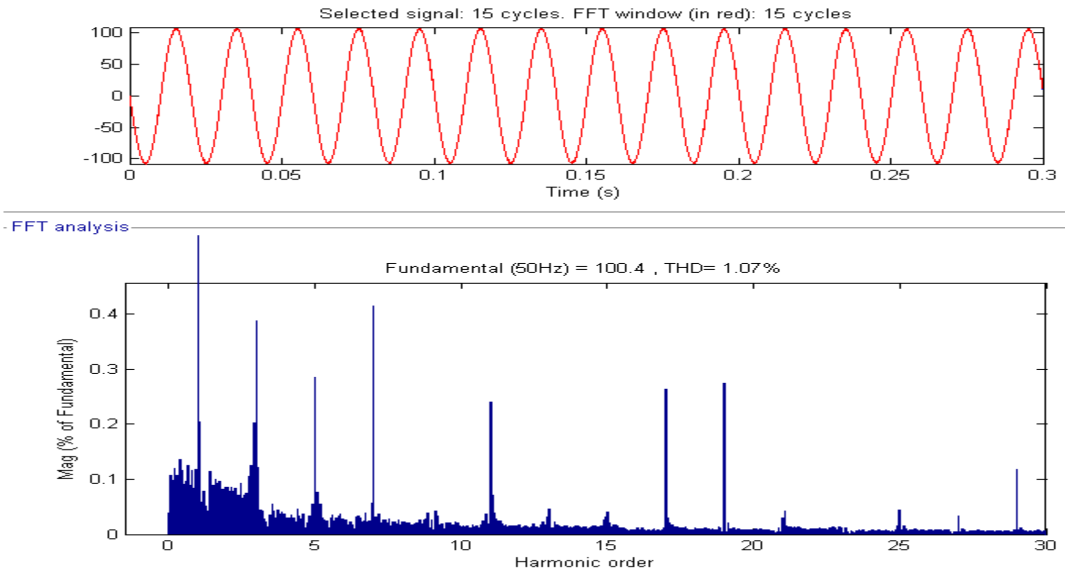

Fig.9. FFT and THD analysis of cascaded nine level inverter using SVPWM with m_a=0.8

Table-2 Comparisons between SPWM and SVPWM by varying modulation index
(For 9 level cascaded H- bridge inverter)

Technique	**Sinusoidal PWM**		**Space Vector PWM**	
Modulation Index (M)	**Output line voltage (volts)**	**THD (%)**	**Output line voltage (volts)**	**THD (%)**
0.4	57.60	148.57	61.45	1.57
0.6	65.70	121.60	83.74	1.25
0.8	90.27	69.01	100.40	1.07
1.0	**117.80**	**61.56**	**123.00**	**0.92**

V. CONCLUSION

Space vector Modulation Technique has become the most popular and important PWM technique for Three Phase Voltage Source Inverters. In this paper first comparative analysis of Space Vector PWM with conventional SPWM for a 9 level Inverter is carried out. The Simulation study reveals that SVPWM gives 0.92% enhanced fundamental output with better quality i.e. lesser THD compared to SPWM. Space vector Modulation Technique has become the most popular and important PWM technique for Three Phase Inverters. In this paper first comparative analysis of Space Vector PWM with conventional SPWM for a 9 level Inverter is carried out. The Simulation study reveals that SVPWM gives 0.92% enhanced fundamental output with better quality i.e. lesser THD compared to SPWM. PWM strategies viz. SPWM and SVPWM are implemented in MATLAB/SIMULINK software and its performance is compared with conventional PWM techniques.

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International Journal Of Computational Engineering Research||Vol, 03||Issue, 6||

A Novel Design for a Scooter Radiator Using Minichannel

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ABSTRACT

The study was presented a novel design for a scooter radiator using minichannel. The minichannel heat exchanger size is about 64% the size of the scooter radiator which made from manufacturer; however, the heat transfer rate obtained from the minichannel heat exchanger is higher than or equal to that obtained from the scooter radiator. In addition, the experimental method also shows that the heat transfer efficiency obtained from the heat exchangers with water as the working fluid is higher than that obtained from the heat exchanger with ethylene solution as the working fluid. The results are in good agreements with the relevant research.

KEYWORDS: *radiator, minichannel heat exchanger, experimental method, heat transfer rate, temperature.*

Nomenclature

A	heat transfer area	m^2
A_c	cross-sectional area	m^2
c	specific heat at constant pressure	J/(kgK)
f	Fanning friction factor	
k	overall heat transfer coefficient	$W/(m^2K)$
L	length of substrate	m
m	mass flow rate	kg/s
P	wetted perimeter	m
q	heat flux	W/m^2
Q_a	heat transfer rate of air side	W
Q_l	heat transfer rate of liquid side	W
Re	Reynolds number	
T	temperature	ºC
Greek symbols		
ρ	density	kg/m^3
μ	dynamic viscosity	kg/(ms)
ε	effectiveness (NTU method)	
Δp	pressure drop	Pa
ΔT_{lm}	log mean temperature difference	ºC.

I. INTRODUCTION

Most motor scooters are using the step-less transmission. Compared with the chain gear of the motorcycles, the engine of scooter generates more heat. The manufacturers often choose one of two methods: use cooling air on the engine or cooling system with a solution so called radiator. Meanwhile, the engine with cooling solution has an ability to control the combustion process as well as has better performance and higher reliability than the cooling air. In fact, conventional scooter radiator still has some disadvantages such as: the fins are thin, easy to be warped and dirty. Besides, the fins are welded to a channel, the heat transfer area at the welded position is small, so the heat transfers from the channel to fins is not ideal, it is smaller than the monolithic fins. Moreover, the conventional radiators are manufactured with the macro construction, leading to the size of radiator is still bulky. So the technology for mini/micro heat transfer has demonstrated its primacy in this case. Regarding to the micro/mini heat transfer, Xie et al. [1] studied laminar heat transfer and pressure drop characteristics in a water-cooled minichannel heat sink.

A minichannel can be used in heat sink with a quite high heat flux and a mild pressure loss. However, the study mentioned with numerical method. Dang and Teng [2, 3] studied the effects of configurations on performance of the microchannel and minichannel heat exchangers. However, their study ignored the effects of gravity on the performance index of microchannel heat exchangers.The effect of inlet configuration on the refrigerant distribution in a parallel flow minichannel heat exchanger was presented by Kim et al. [4]. Tests were conducted with downward flow for mass flux from 70 to 130 $kg.m^{-2}.s^{-1}$ and quality from 0.2 to 0.6. As mass flux or quality increased, better results were obtained for normal inlet configuration. Oliet et al. [5] presented a set of parametric studies on automotive radiators by means of a detailed rating and design heat exchanger model. In the study, the numerical method was applied to verify and validate using a wide experimental data bank. The results show the utility of this numerical model as a rating and design tool for heat exchangers manufacturers, being a reasonable compromise between classic $\varepsilon-$NTU methods and CFD. An experimental study of heat transfer enhancement using water/ethylene glycol based nanofluids as a new coolant for car radiators was done by Peyghambarzadeh et al. [6]. In this paper, the heat transfer performance of pure water and pure EG was compared with their binary mixtures; different amounts of Al_2O_3 nanoparticle were added into these base fluids and its effects on the heat transfer performance of the car radiator were determined experimentally. The results demonstrated that nanofluids clearly enhance heat transfer compared to their own base fluid.

Trivedi and Vasava [7] analysed the fluid flow and heat transfer behaviours of an automotive radiator by numerical simulation using software ANSYS version 12.1. The results shown that as the pitch of tube is either decreased or increased, the heat transfer rate decreases; the optimum efficiency has a pitch of 12 mm. Yadav and Singh [8] presented a comparative analysis between different coolants. One of the coolants was used as water and other as mixture of water in propylene glycol in a ratio of 40:60. It therefore can be concluded that the water is still the best coolant; however, its limitation is corrosive and contains dissolved salts. Khot and Satre [9] used the CFD tool to evaluate and compare performance of two different cooling jacket of the 6-cylinder in-line diesel engine. The results shown that flow and heat transfer analyses both are equally important to analyze cooling jacket of an IC engine. In the study, model 2 has advantage of improved velocity in head jacket due to source of flow directly coming from sideways instead of cylinder block to head block. One more advantage of model 2 over model 1 is pressure drop: pressure drop is also reduced due to reduced resistance.

Yoshida et al. [10] studied effects of the number fins, fin pitch, and air velocity on cylinder for an air – cooled engine by the experimental method. The results shown that the optimized fin pitches the greatest the effective cooling are at 20 mm for non-moving and 8 mm for moving. Heat transfer simulation for fins of an air cooled motorcycle engine under varying climatic conditions was done by Agarwal [11]. The heat transfer surface of the engine was modeled in GAMBIT and simulated in FLUENT software. It was observed that when the ambient temperature reduces to a very low value, resulting in overcooling and poor efficiency of the engine. Paul et al. [12] presented experimental and parametric studies of extended fins in the optimization of internal combustion engine cooling using CFD. The heat transfer from 6mm fins is found to be the higher at high velocities. For high speed vehicles, thicker fins provide better efficiency. When fin thickness was increased, the reduced gap between the fins resulted in swirls being created which helped in increasing the heat transfer. From the relevant literatures above, the mini/microchannel heat transfer technology indicates its preeminence in this case. The mini/microchannel heat exchangers have high heat transfer rate and small dimensions. In this study, a novel design for radiator will be invested using minichannel and UV light technology. In the following section, the heat transfer characteristics of the new radiator (the minichannel heat exchanger) will be compared with those of the conventional radiator. The working fluids were used are water and 11% ethylene solution.

II. METHODOLOGY

A. Design and fabrication

The governing equations used to design the minichannel heat exchanger as follows:

The heat balance equation:

$$Q_l = Q_a = Q \tag{1}$$

Or

$$m_l c_l (T_{l,i} - T_{l,o}) = m_a c_a (T_{a,o} - T_{a,i}) \tag{2}$$

where Q_l is heat transfer rate of liquid (water or ethylene), Q_a is heat transfer rate of air, m is mass flow rate (subscripts l and a stand for liquid and air side, respectively), c is specific heat, $T_{l,i}$, $T_{l,o}$, $T_{a,i}$ and $T_{a,o}$ are inlet and outlet temperatures of liquid and air side, respectively.

The maximum heat transfer rate, Q_{max} is evaluated by

$$Q_{max} = (mc)_{min}(T_{l,i} - T_{a,i}) \tag{3}$$

The effectiveness (NTU method) is determined by

$$\varepsilon = \frac{Q}{Q_{\max}} \tag{4}$$

Heat flux is calculated by

$$q = \frac{Q}{A} \tag{5}$$

$$\text{Or } q = k\Delta T_{lm} \tag{6}$$

where q is heat flux, A is heat transfer area, k is overall heat transfer coefficient, and ΔT_{lm} is log mean temperature difference.

The log mean temperature difference is calculated by

$$\Delta T_{lm} = \frac{\Delta T_{\max} - \Delta T_{\min}}{\ln \frac{\Delta T_{\max}}{\Delta T_{\min}}} \tag{7}$$

Reynolds number is calculated by

$$\mathrm{Re} = \frac{\rho w \times D_h}{\mu} \tag{8}$$

The pressure drop due to friction is determined by

$$\Delta p = 2 f \rho w^2 \frac{L}{D_h} = 2 f \,\mathrm{Re} \frac{L}{D_h^2} w \mu \tag{9}$$

where $D_h = \frac{4A_c}{P}$ is the hydraulic diameter, w is velocity in the z-direction, μ is dynamic viscosity, ρ is density, A_c is cross-sectional area, P is wetted perimeter, L is channel length, and f is Fanning friction factor.

Based on the equations above, a minichannel heat exchanger was designed in this study. The heat exchanger has the same total cross-sectional area of 52 mm^2 for all channels involved. That implies that the average velocity in the channels is the same. This heat exchanger can be used to replace the scooter radiator which made by the manufacturer. The heat transfer process of this device is carried out between two fluids which are hot water and cool air. Fig. 1 shows the dimensions of the test section. The material for the heat exchanger is aluminum, used as a substrate with thermal conductivity of 237 W/(mK), density of 2,700 kg/m^3, and specific heat at constant pressure of 904 J/(kgK). The thickness of the substrates is 12 mm. With the minichannel heat exchanger, the liquid side has 52 minichannels; the length of each minichannel is 114 mm, and the distance between two adjacent minichannels is 1 mm. For these 52 minichannels, the liquid flows through with three pass: the first pass has 18 minichannels; the second pass has 17 minichannels and the last one has 17 minichannels. The minichannels have rectangular cross-section with a width of 1 mm and a depth 1 mm. All channels are connected with a manifold for each inlet and outlet of hot liquid and cool air, respectively. The manifolds of the minichannel heat exchanger are rectangular in shape, with the width of 9 mm and the depth of 1 mm, as shown in Fig. 1. The air side has 40 fins; the length of each minichannel is 150 mm, and the distance between two adjacent fins is 2 mm. The cross-section of fins is rectangular in shape, with a width of 1 mm and a height of 10 mm, as shown in Fig. 1. However, with the two outermost fins, they have a width of 2 mm.

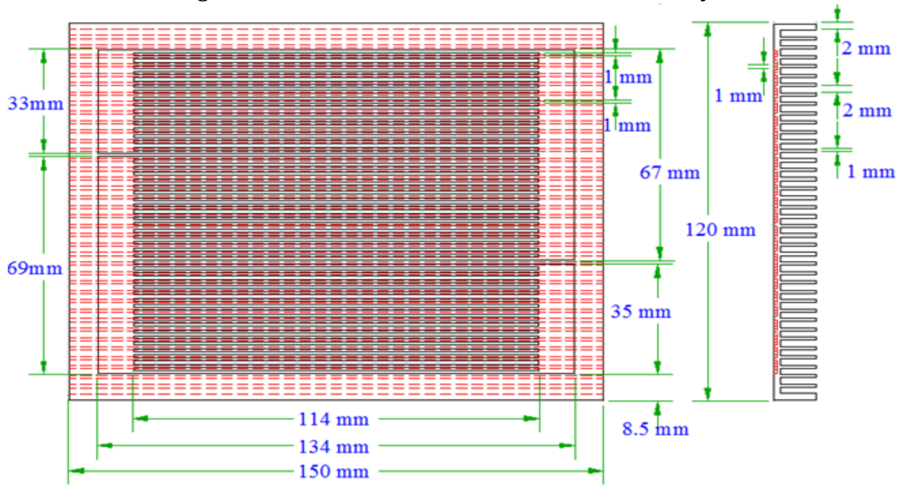

Fig. 1. Dimensions of the test sample

The test section was manufactured by precision machining. Each inlet or outlet of the heat exchanger has cross-sectional area of 19.6 mm^2. To seal the minichannels, a layer of PMMA (polymethyl methacrylate) was bonded on the fluid side of the substrate by UV (ultraviolet) light process, as indicated in Fig. 2. After cleaning the surfaces of Aluminum and PMMA, a special-purpose gel was used to paste. Then, it was joined and solidified using UV Light. The Fig. 3 shows a photo of the minichannel heat exchanger. With the bonding technology, the minichannel heat exchanger can stand with the working temperature up to 105 °C and absolute pressure up to 1.8 bar, this condition can allow the minichannel heat exchanger to operate as a scooter radiator. With a length of 150 mm and a width of 120 mm, the size of the minichannel heat exchanger is equal 64 percent of the conventional radiator, as shown in Fig. 4.

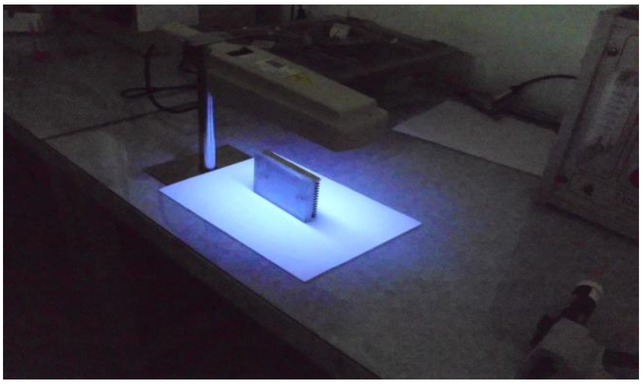

Fig. 2. A photo of bonding substrate and PMMA using UV Light

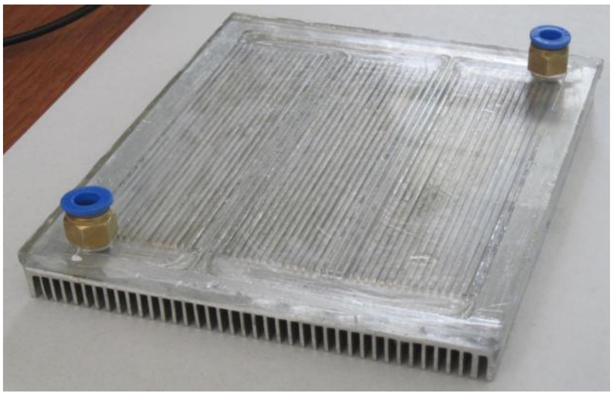

Fig. 3. A photo of the minichannel heat exchanger

Fig. 4. Comparison between the minichannel heat exchanger and scooter radiator

B. Experimental setup

The experimental system consists of the test section (the minichannel heat exchanger or the conventional radiator), syringe system, and overall testing loop, as shown in Fig. 5. Experimental data obtained from the microchannel heat exchanger/scooter radiator are under the constant room temperature condition of 34~35 °C.

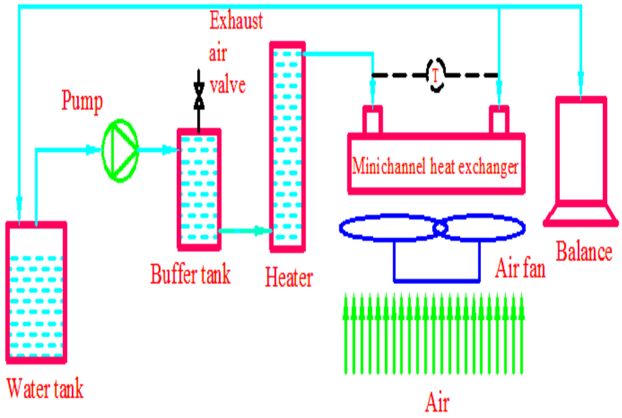

Fig. 5. Schematic of the test loop

For this study, the water and the ethylene solution were used as the working fluid. Each inlet or outlet of the radiator/minichannel heat exchanger has two thermocouples embedded to record temperature values. Accuracies and ranges of testing apparatus are listed in Table 1.

Table 1. Accuracies and ranges of testing apparatuses

Testing apparatus	Accuracy	Range
Thermocouples	± 0.1 °C	0 ~100 °C
Precision balance	± 0.1 mg	0.0000 ~ 210g
Flow meter	± 1 %	0 ~ 50 m/s

The equipments used for the experiments are listed as follows:

1. Thermocouples, Model PT-100, made by Omega
2. Pump, Model YS-1200
3. Pump, VSP-1200, made by Tokyo Rikakikai
4. Heater, Model AXW-8, made by Medilab
5. Micro electronic balance, Model TP – 214, made by Denver.
6. Flow meter.

III. RESULTS AND DISCUSSION

A. The water as the working fluid

Varying mass flow rate of water

For this study, the experimental data obtained under the atmospheric temperature of 35 °C; the air inlet velocity was 3 m/s; the mass flow rate of water was varying from 1.64 to 4.1 g/s, and the water inlet temperature was kept around 62°C. Fig. 6 shows a relationship between the outlet temperature and mass flow rate of water. When mass flow rate of water increases, the temperature difference between the inlet and outlet of water decreases, leading to the outlet temperature increases, as shown in Fig. 6. Besides, the water inlet temperatures obtained from the minichannel heat exchanger are less or equal to those obtained from the conventional radiator. As a result, the temperature difference of the minichannel heat exchanger is higher or equal to the radiator, leading to the heat transfer of minichannel heat exchanger is the better one.

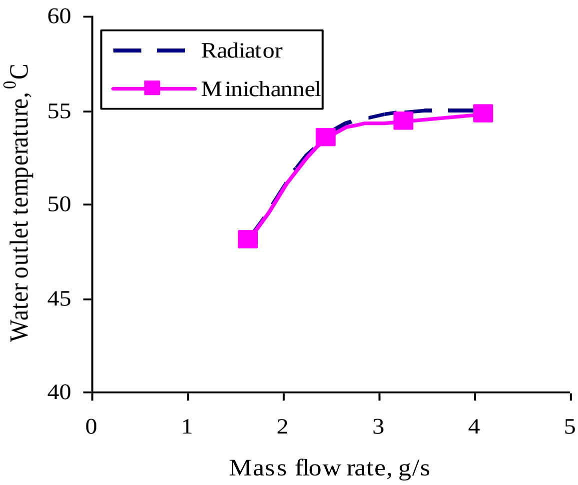

Fig. 6. Outlet temperature versus mass flow rate of water

Varying air velocity

In this study, the mass flow rate of water was 3.8 g/s, the water inlet temperature was 62°C, the air inlet velocity were varying from 0.8 to 3.5 m/s. A comparison of water temperature difference as rising air velocity was shown in Fig. 7. It is observed that the temperature difference of water increases as the air velocity increases. As a result, the heat transfer rate also increases with the air velocity increases. It is also observed that the heat transfer rate obtained from the minichannel heat exchanger is higher that obtained from the radiator as high air velocity (over 1.5 m/s), as shown in Fig. 8. The results indicate that with high air velocity, the heat transfer of the radiator back side is not good because it has many fins and distance of fins is small, leading to the air outlet velocity is small. Meanwhile, the velocity distribution on the surface of the minichannel heat exchanger is better than that of the scooter radiator; it does not have a velocity drop at the surface heat transfer. With the minichannel heat exchanger, the heat transfer rate of 145 W was achieved for hot water of the device having the inlet temperature of 62°C and mass flow rate of 3.8 g/s and for cool air having the inlet velocity of 3.5 m/s and the ambient of 34°C (Fig. 8).

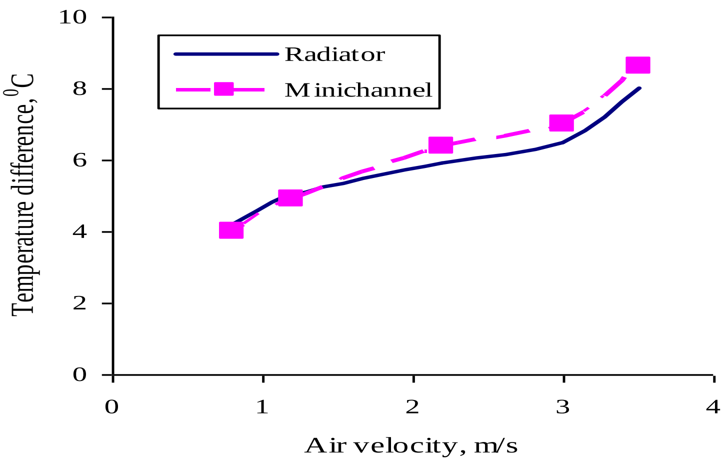

Fig. 7. Water temperature difference versus air inlet velocity

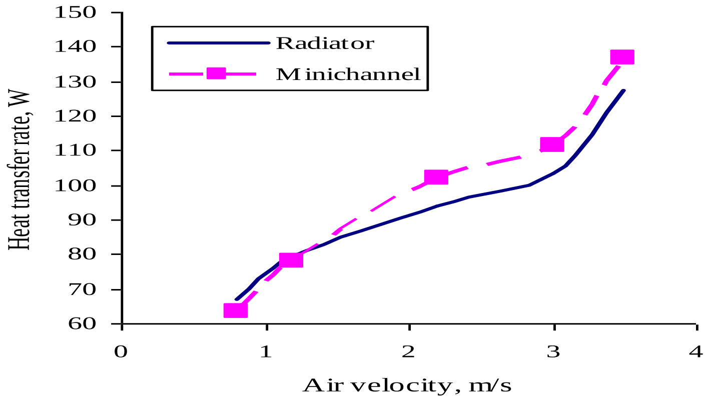

Fig. 8. Heat transfer rate versus air inlet velocity

B. The ethylene solution as the working fluid

For experiments carried out in this study, the mass flow rate of ethylene solution (11% ethylene) was 3.28 g/s and the inlet temperature was 60 °C. The air inlet velocity was from 0.8 to 3.5 m/s with the average ambient temperature of 34 °C. The experimental results shown that at high air velocity (over 1.5 m/s), the temperature differences obtained from the minichannel heat exchanger are higher than those obtained from the scooter radiator, as shown in Fig. 9.

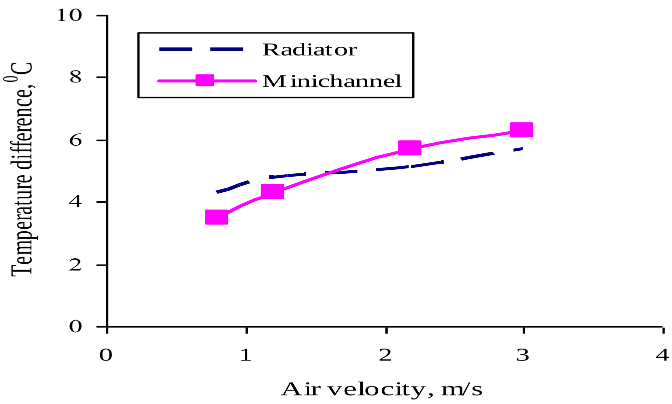

Fig. 9. Comparison between the radiator and the minichannel heat exchanger using ethylene

The results also indicated that with high air velocity, the heat transfer obtained from the minichannel heat exchanger is higher than that obtained from the radiator. The results have the same rule with those in Figs. 7 and 8. At low air velocity (less than 1 m/s), the heat transfer process is backward to the natural convective condition, so the conventional radiator has more preeminent than the minichannel heat exchanger because the radiator has more heat transfer area (more fins). However, this study was also presented to measure the air velocity at head cylinder. With scooter velocity was from 30 to 60 km/h, the air velocity measured at head cylinder from 1.2 to 3.8 m/s. Hence, the results obtained with air velocity over 1.2 m/s are available for real working condition of a scooter.From Figs. 6-9, with air velocity over 1.2 m/s, the heat transfer rate obtained from the minichannel heat exchanger is higher than that obtained from the conventional radiator. So it can be concluded that the minichannel heat exchanger can replace for the conventional radiator.

Comparisons between the ethylene glycol and the water were done in this study. Fig. 10 shows a comparison of the two liquids using in the minichannel heat exchanger. It is observed that the temperature difference obtained with water is higher than that obtained with the ethylene solution. The same condition above, with air velocity from 0.8 to 3.5 m/s, the maximum temperature difference is 0.8 °C. The results are in good agreement with the results in [8]. The comparison in [8] between water with propylene has a conclusion that the water is still the best coolant. In the study, the water is also the best one.

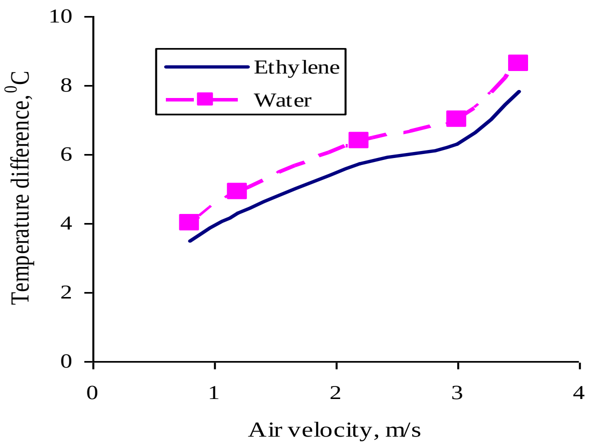

Fig. 10. Comparison between the ethylene and the water

IV. CONCLUSION

Experimental works were done on a scooter radiator and a minichannel heat exchanger to carry out the evaluation of their heat transfer rate. The minichannel heat exchanger size is about 64% the size of the radiator which made from manufacturer; however, the heat transfer rate obtained from the minichannel heat exchanger is higher than or equal to that obtained from the scooter radiator. For the minichannel heat exchanger, the heat transfer rate of 145 W was achieved for hot water of the device having the inlet temperature of 62°C and mass flow rate of 3.8 g/s and for cool air having the inlet velocity of 3.5 m/s and the ambient of 34°C. In addition, the experimental method also shown that the heat transfer efficiency obtained from the heat exchanger with water as the working fluid is higher than that obtained from the heat exchanger with ethylene solution as the working fluid. The results are in good agreements with the relevant research.Based on the results above, it has an ability that the minichannel heat exchanger can replace for the conventional radiator.

ACKNOWLEDGMENT

The supports of this work by (1) the projects (Project Nos. 54-11-CT/HD-CTTB, 38- 12-CT/HD-CTTB, and 11-13-CT/HD-CTTB) sponsored by New Product & Technology Center (NEPTECH) – Hochiminh City Department of Science and Technology of Vietnam and (2) the project (Project Nos. T2012-16TĐ /KHCN –GV and T2013-22TĐ /KHCN-GV) sponsored by the specific research fields at Hochiminh City University of Technical Education, Vietnam, are deeply appreciated.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

Secure Adhoc Network

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ABSTRACT

Now a day, it is no longer optional to have security solutions even inevitable for every kind of organizations and individuals. There are number of generic tools which are common for organizations as well as for individual users to provide security which includes; Anti-Spam, Anti-Virus etc., and network security have become essential issue in MANET. Security is one of the main issues in the MANET especially with respect to size and complexity of the network. The aim of the thesis is to discuss different aspects of security in MANET (e.g. multi-layer intrusion detection technique in multi hop network of MANET, security problems relates between multihop network and mobile nodes in MANET etc) and also implement some of the solutions (e.g. comparative study of different routing protocol (AODV, DSR and TORA) security threats within MANET network like intruder behavior, tapping and integrity, MANET link layer and network layer operations with respect to information security etc) with respect to MANET network.This paper also discusses different number of scenarios of MANET network which we implement in our simulation. In our simulation we use to implement different routing protocols and also did comparative study that which one is better with respect to different aspects. We also use to implements mechanisms of intruder behavior, tapping and integrity, and MANET link layer and network layer operations with respect to information security.

KEYWORDS: *MANET, Security, tapping, intruder.*

I. INTRODUCTION

Mobile ad hoc network got outstanding success as well as tremendous attention due to its self maintenance and self configuration properties or behavior.

There are different types of challenges in mobile ad hoc network which are given below:

- Open network architecture
- Shared wireless medium
- Stringent resource constraints
- Highly dynamic network topology

Mobile ad hoc network has different challenges with respect to wireless security due to some of the following reasons:

[1] The wireless network especially liable to attacks because of active eavesdropping to passive interfering.
[2] Due to lack of Trusted Third Party adds, it is very difficult to deploy or implement security mechanisms.
[3] Mostly Mobile devices have limited computation capability and power consumption functionalities which are more vulnerable to Denial of Service attacks. It is also incapable to run heavy security algorithms which need high computations like public key algorithms.
[4] Due to MANET's properties like infrastructure less and self-organizing, there are more chances for trusted node to be compromised and launch attacks on networks. In other words we need to cover up from both insider and outsider attacks in MANET, in which insider attacks are more difficult to deal with.
[5] It is difficult to distinguish between stale routing and faked routing information because of node mobility mechanism. In node mobility mechanism it enforces frequent networking reconfiguration which creates more chances for attacks.

There are mainly three main security services for MANETs: Authentication, confidentiality, integrity.

- Authentication means correct identity is known to communicating authority.
- Confidentiality means message information is kept secure from unauthorized access.

Integrity means message is unaltered during the communication between two parties. Once authentication is achieved in MANET then confidentiality is just a matter of encrypting algorithm on the session by using keys. These security services can be provided singly or in combination, it only depends on our requirements. In this paper we will focus on the fundamental security problems of the Mobile ad hoc network connectivity between mobile nodes from one network to another network, and how it works in client (mobile nodes) server (mobile server) architecture with respect to security.

II. BACKGROUND

There are some ultimate goals regarding security solutions with respect to Mobile ad hoc networks or we can say there are some security services which should be fulfill in order to enforce security like authentication, confidentiality, integrity to mobile users, we also use another term for them CIA which should be fulfill. In order to achieve goal in security, whatever the security solution it is? But it should provide complete protection to entire protocol stack.

Table 2.1 shows the security issues with respect to each layer.

S. No	Layer	Security Issues
1	Application Layer	In this layer we should prevent viruses, application abuses, worms, as well as malicious nodes.
2	Transport Layer	It provide authentication and provide secure end-to-end communications through data encryption between two nodes.
3	Network Layer	This layer deals with the protection of routing as well as forwarding protocols.
4	Link Layer	In this layer we mainly concern with the protection of wireless MAC protocol and also provide link-layer security.
5	Physical Layer	In this layer we should prevent signal jamming as well as denial-of-service attacks.

2.1.Challenges

One of the fundamental vulnerability of MANETs comes from open peer-to-peer architecture. In case of wired networks there are dedicated routers but in case of mobile ad hoc network each mobile node acts as a router in order to forward packets for one node to other node. According to security information with respect to MANET network are vulnerable compromises or physical capture, especially at the end of low-end devices due to weak protection.

There are some characteristics of security solutions of MANETs which will clearly provide multi fence security solutions with respect to network protection and also provide desirable network performance.

1. The security solution should also implement across many individual components in order to provide collective protection to secure entire network.
2. 2. The security solution should also provide security with respect to different layers of the protocol stack and each layer provide line of defense.
3. The security solutions should avoid threats from both outsiders as well as inside.
4. The security solutions should enforce all three components of security like prevention, detection, and reaction.
5. The security solutions should be affordable as well as practical in resource constrained and highly dynamic networking scenario.

2.2.Routing protocol description

There are basically there kind of routing protocols which are:

- **Table driven routing protocols**

In these routing protocols each node in the network maintains the complete routing information of the network by occasionally updating the routing table.

- **On-Demand routing protocols**

While in this kind of routing protocols, a node simply maintains routes information to get destination that it needs to send required data packets.

- **Hybrid routing protocols (ZRP)**

In this type of routing protocol is the combination of the above two categories. In which nodes belonging to a particular geographical area or within a certain detachment from an anxious node are said to be in routing area and uses table driven routing protocol. Communication between nodes in different areas will rely on the source initiated or on-demand routing protocols. This routing protocol Include ZRP.

2.2.1 AODV

AODV using a classical distance vector routing algorithm. It is also shares DSR's on-demand discovers routes. During repairing link breakages AODV use to provide loop free routes. It does not add any overhead to the packets, whenever a route is available from source to destination. Due to this way it reduces the effects of stale routes and also need for route maintenance for unused routes.

2.2.2 DSR

The DSR is an on-demand routing protocol that is based on source routing. It uses no periodic routing messages like AODV, and due to this way it reduces network bandwidth overhead, and also avoids large routing updates as well as it also reduces conserves battery power.

2.2.3 TORA

The TORA is an adaptive, scalable and efficient distributed routing algorithm. It is mainly designed for multi-hop wireless networks as well as highly dynamic mobile environment. It is also called source-initiated on-demand routing protocol.

III. MANET ATTACKS &SECURITY

3.1 Security

Security aspects play an important role in almost all of these application scenarios given the vulnerabilities inherent in wireless ad hoc networking from the very fact that radio communication takes place (e.g. in tactical applications) to routing, man-in-the-middle and elaborate data injection attacks.

3.2 Protecting Mobile ad-hoc network

The basic idea is that a new node may announce its presence and should listen for announcements broadcast by its neighbors. Each node learns about nodes nearby and how to reach them, and may announce that it, too, can reach them.

3.4. Reactive Approach

Seeks to detect security threats and react accordingly.

3.5. Proactive Approach

Attempts to prevent an attacker from launching attacks through various cryptographic techniques: This type of protocols maintains fresh lists of destinations and their routes by periodically distributing routing tables throughout the network.

3.6.Attacks

There are two mainly protocols are used in MANET networks, Link layer protocol are used to provide connectivity between different mobile nodes in order to ensure one-hop connectivity by using multihop wireless channels. On the other hand if we like to extend connectivity to different multiple hops then MANET network uses network layer protocols.

3.7.Network Layer operation

There are two main network-layer operations in MANET.

1. Ad hoc Routing
2. Data packet forwarding

They interact with each other and delivering packets from source to destination. The main function of the ad hoc routing protocols is to provide routing among nodes; they exchange routing messages between different mobile nodes in order to maintain routing information at each node. According to the routing states, the second network layer operation data packets are used to forward data by intermediate next node which is an established route to the destination node. These both operations are vulnerable to malicious attacks, and which will lead to various types of malfunction in network layer.

3.8. Network Layer Attack

Due to this reason network-layer generally fall into two categories attack:

Routing attacks

Packet forwarding attacks(based on the target operation of the attacks)

3.9.Active Attacks

There are also some different active attacks which are really difficult to locate or identify because these attacks are more sophisticated and they are considered as subtle routing attacks some of them are given below :

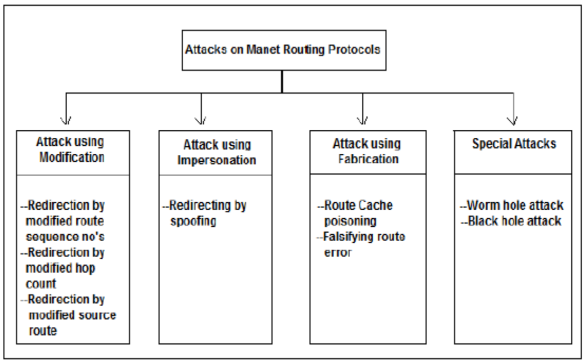
- Attacker may further subvert existing nodes in the network.
- They can also fabricate their identity
- They can also impersonate other legitimate node
- Attackers in pair nodes may create a wormhole
- They also creates shortcut in normal flows between each other
- The attackers target the route maintenance process and advertise operational link is broken

3.10.Routing Attacks

Generally there are four different types of MANET routing protocol attacks which is divided in to two main types which are given below:

1. Routing disruption attacks
2. Resource consumption attacks

In case of routing disruption attacks, the main task of attacker is to disrupt routing process by routing packets in order to introduce wrong paths. In case of resource consumption attacks are concerned the main task of the attacker is to introduce some non-cooperative or selfish nodes that can be used to inject false packets due to this way load on the network increases and it will become a cause of consuming network bandwidth.



3.11.Security steps to avoid Attacks in MANET

Secure Multicasting

There is an architecture usually used to secure multicast traffic that is DIPLOMA. DIPLOMA stands for DIstributed Policy enfOrceMent Architecture which is use to protect or secure end user services as well as network bandwidth.

3.12.Secure routing

One of the primary challenges of secure routing is to provide authentication (trustworthiness) of users in the network.

3.13.Privacy-aware and Position based Routing

In case of position based routing mechanism, a mobile node within the MANET network broadcast its position co-ordinates as well as its one-hop neighbors. This information can easily be attacked, so therefore privacy-aware mechanism is together with position based routing in order to provide secure communication. PPBR stands for privacy aware and position based routing in which a mobile node mainly takes pseudo identifiers that are usually dynamic and it is also use to provide end-to-end inconspicuousness to other nodes.

3.14.Key management

Certified Authority (CA) is one of the mechanism which provide key management; if it is compromised then entire network can easily be damaged.

3.15.Intrusion detection System

Intrusion detection system is a complete security solution which provides information about malicious activities in the network, it also uses to detect and report about malicious activities.

3.16.Multi-layer Intrusion detection technique

Multi-layer intrusion detection technique is a technique in which an attacker attacks at multiple layers in order to stay below the detection threshold so that they will escape easily whenever a single layer impropriety detects.

IV. PERFORMANCE EVALUATION &DESIGN

4.1 OPNET Usability

One of the most common methods is to conduct research in the fields of networking as well as security is to simulate and evaluate the routing protocol(s) in different kinds of network based scenarios. Our paper is mainly based on two tasks, one is concern with theoretical study and the other one is based on the implementation and experiments of the MANET in security which we perform in OPNET simulation environment. We are using the Optimized Network Engineering Tool (OPNET) software for our simulations.

4.2 Security Metrics Review

There are some quantitative metrics which can be used to evaluate the performance of routing protocol.

1. End-to-end load, throughput and delay
2. Packet sent and received
3. Download response time
4. Efficiency

V. OPNET SIMULATION

There are seven different network scenarios which we implement in our OPNET simulation and they are given below:

1. MANET with DSR routing protocol.
2. MANET with TORA routing protocol.
3. MANET with AODV routing protocol.
4. MANET with routing protocol with respect to security parameters with an intruder.
5. MANET with routing protocol without firewall.
6. MANET with routing protocol with firewall.
7. MANET with routing protocol with firewall as well as with VPN.

5.1Network Scenarios Descriptions

We implement first three scenarios with different routing protocols with profile config, application config and Rx Group config and server for communication and also use 25 mobile nodes for wireless communication. All these devices are explained well in the below network component section. All nodes in the network are configured to run AODV, DSR, and TORA routing protocol one by one in the first three scenarios respectively; and we also use to configure FTP traffic for our result observations. The Rx group config node is added to speed up the simulation. It is configured to eliminate all receivers that are over 1500 meters away. In case of AODV scenario, AODV parameters are used as suggested by RFC and WLAN data rate is 1Mbps.

Second, most important scenario with respect to security policy implementation, in this scenario we use an intruder which is an un-authentic user, how a network would be safe and secure in different network attacks by an intruder.we also implement two mobile ad hoc networks which are sharing information through internet and how we make information secure that's the main task of last three scenarios. In the first scenario we implement network scenario without firewall and VPN and how will we make network free of information security we will discuss this in the next two scenarios. In the next scenario in which we implement our network scenario with firewall setting and we also compare our result with the previous scenario where we implement our scenario without firewall network settings. In the firewall scenario, firewall (Router C) use to configure IP Forwarding Rate, IP Gateway Function, RIP Start Time, RIP Process Mode and Proxy Server Information mechanisms.

In the last scenario, we implement the secure information mechanism by comparing our results. In this scenario we implement firewall as well as VPN network configuration in order to secure our information and safe our communication. In VPN scenario, it configures Virtual Private Network (VPN) attribute configuration details for tunneling supported at the IP layer.

5.2 Network Components

In the above simulation model there are different types of network components are used and these are given below:

[1] There are 25 Wlan workstations with mobile node type are used in first four network scenarios.
[2] There is one Wlan server with mobile node type is used.
[3] There is one application configuration model is used in the network topology.
ACE Tiers information
[4] Application spécification
[5] Voice encoder schèmes
[6] There is also one profile configuration model is used in the network topology.
[7] There is also one dynamic receiver group config node is used in the network model.

VI. RESULT &ANALYSIS

6.1.Throughput among AODV, DSR and TORA

If there is high load traffic then packet drop, in case of high mobility TORA performs better but in other cases it has low throughput. AODV shows best performance in case of throughput.

Delay among AODV, DSR and TORA

DSR and TORA show poor delay due to the reason of its routes because typically their routes are not the shortest. At start of route discovery phase; their routes are not shortest over a period of time due to its node mobility. AODV shows low delay and even it can be better with some fine-tuning.

Load among AODV, DSR and TORA

In case of load TORA's performance is very impressive due to its substantial work to erase routes even when those routes are not in use; we know that TORA shows good performance for small networks with high mobility. AODV also perform well as compare to DSR because byte overhead and packet overhead of AODV are less than DSR's overhead. DSR has high load because of high number of its route discoveries and wide flooding network discovery.

Traffic sent among AODV, DSR and TORA

DSR has high traffic sent as compare to other two routing protocols, after that AODV and TORA respectively.

Traffic received among AODV, DSR and TORA

DSR has high traffic as compare to other two routing protocols, after that AODV and TORA respectively.

Download response time among AODV, DSR and TORA

AODV has high download response time and then TORA and DSR respectively.

6.2 INTRUDER BEHAVIOR (INTEGRITY ASPECT)

An intruder allocate in the network then its block by the server for security by using Net Doctor and security demands in order to avoid intruder behavior from the network. Once server finds an intruder then it will develop complete network route discover map among nodes. We come to know that its an intruder and try to damage our network then through security demand mechanism we block complete application traffic at intruder mobile node because our security system tells us that its an intruder and it should be blocked in the network. By using security demand procedure we blocked its application traffic so that there will be no miss use of the network recourses as well as network information among the users and here we are not talking about the overall traffic.

6.3 INFORMATION SECURITY OVER LINK LAYER AND NETWORK LAYER

We also implement network methodology with respect to firewall. In the first scenario we implemented network without firewall and here we implement with firewall in order to compare page response time; with firewall load on the network increase because it will check traffic packet one by one for the safety of network so that there will no attack by any intruder or any malicious data in the network. As we know that in the last three scenarios we analyze http traffic that’s why we discussed page response time. In the second case we have 0.00610 sample sum mean with respect to traffic. If we compare this sample mean with respect to to previous case then we come to know that its high value of page response time as compare to without firewall case because when security increase so it takes more time to give response and thus the page response time increase.

Now as we can see that the response time is high value so we try to overcome that problem thus we implement the idea of VPN which give us more security and also the page response time value decrease. So we implement network methodology with respect to firewall as well as VPN. In the first two scenarios we implemented network without firewall and with firewall and in the last scenario here we implement network with firewall as well as with VPN in order to overcome the difference which we got in the first two scenarios. with firewall increases load on the network because it will check traffic packet one by one for the safety of network so that there will no attack by any intruder and there is no malicious data in the network. In the third case we have 0.00368 sample sum mean with respect to traffic. If we compare this sample mean with respect to to previous two cases then we come to know that now our network is also more secure due to encapsulation of data in VPN tunneling and also the page response time value decreases as compare to with firewall case.

VII. DISCUSSIONS OF SIMULATION ANALYSIS

Here is the overall comparison of AODV, DSR and TORA with respect to delay, throughput, load, traffic sent, traffic received, Upload response time and download response time.

S.No	Parameters	DSR	AODV	TORA
1	Throughput (bits/sec)	2850	3460	2605
2	Delay (sec)	0.0050	0.0019	0.0026
3	Load (bits/sec)	2800	2663	2260
4	FTP Traffic sent (bytes/sec)	53	50	39
5	FTP Traffic received (bytes/sec)	53	50	39
6	Download response time (sec)	0.12	0.70	1.30

7.1.FUTURE WORK

During our thesis, we also find some of the points that can be further researched and explored in the future, such as there should be some standardized intrusion detection techniques can be used and the techniques which already have get further improved. However, in our thesis we recognized that the current evaluation for state-of-the-art wireless security solutions is quite ad hoc. There are some drawbacks which should be improved and some of them are given below:

Lacks of effective analytical tools especially in case of large scale wireless network setting.

- Find out and block an authenticated user, which start miss behaving inside the network.
- The multidimensional trade-offs among security strength.
- Communication overhead.
- Computation complexity.

- Energy consumption.
- Scalability still remains largely unexplored.

There should be developed an effective evaluation methodology and toolkits that will probably be used and need interdisciplinary efforts from different research communities which are working in mobile systems, cryptography, and wireless networking. In case of Transient Multicast security is still an open problem.

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Study of Water Distribution Network Using EPANET

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ABSTRACT:

An attempt has been made to simulate the water distribution network of urban estate, city of Punjab, India, based on the observation taken in the month of April 2013. The area under study is served by Municipal Corporation, which relies on water supply from ground water deep bore wells. In this study attempt has been made to develop a water distribution system using EPANET software as a tool to assist the assessment of the hydraulic behaviour of hydraulic parameters.

This report has presented the following aspects of the overall assessment of hydraulic behaviour of a water distribution network

- *Data gathered for simulation for the period of April 2013.*
- *Development of water distribution model*
- *Calibration of water distribution model*

The present day water distribution system has four deep bore tube-wells to serve. The simulation of network was carried out for 24 hour period supply for afternoon shift of 12 noon to 3pm. Elaborate calibration was not possible but attempt has been made to check simulation results at 12 different locations. Comparison of these results indicates that the simulated model seems to be reasonably close to the actual network.

KEYWORDS: *calibration, EPANET, hydraulic losses, simulation, distribution system.*

I. INTRODUCTION

With increasing population, particularly in the urban areas of developing countries, finding new water resources either from surface or groundwater sources to supply the needed water is becoming more difficult both with respect to quantity and quality. The ability to better manage water supplies is becoming increasingly important as demand for water continues to escalate.In the last decade, changing climatic conditions and high temperatures have led to water shortage and restrictions in many countries. As a result, hydraulic losses have become high priorities for water utilities and authorities because there is a greater understanding of the economic, social, and environmental costs associated with water losses. The primary task for water utilities is to deliver water of the required quantity to individual customers under sufficient pressure through a distribution network. The distribution of drinking water in distribution networks is technical challenge both in quantitative and qualitative terms. It is essential that each point of the distribution network be supplied without an invariable flow of water complying with all the qualitative and quantitative parameters. The water supply in most Indian cities is only available for a few hours per day, pressure is irregular, and the water is of questionable quality. Intermittent water supply, insufficient pressure and unpredictable service impose both financial and health costs on Indian households.Current Study will present a model based optimization method for hydraulic losses of water distribution systems. Leakage hotspots are assumed to exist at the model nodes identified. For this study area of urban estate of a city of Punjab has been identified and the network model for the area under consideration will be prepared and studied for water losses.

II. METHODOLOGY

Urban Estate phase-II comes under the administration of Municipal Corporation. The area under consideration is well developed and has all the basic amenities. Geographically the area is plain; there is no variation in the levels of the area.

2.1.Data Collection

[1] Distribution network drawing- A copy of the drawing of the existing distribution system was taken from the Municipal Corporation. The drawing helps in the understanding of the distribution of the mains, sub-mains, how they move in the area, presence of dead ends etc.

[2] Source data- Ground water is the main source of water. The ground water table is present at a depth of 250 ft.

[3] Four tube-wells are used to pump out the water for the drinking water supply. The pumping capacity, head and other required data regarding them was taken from the municipal corporation.

[4] Topography- Although the elevations of the area were present with corporation office, it was decided to go through the level measurements again to better understand the topography of the area. The equipments used for level measurements were
a) Auto level
b) staff.
The measurements were taken in the following manner starting from tube-well no 1 covering tube-well no. 2 and 3 and the whole area along with tube-well no. 4 in the end.
It was not an easy task to move through the busy streets of the area. Therefore, there was lot of shifting in the auto level positions, which led to increase in the foresight and backsight readings and increase in the calculation work. With so much shifting in the instrument positions there is always the chance of occurrence of errors but utmost care was taken to reduce the possibility of error occurrence.

[5] Population data- As per the census of 2011, the population of the urban estate is 9150 persons. The total population was available with the municipal corporation.
Now, when all the data collection work was done, the first job was to draw the computer aided model. The model was prepared on the EPANET software.

[6] Distribution system- The distribution system itself is a complex network of transmission mains, distribution pipelines and pumping stations. The mains and sub mains has the size ranging from 200mm, 150mm and 100mm along with small house connection pipes.

[7] Pumping stations- There are four tube-wells used for supply of drinking water to the village, namely tube-well no.1, 2, 3 and 4 respectively. Ground water is the main source of water. Each pumping station is equipped with a pressure gauge for documentation of the pump gauge.

Preparation of the model

From the original drawing of the distribution network provided by the municipal corporation, the distribution network was reproduced on the graph paper. It was difficult to mark every house on the graph sheet and then on the model. So the whole network was divided into different junctions where each junction represents a definite set of houses. Each junction is given a serial no. j1, j2, j3 etc. X-Y co-ordinates were given to all the junctions of the network, which were needed for computer aided model.

After marking of the junctions, the co-ordinates of all the junctions were noted down from the graph sheet. In similar fashion the elevations which were measured earlier as per junction locations, were noted down on the separate plain sheet but as there was hardly any variation in the elevations of different junctions so we considered all the elevations to be equal and marked it levelled one in all junctions. Next job was to draw these junctions on the EPANET software and then assigning them the required properties calculated above, in the properties box of each junction.

For creating an EPANET model following network elements were used-:

[1] Junctions
[2] Pumps
[3] Valves
[4] Reservoirs
[5] Pipes

To draw the network X-Y co-ordinates limits were set up in the software from the graph sheet. First of all, all the junctions were put in model in serial order from the tool box of the software and then their required properties were assigned to them.Similarly, other major points like the reservoirs representing groundwater and pumps were drawn on the network with their required properties.After marking of all the major points and incorporation of all the required data on the computer aided model these points were then joined together by the lines representing pipes. The pipe data like the pipe roughness, pipe diameter etc was provided in the property box of all the pipes.

Static period analysis-When sufficient data was incorporated in the computer aided network model, next job was to run it for the static period analysis. The static period analysis was done to check that whether the data provided was correct and sufficient. Calibration of equipment -Well in advance of the field tests, all the equipments being used should be checked and recalibrated. Before taking the pressure gauges for field measurements they were calibrated. The gauges were found to be accurate.Pressure Measurements- For pressure measurements the pressure gauges of different ranges were used. These gauges were then installed at different locations to physically measure the pressure heads of tube-wells.After the pressure measurements of the tube-wells, the pressure heads at the different junctions of the distribution network were to be carried out for the calibration purpose. The junctions were selected as per their location from the pumping stations. The pressure readings were taken on 15th April 2013 at 1pm. The supply hours in the area under study are 10 hrs spanning three shifts. The first shift is from 5 am to 9 am, 2nd shift from 12 noon to 3 pm and third shift from 6 pm to 9 pm.Calibration work- After the job of pressure measurements, the model was calibrated for hydraulic analysis. There is a provision for the single stage simulation and the extended period simulation in the software. The model was calibrated for the extended period simulation. The results of the analysis and required discussion are given in the next chapter.

III. RESULTS AND DISCUSSION

Node Results-Ministry Of Urban Development (Govt. of India) manual on water supply stipulates a minimum residual pressure of 7m, 12m and 17m for single storey, double storey and triple storey buildings respectively at the end of design period. But the results are not attained even during the initial periods of commissioning. The residual pressure were checked at few points and found to be very low and ranging between 2m to 5m at the middle and far off points from the pumping stations in the area at the time of measurement. It clearly shows that the system is under performing and that the desired level of service is not achieved for residual pressure requirements. The software model results for pressure closely match with the field measurements and is shown in table I.Pipe Results- With available infrastructure of water supply it is only possible to measure the velocity and flow in pipes. No work was undertaken for the measurement of ‘c’ value and these were changed to match the field measurement values for flow in a pipe. From analysis of the water supply network it is clear that the carrying capacities of pipes are sufficient to serve the present requirement and may serve for many years to come.

TABLE NO. 1
CALIBRATION RESULTS-PRESSURE

Sr. No.	Node No.	Pressure as per field measurement(m)	Pressure as per Intermittent EPS Model(m)
1	J13	3.78	4.00
2	J31	3.24	3.66
3	J42	3.29	3.52
4	J57	2.98	3.48
5	J66	3.02	3.59
6	J83	3.72	3.69
7	J87	3.37	3.80
8	J100	4.02	4.08
9	J103	3.73	4.11
10	J125	3.96	4.14
11	J168	4.08	4.26
12	J197	3.29	3.57

IV. CONCLUSION

In this study attempt has been made to develop a water distribution system using EPANET software as a tool to assist the assessment of the hydraulic behaviour of water supply distribution network.
This report has presented the following aspects of the overall assessment of hydraulic behaviour of a water distribution network

- Data gathered for simulation for the period of April 2013.
- Development of water distribution model
- Calibration of water distribution model

The present day water distribution system has four deep bore tube-wells to serve. The simulation of network was carried out for 24 hour period supply for afternoon shift of 12 noon to 3pm. Elaborate calibration was not possible but attempt has been made to check simulation results at 10 different locations. Comparison of these results indicates that the simulated model seems to be reasonably close to the actual network.

ACKNOWLEDGEMENTS

The authors are grateful to PEC University of Technology, Chandigarh for their cooperation and encouragement to carry out the work.

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A Study of Treatability of Kitchen Wet Waste And Biogas Production

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ABSTRACT

The present paper contributes to solve 'the waste disposal' problem to some extent. The percentage of Kitchen waste in total Municipal solid waste is quite high, so the treatability of Kitchen waste should be start at personal level i.e. from homes. The contribution in treating the waste by using organic wet waste in anaerobic digestion i.e. decomposition of large complex chain into smaller chain of molecules without the presence of oxygen. Anaerobic digestion process is placed in Biogas plant. So for a middle class family the plan should be economical. Deenbandhu biogas plant is Economical plant, because the Payback period of this plant is 2 and half year only. The initial investment cost is only Rs27000/-. Place for such kind of plant at homes is 424sq. ft, which is easily available at backyard of home. The contribution describes the several month laboratory research of the utilization of domestic waste as the organic source of biogas production .The results from Deenbandhu biogas plant produces up to 6m³of Biogas per day, which is available for cooking 8-12hours for 10- 14 family members. Production of Biogas depends upon various factors which are also to be taken into account. So the optimum pH, TS% and temperature which is recorded time to time are i.e. 7, 12%and 37˚C respectively.

KEYWORDS : *Waste disposal, Treatability, Kitchen waste, Anaerobic digestion, Economics, Deenbandhu biogas plant.*

I. INTRODUCTION

Waste disposal is one of the major problems being faced by all nations across the world. The daily per capita per person solid waste generated in our country ranges from about 300 g to 500g. If we carefully analyse this waste we will realize that majority of it is biodegradable. Waste like glass, metals and paper would be recyclable. There is large amount of waste being produced in every household. Toxic Links at New Delhi conducted a survey in May 2002 and prepared a fact file on waste in India. (Manmeet Kaur et al, 2012). It stated that about 0.1 million tone of MSW is generated in India every day. So, annual production reaches approximately 36.5 million tonnes. Per capita waste generation in major Indian cities ranges from 0.2 Kg to 0.6 Kg. Difference in per capita waste generation between lower and higher income groups range from 180 to 800 gram per day. The urban local bodies spend approximately Rs.500 to Rs.1500 per tone on solid waste for collection, transportation, treatment and disposal. About 60-70% of this amount is spent on collection, 20-30% on transportation and less than 5% on final disposal. (Hilkiah Igoni, M. F. N. Abowei, M. J. Ayotamuno And C. L. Eze (2008)'Waste are of different types such as Food waste, plastic waste, paper waste, solid waste et al. Kitchen waste is a form of food waste i.e. Wet wast. Food waste is an unwanted raw or cooked food discarded during or after food preparation that is no longer fit for consumption or desirable (Nathalie Jean et al., 2009). The two main sources from where a large amount of kitchen waste can be collected are Household and Residential areas. Larger households waste more avoidable food than smaller households; certain types of households (e.g. households with children) appear to waste more food but that is mainly because they contain more people .Single person households waste the most food on a per capita basis. On contrary to accepted wisdom, older people waste as much avoidable food as younger people (1.2kg per person per week); retired households appear to waste less but that is because they tend to be smaller (Lorrayne Ventour, 2008).

Biogas Plant: Anaerobic digestion (AD) is a promising method to treat the kitchen wastes. Anaerobic digestion is controlled biological degradation process which allows efficient capturing & utilization of biogas (approx. 60% methane and 40% carbon dioxide) for energy generation.. (Wastesum et al 2006). Biogas plants are installed at individual family level by Using Deenbandhu model biogas .

The biogas from this type of biogas plants are used by the individual family. The size of these plants is recommended up to 6 m3 per day. (Dr. Sarbjit Singh Sooch et al (2012) Biogas is produced by bacteria through the bio-degradation of organic material under anaerobic conditions. Natural generation of biogas is an important part of bio –geochemical carbon cycle. It can be used both in rural and urban areas. The dumping of food in places and making the places unhygienic can be taken good care of. It adds to the value of such Biogas plants. Using the natural processes like microorganism's kitchen waste & biodegradable waste viz paper, pulp can be utilized. Composition of biogas depends upon feed material also.

II. MATERIALS AND METHODS

Materials Used: 20 litre container, PVC pipe 0.5'' (length ~ 1 m), Solid tape M – seal, Plastic cape (to seal container), Funnel (for feed input), Cape 0.5" (to seal effluent pipe), Pipe (for gas output, I was used level pipe) (3-5 m), 2 Buckets (15 to 20 litre) for collection of gas , Gas burner with nozzle , pH meter. (Suyog Vij & Prof. Krishan Parmanik et al.(2011)

Kitchen Waste used: Tea bags, Turnip, Rotten tomato, Potato Waste Spinach, Onion ,Pea peels , Bread ,Pumpkin, Cheese, Butter, Rotten Apples ,Eggs, banana peels, Paper, Mushrooms ,Cooked meat , Rice. (Dhanalakshmi Sridevi V.1 And Ramanujam R.A Et Al. (2012)

Sample Collection : Collect the waste from kitchen dustbin then put all the collected waste in grinder mixture with water to make slurry of it also add Fresh cow dung then pour the mixture in 20 lit. Digester. (Ranjeet Singh ,S.K.Mandal ,V.K.Jain (2008))
Propotion of the Sample + Water + Cow Dung used in the experiment as follows, (pH – 4.39) ,Waste Material – 6kg ,Water – 7lit. ,Cow dung – 1kg(app.)

Anaerobic digestion ; This biogas plant consists of mainly two parts:

- A digester or fermentation tank with an inlet and outlet chambers for the entry of fermentable mixture (cow dung and water in 1:1 ratio) in the form of slurry into the digester and exit of digested slurry. The outlet would also control to constant volume of slurry in the digester. (Dr. Sarbjit Singh Sooch et al. (2012)
- A gas holder to collect biogas, so formed by fermentation in the digester. It would also help to maintain anaerobic condition in the digester in the digester in which kitchen waste was put gas is formed:
- The outlet of anaerobic digester is the inlet of water bottle.
- When gas is formed pressure will be generated in the mentioned water bottle.
- Now when the pressure is exerted due to gas, the water comes out and is collected in the jar.
- Now we measure the water which we collected by graduated cylinder

III. RESULTS

Economics of Deenbandhu Model Biogas Plant :The economics of all the models of biogas plants (i.e. saving money by using biogas for cooking instead of using other conventional fuels like LPG etc.) during the year 2013 is explained as below : Size of biogas plant taken = 6 m3. (Gurvinder Singh Brar Dr. R. K Khitoliya & Er. Sarbjit Singh Sooch (2005)

$$\textit{Payback period of the plant} = \frac{\textit{Initial investment}}{\textit{Annual profit}} = 2.37 \textit{ years}$$

At optimum pH, temperature & TS%, the biogas production goes on increasing that is shown in Table 1 & 2. The variability in gas evolution is based upon hydrolysis & acidogenesis stage , which produce bacterial for methanogenesis.It has been seen that the production of biogas goes on decreasing at first week because hydrolysis and acidogenesis reaction in very fast as bacteria utilize the waste more readily.

Table 1 : Biogas production(m^3/kg) v/s days

Biogas production v/s days	*Biogas production in m3*	
1st day	0.51	*AVERAGE BIOGAS PRODUCTION FROM 20LIT. DIGESTER WITH APPROX. 7KG KITCHEN WASTE: 0.535 m3*
5th day	0.21	
10th day	0.57	
15th day	0.63	
20th day	0.65	

As it is a continuous fed digester we put kitchen waste again through the funnel, and fermentation starts within 24hrs , the gas production goes on increasing.

Table 2 : pH and total solid concentration of setup.

Day	pH	TS %
1st day	6.9	12
5th day	5.83	10
10th day	7.18	12.34
15th day	7.52	12.97
20th day	7.3	12.97
AVERAGE	6.93	12.35

IV. DISCUSSION

Graph Analysis – it can be seen from the graph that gas production decreasing first upto 6days but then it starts increasing as acid concentration increasing in the digester and pH decreasing below 6.8, after 6days slurry of kitchen waste added to dilute which increases the pH, gas production starts increasing.

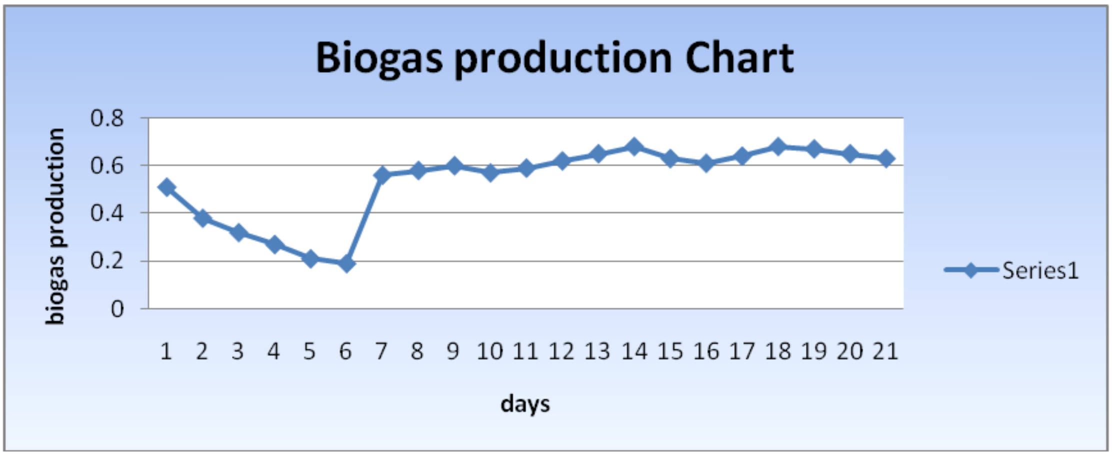

Fig. 1: Gas production m³/kg V/s days

pH

Graph Analysis - Acid concentration greatly affects the biogas production. Hydrolysis and Acidogenesis reaction is very fast as bacteria utilize the waste more readily so gas production decreasing.

Simplification of process is as follows:

Acidogenesis reaction – Fast

pH – Decreases

Gas production – Decrease

(And vice-verse all the above increases the gas production)

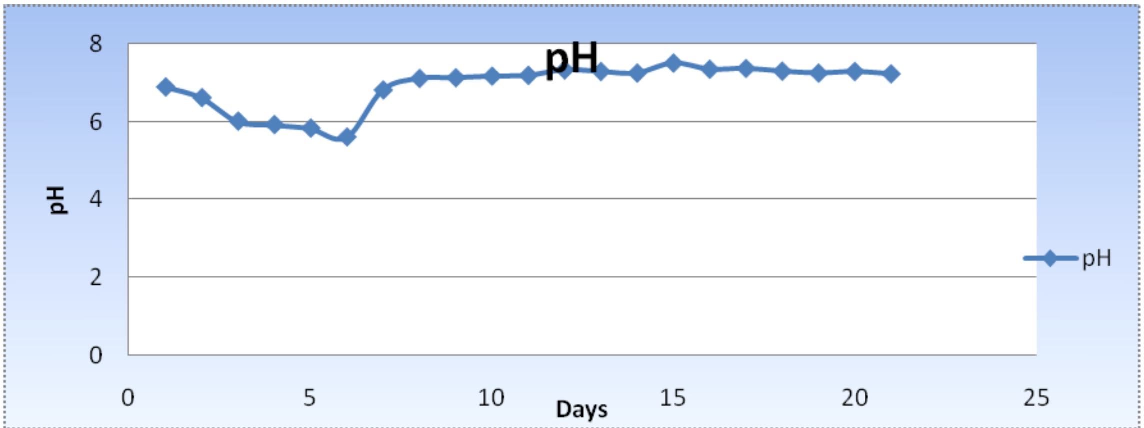

Fig 2 : variation in pH V/s days

TS%

Graph Analysis - Acid concentration greatly affects the biogas production. Methanogens reaction is very fast as bacteria utilize the waste more readily so gas production decreasing. Simplification of process is as follows: Methanogens reaction – Fast TS% – Decreases
Gas production – Decrease (And vice-verse all the above increases the gas production)

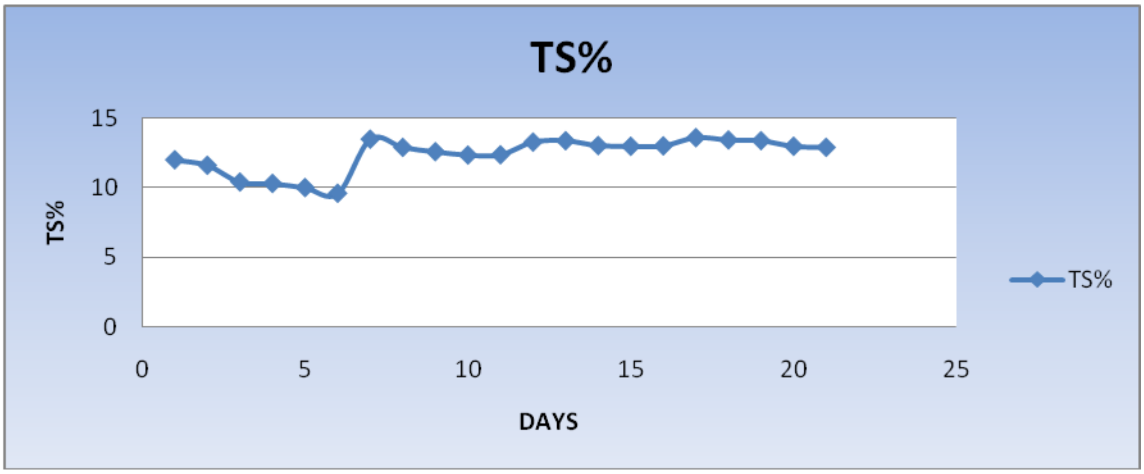

Fig 3: variation in TS%

Temperature: Methane microorganisms are very sensitive to temperature changes; a sudden change exceeding 3°C will affect production, therefore, one must ensure relative stability of temperature. Optimum temperature for biogas production is 35°-45°C. It is the temperature, prevailing inside the digester.

V. CONCLUSION

The study has shown that Kitchen Wet Waste is useful and can be utilized for energy generation. The study has also shown The Treatability of Waste through Anaerobic Digestion & Economics of the Biogas plant for a middle class family. The efficient disposal of kitchen waste can be ecofriendly as well as cost effective. Deenbandhu biogas plant is Economical plant, Payback period of this plant is 2 and half year only. The initial investment cost is only Rs27000/-. Place for such kind of plant at homes is 424sq. ft, which is easily available at backyard of home. 12kg of kitchen waste was produced 1m³(app.) of gas per day if there is ambient environment like optimum temperature conditions, pH , TS% i.e. 37˚C , 6.8 & 12%.

ACKNOWLEDGEMENT

The authors are grateful to PEC University of Technology, Chandigarh for their cooperation and encouragement to carry out the work.

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International Journal of Computational Engineering Research||Vol, 03||Issue, 6||

A Survey of Permissive Public Auditability and Data Dynamics For Storage Security In Cloud Computing

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ABSTRACT

Cloud storage allows users to remotely store their information and revel in the on-demand top quality cloud applications while not the burden of local hardware and software management. although the advantages are clear, such a service is additionally relinquishing users physical possession of their outsourced information, that inevitably poses new security risks towards the correctness of the information in cloud. In order to handle this new drawback and any attain a secure and dependable cloud storage service,we offer in this paper a versatile distributed storage integrity mechanism, utilizing the homomorphic token and distributed erasure-coded information. The proposed style permits users to audit the storage of cloud with terribly light-weight communication and execution price. The auditing result not solely ensures robust cloud storage correctness guarantee, however conjointly at the same time achieves quick information error localization,that is, the notification of misbehaving server. Considering the cloud information are dynamic in nature, the planned style any supports secure and economical dynamic operations on outsourced data , as well as block modification, deletion, and append operation. Analysis shows the planned theme is extremely economical and resilient against Byzantine failure, malicious information modification assailant, and even server colluding attacks.

I. INTRODUCTION

Consisting of variety trends are opening up the era of Cloud Computing, that's associate degree Web-based development and use of technology. Cloud computing has been visualised it's the next generation design of the IT Enterprise. The ever cheaper and additional powerful processors, together with the "software as a service" (SaaS) computing design, are transforming information centers into pools of computing service on a large scale. Meanwhile, the increasing network bandwidth and reliable however versatile network connections create it even potential that purchasers will currently subscribe prime quality services from information and software that reside exclusively on remote information centers. With the help of SAAS it moves the applying package and database to the centralized massive data centers wherever the information management and services might not be totally trustworthy. Moving data into the cloud offers nice convenience to users since they don't have to care about the potential of direct hardware management. The pioneer of Cloud Computing vendors, Amazon easy Storage Service (S3) and Amazon Elastic cipher Cloud (EC2) [2] are each renowned examples. whereas these internet-based on-line services provides immense amounts of space for storing and customizable computing sources, this computing platform move, however, is remove.

the responsibility of native machines for information maintenance at an equivalent time. As a result, users area unit at the mercy of their cloud service suppliers for the supply and integrity of their data[3] . On the one hand, though the cloud infrastructures area unit rather more powerful and reliable than personal computing devices, broad of broad internal and external threats for information integrity still exist.Another major concern among previous styles is that of supporting dynamic information operation for cloud information storage applications. In Cloud Computing, the remotely keep electronic information won\'t solely be accessed however conjointly updated by the purchasers, e.g., through block modification, deletion and insertion. sadly, the progressive within the context of remote information storage primarily specialise in static information files and also the importance of this dynamic information updates has received restricted attention within the information possession applications to date [1–4,6,9,11,12]. Moreover, as are going to be shown later, the direct extension of this demonstrable information possession (PDP) [6] or proof of retrievability (PoR) [2,5] schemes to support information dynamics could result in security loopholes. though there area unit several difficulties long-faced by researchers, it\'s well believed that supporting dynamic information operation is of significant importance to the sensible application of storage outsourcing services. In view of the key role of public verifiability and also the supporting of information|of knowledge|of information} dynamics for cloud data storage, during this paper we have a tendency to gift a framework associate degreed an economical construction for seamless integration of those 2 elements in our protocol style. Our contribution is summarized as follows:

[1] we have a tendency to propose a general formal PoR model with public verifiability for cloud information storage, during which block less verification is achieved;
[2] we have a tendency to equip the planned PoR construction with the perform of supporting for totally dynamic information operations, particularly to support block insertion, that is missing in most existing schemes;
[3] we have a tendency to prove the safety of our planned construction and justify the performance of our theme through concrete implementation and comparisons with the progressive.

II. RELATED WORK

Juels et al. [3] design a proper "proof of retrievability" (POR) model, for to form safe the remote information integrity. Where theme combines spot-checking and errorcorrecting code to make sure each possession and retrievability of data files on remote archive service systems. Schwarz et al. [4] projected to make sure static file integrity across multiple distributed servers, mistreatment erasure-coding and blocklevel file integrity checks. we have a tendency to adopted some ideas of their distributed storage verification protocol. However, our theme any support information dynamics and expressly study the matter of misbehaving server identification, whereas theirs didn't. terribly recently, Wang et al. [8] gave a study on several existing solutions on remote information integrity checking, and mentioned their professionals and cons under totally different style eventualities of secure cloud storage Shacham et al. [2] style and to form PoR theme with full proof of security within the security model outlined in [3].they use in public verifiable homomorphic authenticators engineered from BLS Signature.Based on the elegant BLS construction,public comparatively is achived and therefore the proof may be mass into atiny low critic worth. Bowers et al. [5] To intend associate degree become higher framework for POR protocols that to cut back the final laws each Juels and Shacham's work. Later in their ulterior work, Bowers et al. [5]extended POR model to distributed systems. However, all these schemes are that specialize in static information.

The effectiveness of their schemes rests totally on the preprocessing steps that the user conducts before outsourcing the information file F. Any amendment to the element of F, even some bits, should propagate through the error-correcting code and therefore the corresponding random shuffling method, thus introducing vital computation and communication quality. Recently, Dodis et al. [8] gave theoretical studies on generalized framework for various variants of existing POR work. Ateniese et al. [6] outlined the primary contemplate public auditability "provable information possession" (PDP) model for guaranteeing possession of file on untrusted storages. In Their theme utilised public key primarily based homomorphic tags for auditing the information file and that they utilize RSA-based Homomorphic tags for auditing but, the pre-computation of the tags imposes significant computation overhead that may be dear for a complete file. In their ulterior work, Ateniese et al. [7] described a "provable information possession" PDP theme that uses solely bilaterally symmetric key primarily based cryptography. This technique has less-overhead than that previous theme and to approve for block updates,deletions and appends to the abundance file, that has conjointly been supported in our work. However, their theme focuses on single server situation and doesn't offer data handiness guarantee against server failures, effort each the distributed situation and information error recovery issue unknown. the express support of information dynamics has any been studied within the 2 recent work [9] and [10]. Wang et al. [8] projected to mix BLS primarily based homomorphic critic with Merkle Hash Tree to support totally information dynamics, whereas Erway et al. [9] developed a skip list primarily based theme to alter provable information possession with totally dynamics support.The progressive cryptography work done by Bellare et al. [10] conjointly provides a group of cryptological building blocks like hash, MAC, and signature functions that may be used for storage integrity verification whereas supporting dynamic operations on information. However, this branch of labor falls into the standard information integrity protection mechanism, wherever native copy of information must be maintained for the verification. Shah et al. [11], [12] projected permitting a TPA to stay on-line storage honest by 1st encrypting the information then causation variety of pre-computed symmetrickeyed hashes over the encrypted information to the auditor.However, their theme solely works for encrypted files, and auditors should maintain long-run state.

III. CLOUD COMPUTING SECURITY

Cloud computing security is a sub-domain of computer security, network security, and, more mostly, data security. It provide to a broad set of technologies, principles and controls organise to protect facts and figures, applications, and the combine infrastructure of cloud computing.

Security issues associate with Cloud There are numerous security issues affiliate with cloud computing but these matters fall into two very wide classes:

1. Security matters faced by cloud providers (configuration supplying software-, platform-,or infrastructure-as-a-service by the cloud)

2. Security matters faced by their customers. In most situations, the provider should double-check that their infrastructure is secure and that their purchasers' facts and figures and applications are protected while the customer should double-check that the provider has taken the correct security assesses to protect their data.
The extensive use of virtualization in applying cloud infrastructure brings exclusive security anxieties for customers or tenants of a public cloud service. Virtualization alters the connection between the OS and underlying hardware - be it computing, storage or even networking. This introduces an added layer - virtualization - that itself should be correctly configured, organised and protected. Specific concerns encompass the potential to compromise the virtualization programs, or "hypervisor". While these concerns are mostly theoretical, they do exist.For demonstration, a breach in the manager workstation with the administration programs of the virtualization programs can origin the entire datacenter to proceed down or be reconfigured to an attacker's liking.

Cloud Security Control Cloud security architecture is productive only if the correct defensive implementations are in place. An efficient cloud security architecture should identify the matters that will originate with security administration. The security management locations these matters with security controls. These controls are put in location to safeguard any weaknesses in the system and decrease the effect of an strike. While there are many kinds of controls behind a cloud security architecture, they can usually be discovered in one of the following classes:Deterrent Controls These controls are set in place to avert any purposeful attack on a cloud system. Much like a alert signalal on a barrier or a property, these controls do not reduce the genuine vulnerability of a system.Preventative command These controls upgrade the power of the scheme by managing the vulnerabilities. The preventative command will safeguard vulnerabilities of the scheme. If an attack were to happen, the preventative controls are in location to cover the attack and decrease the impairment and violation to the system's security.Corrective Controls Corrective controls are utilised to decrease the effect of an attack. Different the preventive controls, the correct controls take action as a strike is happening.

Detective Controls Detective controls are utilised to notice any attacks that may be occurring to the scheme. In the event of an attack, the detective command will pointer the preventative or corrective commands to address the topic. Dimensions of cloud security Correct security controls should be applied according to asset, risk, and vulnerability risk evaluation matrices. While cloud security anxieties can be grouped into any number of dimensions (Gartner titles seven while the Cloud Security coalition recognizes fourteen localities of concern these dimensions have been aggregated into three general localities: Security and Privacy, Compliance, and lawful or Contractual Issues.Security and privacy Identity administration Every enterprise will have its own identity administration system to command access to information and computing resources. Cloud providers either integrate the customer's persona administration scheme into their own infrastructure, utilizing federation or SSO expertise, or supply an identity administration solution of their own. personnel and staff security as well as all relevant customer facts and figures is not only restricted but that get get access to to be documented. Get get access to toibility Cloud providers boost customers that they will have regular and predictable access to their facts and figures and appliance. Submission security Cloud providers arrange that submission available as a service by the cloud are protected by bringing out checking and acceptance methods for outsourced or bundled submission cipher. It furthermore needs submission security measures to be in place in the output natural natural environment. Privacy Providers provide that all analytical facts and figures (for example borrowing business business card figures) are cached and that only declared users have get access to to data in its entirety. further, digital identities and authorization must be protected as should any facts and figures that the provider assembles or produces about customer undertaking in the cloud. Lawful issues .In addition, providers and customers should consider lawful matters, such as Contracts and Discovery, and the associated laws, which may vary by homeland.

Cloud computing **security** is a sub-domain of computer security, network security, and, more manly, information security. It provide to a broad set of technologies, policies and controls arrange to protect data, applications, and the blend infrastructure of cloud computing.

3.1.Security issues associate with Cloud

There are many security issues affiliate with cloud computing but these issues fall into two broad categories:

1. Security problems visaged by cloud suppliers (configuration providing software-, platform, or infrastructure-as-a-service via the cloud)
2. Security problems visaged by their customers. In most cases, the supplier should make sure that their infrastructure is secure which their clients' knowledge and applications ar protected whereas the client should make sure that the supplier has taken the right security measures to guard their data.The intensive use of Virtualization in implementing cloud infrastructure brings distinctive security considerations for purchasers or tenants of a public cloud service. Virtualization alters the link between the OS and underlying hardware - be it computing, storage or maybe networking. This introduces an extra layer - Virtualization - that it should be properly organized, managed and secured. Specific considerations embrace the potential to compromise the Virtualization package, or "hypervisor". whereas these issues ar for the foremost half theoretical, they're doing exist. as associate example, a breach at intervals the administrator digital computer with the management software package of the Virtualization package can cause the full datacenter to travel down or be reconfigured to associate attacker's feeling.Cloud Security control Cloud security design is effective as long as the right defensive implementations are in place. AN economical cloud security design should acknowledge the problems that may arise in security management. the security management addresses these problems with security controls. These controls are place in situ to safeguard any weaknesses within the system and reduce the impact of an attack. whereas there are many sorts of controls behind a cloud security design, they will sometimes be found in one amongst the subsequent categories:

3.2.Deterrent Controls

These controls are set in situ to prevent any purposeful attack on a cloud system. very like a be-careful call on a fence or a property, these controls don't cut back the particular vulnerability of a system.

3.3.Preventative management-

These controls upgrade the strength of the system by managing the vulnerabilities. The preventative management can safeguard vulnerabilities of the system. If an attack were to occur, the preventive controls are in place to cover the attack and reduce the damage and violation to the system's security.

3.4.Corrective Controls

Corrective controls are used to reduce the effect of an attack. Unlike the preventative controls, the correct controls take action as an attack is occurring.

3.5.Detective Controls

Detective controls are used to detect any attacks that may be occurring in the system. In the event of an attack, the detective control will signal the preventative or corrective controls to address the issue. [7] Dimensions of cloud securityCorrect security controls should be enforced according to quality, threat, and vulnerability risk assessment matrices. whereas cloud security considerations will be classified into any variety of dimensions (Gartner names seven whereas the Cloud Security Alliance identifies fourteen areas of concern [10]) these dimensions are aggregated into 3 general areas: Security and Privacy, Compliance, and Legal or contractual problems.

3.6.Security And Privacy-

Identity Management

Every enterprise can have its own identity management system to regulate access to data and computing resources. Cloud suppliers either integrate the customer's identity management system into their own infrastructure, using federation or SSO technology, or offer an identity management answer of their own.

3.7.Physical And Personnel Security

Providers make sure that physical machines are adequately secure which access to those machines in addition as all relevant client information isn't solely restricted however that access is documented.

3.8. Availability

Cloud suppliers encourage customers that they'll have regular and sure access to their knowledge and appliance.

3.9.Application Security

Cloud suppliers organize that applications obtainable as a service via the cloud are secure by bringing out testing and acceptance procedures for outsourced or prepackaged application code. It additionally needs application security measures be in situ within the production atmosphere.

3.10.Privacy

Providers offer that every one analytical knowledge (for example mastercard numbers) are cached which solely certified users have access to knowledge in its entireness. further, digital identities and authorization should be protected as should any knowledge that the supplier collects or produces concerning client activity within the cloud.

3.11.Legal Problems

In addition, suppliers and customers should contemplate legal problems, like Contracts and E-Discovery, and also the connected laws, which can vary by country.

IV. PROPOSED SCHEME

In this paper the cloud security and data dynamics approach is presented .In this paper already considering the use of Third Party Auditor however the limitation of this work is that they are considering only Third Party Auditor and if that fails the whole security of cloud is failing so we are presenting the use of multiple TPA (Third Party Auditor). This section introduced our public auditing scheme which provides a complete outsourcing resolution of information– not only the information itself, but also its integrity checking. We start from the short view of our public auditing system and discuss two straightforward schemes and their disadvantage. Then we present our main scheme and show how to extend our main scheme to support batch editing for the TPA upon delegations from many users. Finally, we have a tendency to discuss the way to generalize our privacy-preserving public auditing scheme and its support of information dynamics.

4.1Framework of Public Audit System

We follow the same definition of antecedently proposed schemes within the context of remote information integrity. A public auditing scheme consists of four algorithms (KeyGen , SigGen , GenProof , Verify Proof).KeyGen may be a key generation formula that\'s run by the user to setup the scheme. SigGen is employed by the user to generate verification data, which can encompass mac, signatures, or alternative connected information that may be used for auditing. GenProof is run by the cloud server to generate a symbol of information storage correctness, whereas Verify Proof is run by the TPA to audit the proof from the cloud server.

A public auditing system consists of 2 phases, Setup and Audit:

• **Setup :** The user initializes the general public and secret parameters of the system by execution KeyGen , and pre-processes the information file F by using SigGen to generate the verification data. The user then stores the information file F and also the verification data at the cloud server, and deletes its local copy. As a part of pre-processing, the user could alter the information file F by increasing it or together with extra data to behold on at the server.

• **Audit:** The TPA problems associate audit message or challenge to the cloud server to create certain that the cloud server has retained the information file F properly at the time of the audit. The cloud server can derive a response message from a perform of the hold on file F and its verification data by execution GenProof. The TPA then verifies the response via Verify Proof.

V. CONCLUSION

In this paper, to confirm cloud information storage security, which is actually a distributed storage System. it's crucial to enable a 3rd party auditor (TPA) to judge the service quality from an associate degree objective and freelance perspective. Public auditability additionally permits purchasers to delegate the integrity verification tasks to TPA whereas they themselves is unreliable or not be able to commit necessary computation resources performing continuous verifications. Another major concern is a way to construct verification protocols which will accommodate dynamic information files. During this paper, we explored the matter of providing coinciding public auditability and information dynamics for remote information integrity check in Cloud Computing. Our construction is deliberately designed to satisfy these 2 necessary goals whereas efficiency being kept closely in mind. To attain economical information dynamics, we have a tendency to improve the present proof of storage models by manipulating the classic Merkle Hash Tree (MHT) construction for block tag authentication. To support economical handling of multiple auditing tasks, we more explore the technique of adding a mixture signature to increase our main result into a multi-user setting, wherever TPA will perform multiple auditing tasks at the same time. Intensive security and performance analysis show that the planned theme is incontrovertibly secure and extremely economical. We have a tendency to believe these benefits of the planned schemes can shed lightweight on the political economy of scale for cloud computing.

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