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Kokula Krishna Hari K, Daniel James

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PREFACE

It is my pleasure to welcome the participants to the "International Conference on Interdisciplinary Research in Electronics and Instrumentation Engineering ICIREIE-2015" at Bharathiar University, Coimbatore, Tamilnadu, India, Asia on 11 – 12 August, 2015.

Research in all the fields of Electronics and Instrumentation has to be undertaken earnestly, with the objective of original findings in new realms. The Department of Electronics and Instrumentation of the Bharathiar University, Coimbatore has been established to give a distinct lead to advanced studies and research in Electronics and Instrumentation and consequently the realization of the aforesaid goal.

I trust that the conference will not only provide a useful forum to the participants to share their expertise for extending collaboration in Electronics and Instrumentation but will also be professionally beneficial to them. It will also help to introduce the Electronics and Instrumentation community and familiarize the participants with its current work for advanced studies and research

With the constant support and encouragement from the ASDF Global President Dr. S. Prithiv Rajan, ASDF International President Dr. P. Anbuoli and ASDF International Secretary Dr. K. Kokula Krishna Hari, this conference will stay in our hearts. Without them, this proceeding could not have been completed within the shortest span.

Heartfelt Gratitude are due to the team members of Association of Scientists, Developers and Faculties – International, Our Management, Friends and Colleagues for their cooperation and commitment for making this conference a successful one.

Dr. S. Muruganand,
Chief Editor
Asst.Professor, Department of Electronics and Instrumentation
Bharathiar University, Coimbatore,India

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Comparative Performance analysis of Trust implemented AODV with Trust implemented OLSR under the Blackhole Attack

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Abstract: *MANETs are group of nodes that get in to communication and resolve at any place or at any point of time without a central authority or infrastructure. The nature of these network are vulnerable to many type of attacks which lead to security issues where valuable information are compromised. There are many available protocols to guide them. But lacuna in secure routing has come in to limelight and vigorous research is in progress to get a robust protocol. One such security measure called Trust, a metric has been implemented in AODV, a reactive routing protocol and OLSR, a proactive routing protocol and under a type of attack i.e. security threat to MANET called Black –hole a comparison of performance analysis is performed in this paper.*

Keywords: MANET; Black hole Attack; AODV; reactive protocol; OLSR; proactive protocol; Trust; (key words)

I. INTRODUCTION

MANETs are Mobile Ad hoc Networks where the nodes coming in to communication act both as hosts and routers. They are boon to the military operations, rescue operations, battlefield areas and where the infrastructure is not found or damaged severely. Since they are formed and deployed anywhere without a access point or base station they are gaining popularity in every aspect. But due to their limited bandwidth, poor scalability, dynamic topology, limited energy and loss of security bring in many challenges in routing. These pave way for their low performance which should be handled efficiently by routing protocols. The routing protocols do not defend MANET due to attacks of data compromise. Off late, many research have given enhancement in improving the protocols to manage and secure MANETs. The attack types are many and one such attack called black hole attack is implemented and a metric Trust is implemented in Ad hoc On Demand Distance Vector (AODV), reactive protocol and Optimized Link State Routing (OLSR), a proactive protocol and comparative study is performed in this paper.

II. ROUTING PROTOCOLS

Routing is the process of forwarding information or data packets towards its destination using the best and efficient path which is talked in terms of number of hops, traffic, security, etc. in MANETs each host node acts as a specialized router itself. Routing protocols have been designed to route in MANETs where they possess a great task of routing with no infrastructure and with no rigid

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topology. MANET routing protocols can be categorized in to the following based on their methodology. They are proactive protocols, reactive protocols and hybrid protocols.

A. Proactive protocols

In these type of protocols the nodes know the complete routing information of the network before the actual transfer of data packets start. This is done by flooding network periodically with network status information to find out possible change in topology. Examples of proactive protocols are:

- GSR : Global State Routing Protocol
- OLSR : Optimised Link State Routing Protocol
- HSR : Hierarchical State Routing protocol

B. Reactive protocols

In reactive protocols the nodes know only the active paths to the destination nodes. A route search is made for every new destination. Example of reactive protocols are :

- AODV : Ad hoc On demand Distance Vector Routing protocol
- DSR : Dynamic Source Routing Protocol
- LAR : Location Aided Routing Protocol

C. Hybrid protocols

They are the combination of proactive and reactive protocols. They remain globally reactive and locally proactive. Example of Hybrid protocol is ZRP, Zone Routing protocol.

III. OVERVIEW OF AODV PROTOCOL

Ad hoc On-demand Distance Vector Routing protocol is a type of reactive protocol. Here the routes for the destination are found only when needed. The routing table is maintained in the nodes and not in the packets reducing Memory overhead. The search for the route by the source to the destination is as follows. If the source node has the route to the destination and if the destination sequence number is the highest it means the route is a fresh one and therefore forwards the packets towards the destination. Else it generates RREQ, Route Request packets and forwards to its one hop neighbors. If the neighbors find itself to be the destination or if has route to the destination it forwards the RREP, Route Reply packet to the source node else it again forwards the RREQ, Route Request packets to its neighbor. The neighbors do the same as its previous node. On getting the RREP, Route Reply packets the source checks for the Destination Sequence Number in the RREP, Route Reply packets greater than the RREQ, Route Request Packets itself. If it finds the Destination Sequence Number to be greater it uses the route to forward the packets in that route to the destination. By the time RREP, Route Reply packets reaches the source all the intermediate nodes know the route to source as well as to the destination. AODV uses HELLO messages to indicate its presence in the network to its neighbor nodes. AODV uses RRER, Route Error Packets for the link failure.

IV. OVERVIEW OF OLSR PROTOCOL

OLSR, Optimized Link State Routing protocol is a proactive routing protocol. By sending periodic control messages it maintains the latest topology information. As its name denotes it as a optimized routing protocol as its makes use of Multipoint Relay (MPR) nodes in-order to decrease the routing overhead. Each node selects its subset of neighbors as MPRs. MPR nodes are responsible for rebroadcasting control packets of nodes which have selected this node as MPR. Other non-MPR neighbor nodes receive and process packets without relaying them. MPRs are selected based on 2 criteria, first is they are one hop neighbors of the node and second is they cover all the two hop neighbors of that node. OLSR uses two type of messages namely HELLO and TC messages. They are periodically transmitted. All the nodes contain a table that includes information of its current neighbors. HELLO messages are generated using this information. Each node propagates Link State information between itself and its neighbors by HELLO messages. Upon receiving these HELLO messages the nodes know their one hop and two hop neighbors and this makes them to choose their MPR set. In addition nodes can create and update their MPR selector list. Upon this list creation nodes start to send TC messages. Hello messages are processed but not relayed by the nodes. But TC messages contain the MPR selectors of a node and existing link from this node is represented. Other nodes update their topology table. All the nodes receive and process TC messages but the MPR relays them. Finally all the nodes extract current detectable routes with regard to information in topology table and store them in this routing table. At the time of sending data packets the nodes use this information.

V. BLACK HOLE ATTACK

Black hole attack is a type of active attack in MANETs. The malicious node advertises itself having the shortest route to the destination and directs the traffic towards itself. It receives the packets from the source by advertising itself with a spoofed destination address.

D. Black hole attack implementation in AODV and OLSR

In AODV, the black hole attacker sends fake RREP message to the source which has higest Destination Sequence Number than any other node stating that it has the fresh route to the destination there by getting the data packets towards itself and starts dropping the packets.

In OLSR, the malicious node sends false HELLO messages, where it shows to have many neighbors than it actually has. It keeps its willingness field to WILL always constantly in HELLO messages. Thus, gaining the probability of acting as MPR. Due to the fake

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HELLO messages falsified TC messages are propagated. Thus, the attacker captures route. Source node S receives HELLO messages from X node , the black hole attacker and selects X as MPR and updates its routing table accordingly. To reach the destination node D,TC and data packets should pass via X where it is dropped.

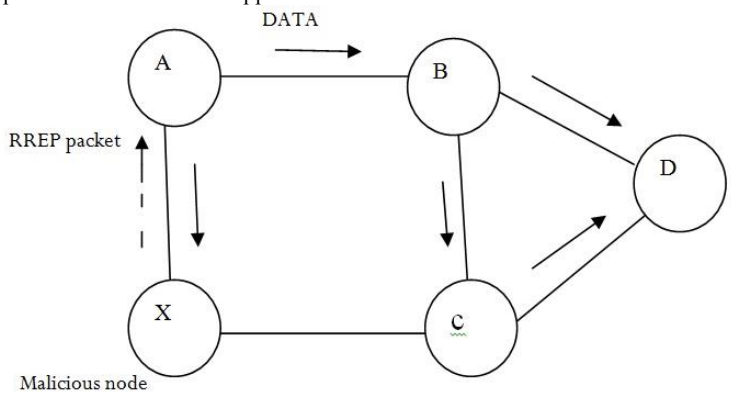

Figure.1. Black hole Attack in AODV Protocol

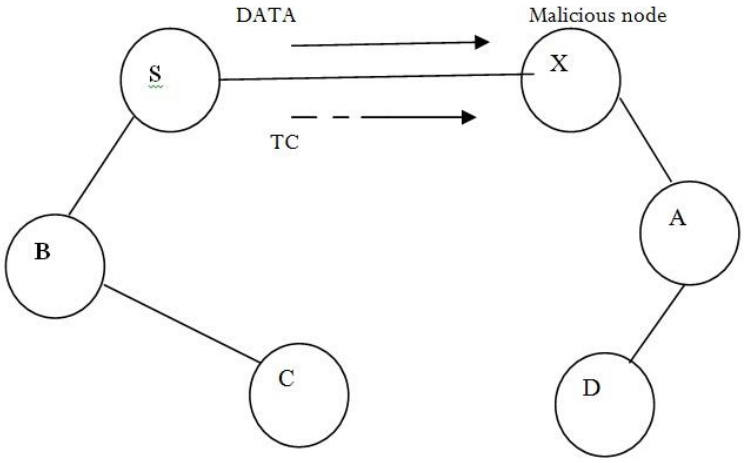

Figure.2. Black hole Attack in OLSR Protocol

VI. TRUST framework and its implementation in AODV and OLSR

Trust metric is implemented in the protocols in-order to gain reliability in routing through nodes. Trust is a measure which can be obtained out of experience. The model of Trust implemented in AODV and OLSR protocols is as follows.

The packets forwarded by the nodes are monitored promiscuously and detection is done by buffer of packets stored that have recently sent for forwarding. A cyclic buffer is used to store the packets. Here when the packets are forwarded they are deleted from the cyclic buffer and the Trust value of forwarded node increases. If the packet is not being forwarded for a long time or when the packet is being delayed for a long time the last element is removed from the cyclic buffer, thus decreasing the trust value of the node.

- Initially trust value is assigned to zero for all the nodes.
- Nodes monitor the other nodes behavior promiscuously.
- Cyclic buffer is maintained for packet storage.
- Packets forwarded, the nodes trust value increases by +1.
- Packets delayed or packets not forwarded, the nodes trust value decreases by -1.
- When the Trust value is -5, the node is blacklisted and is not included for routing.

VII. SIMULATION SET UP

NS 2.34 is used for the simulation. In this 10 -100 nodes have been used for simulation for a duration of 30 seconds, in a area of 1500 * 1000 using 802.11 MAC layer in a transmission range of 250 meters. Under the black hole attack a comparative performance analysis of Trust implanted AODV with Trust implemented OLSR have been performed and their superiority over AODV and OLSR have been witnessed under Blackhole attack. The performance metric taken for study is the Packet Delivery Ratio.

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TABLE 1.
simulation parametrs and values

parameter	value
simulator	ns 2.34
nodes	10 – 100
attack	black hole attack
simulation area	1500 * 1000
routing protocols set 1	TRUST implemented AODV and TRUST implemented OLSR
routing protocols set 2	AODV and OLSR
traffic	cbr (constant bit rate)
data rate	2 Mbps
interval	0.01 seconds
simulation time	30 seconds
antenna	omni directional
packet size	512 bytes
transmission range	250 m
number of attackers	one
propagation	two ray ground

RESULTS AND DISCUSSIONS

In this investigation Packet delivery ratio has been taken as a metric of talk to compare the efficiency of trust implemented AODV and Trust implemented OLSR and its superiority over their base protocols namely AODV and OLSR discussed in terms of Packet Delivery Ratio.

Packet Delivery ratio is the ratio of the number of packets received by the destination to the number of packets being forwarded by the source.

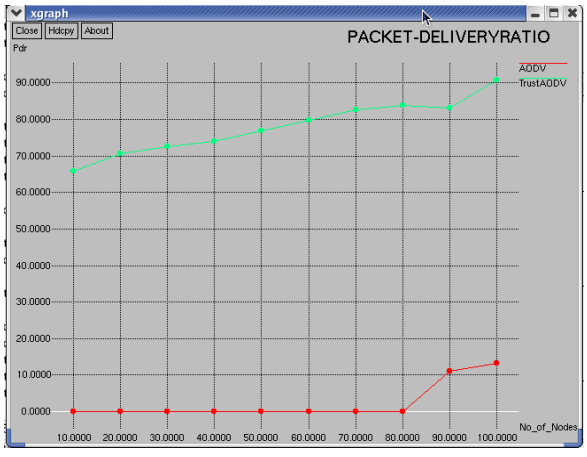

FIGURE. 3. Packet Delivery Ratio for AODV and Trust AODV.

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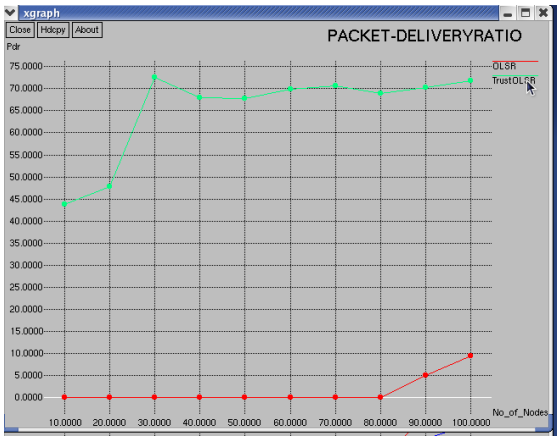

FIGURE. 4. Packet Delivery Ratio for OLSR and Trust OLSR.

From the graph we deduce that the performance of both Trust implemented AODV and Trust implemented OLSR are better in Packet delivery Ratio than their base protocols AODV and OLSR respectively. This is due the black hole attack where it does not allow the packets got by it for further routing and drops it thus adversely lowering the Packet Delivery ratio.

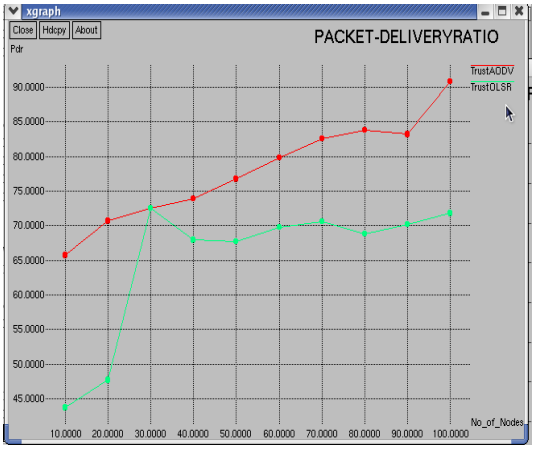

FIGURE. 5. Packet Delivery Ratio for Trust AODV and Trust OLSR.

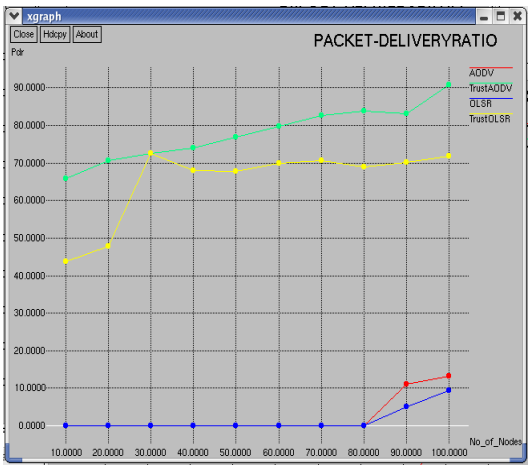

FIGURE. 6. Packet Delivery Ratio for AODV, OLSR, Trust AODV, Trust OLSR.

It is evident from the graph that under black hole attack the above discussed trust framework gives better Packet Delivery Ratio for the trust implemented AODV than the Trust implemented OLSR.

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XI. CONCLUSION AND FUTURE EXTENSION

On the whole the trust implemented AODV gives better performance than Trust implemented OLSR. This investigation shows the better performance of these trust implemented protocols than their base protocols. This trust implementation can be constructed in other MANET routing protocols as well and can be modified a little to suit Jelly fish Attack.

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Edge Detection based on K-means and Gabor Wavelet Technique

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Abstract: *A combination of K-means clustering, and Gabor wavelet method are used to accomplish image segmentation and edge detection tasks. We attained an initial segmentation created on K-means clustering technique and wavelet technique with Gabor filter used to detect their boundaries. Gabor wavelets are used at this point to detect edges, corners and blobs. A routine of such an interest point detector is related to detectors employing a Haar wavelet and a derivative of a Gaussian function. In this paper: We have solved the problem of undesirable over segmentation results produced by the wavelet algorithm, when use straightly with raw data images. Also, the edge we obtained has no broken lines on complete image and the final edge detection outcome is one closed borderline per actual region in the image. The planned approach may be useful when a fast implementation of edge detection is available.*

Keywords: Gabor function, wavelet, K-means, edge detection, image segmentation.

INTRODUCTION

Image segmentation is the process of dividing an image into non-overlapping regions based on perceptual information. Image segmentation continues to be an important and active research area in image analysis. In order to analyze complicated image signals, engineers and mathematicians have been searching for a simple, yet well-understood representation. K-means clustering is a method of vector quantization, initially from signal processing, that is well-liked for cluster analysis in datamining. K-means clustering tries to partition *n* observations into *k* clusters in which each remark belongs to the cluster with the nearest mean as a prototype of the cluster.

The problem is computationally difficult; also there are efficient heuristic algorithms that are commonly active and converge quickly to a local optimum. These are similar to the expectation-maximization algorithm for mixtures of Gaussian distributions via an iterative fine-tuning approach employed by both algorithms. Also, they both use cluster centers to classical the data. K-means clustering tends to find clusters of comparable spatial extent and the expectation-maximization mechanism permits clusters to have dissimilar shapes.

In Image processing, Dennis Gabor is the founder of Gabor filter. Gabor filter is a linear filter use for edge detection. Frequency representations and coordination representations of Gabor filters are alike to those of the human visual system, and they have originate to be particularly suitable for texture representation and discrimination. In the spatial domain, Gabor filter is a Gaussian kernel function controlled by a sinusoidal plane wave. To perform image segmentation and edge detection tasks, there are many methods that

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incorporate region growing and edge detection techniques. In this paper a combination of K-means clustering and Wavelet techniques then region merging and edge detection procedures are used. The clustering method are applied to obtain an image of different intensity regions based on minimum distance to examine each pixel in the image and then to assign it to one of the image clusters.

In the proposed work an algorithm based on K-means and Gabor wavelet rules are developed for detecting edges from an image. K-means algorithm consists of two main steps one is assignment and another one is update. Using this first performs clustering and then we go to next method called Gabor wavelet, in this we follow four steps to achieve out result.

II. K-MEANS AND WAVELET TECHNIQUE

A. K-means Clustering

K-means clustering have used to cluster the image depending upon its pixel values while clustering global optimum value is taken in to consideration. Given an initial set of k means $m_1^{(1)},\ldots,m_k^{(1)}$, the algorithm proceeds by two steps:

Assignment step: Assign each observation to the cluster whose mean yields the least within cluster sum of squares (WCSS). The sum of squares is the squared Euclidean distance, this is intuitively the "nearest" mean.

$$S_i^{(t)} = \left\{x_p : \left\|x_p - m_i^{(t)}\right\|^2 \le \left\|x_p - m_j^{(t)}\right\|^2 \forall j, 1 \le j \le k\right\},$$

where each x_p is allocated to exactly one $S^{(t)}$, even if it could be is assigned to two or more of them.

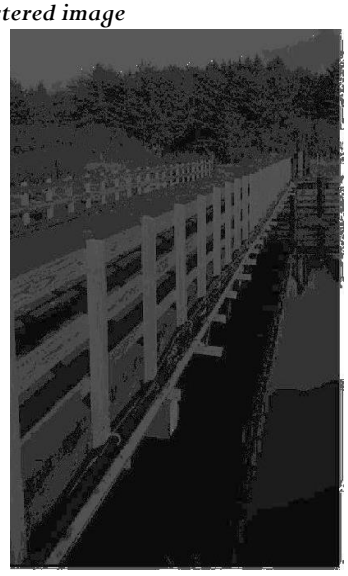
Update step: Compute the new means to be the centroids of the observations in the new clusters.

$$m_i^{(t+1)} = \frac{1}{|S_i^{(t)}|} \sum_{x_j \in S_i^{(t)}} x_j$$

Since the arithmetic mean is a least-squares estimator, which also minimizes the within cluster sum of squares objective. The algorithm has converged when the assignments no longer change. In both steps optimize the WCSS objective, and there exists only a finite number of such partitioning, the algorithm must converge to a optimum. There is no guarantee that the global optimum is found using this algorithm.

Original image

Clustered image



B. Gabor Wavelet

Gabor Wavelet have used for edge detection purpose, the clustered image is given as input for this. In the one-dimensional case, the Gabor function consists of a complex exponential localized around x = 0 by the envelope with a Gaussian window shape

$$g_{\alpha,\xi}(x) = \sqrt{\alpha/\pi}\, e^{-\alpha x^2} e^{-i\xi x},$$

for $\alpha \in \mathbb{R}^+$ and $\xi, x \in \mathbb{R}$, where $\alpha = (2\sigma^2)^{-1}$, σ^2 is a variance and ξ is a frequency.

Dilation of the complex exponential function and shift of the Gaussian window when the dilation is fixed form kernel of a Gabor transform. The Gabor transform hires such kernel for time-frequency signal analysis. The Gaussian window is the finest time frequency localization window in a sense of the Heisenberg indecision principle. In a two-dimensional case, the absolute square of the correlation

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between an image and a two-dimensional Gabor function provides the spectral energy density concentrated around a given position and frequency in a certain direction. The two-dimensional obscurity with a circular Gabor function is separable to series of one-dimensional ones

$$g_{\alpha,\boldsymbol{\xi}}(\boldsymbol{x}) = g_{\alpha,\xi_0}(x_0)\, g_{\alpha,\xi_1}(x_1),$$
$$\text{for } \boldsymbol{\xi} = (\xi_0, \xi_1) \text{ and } \boldsymbol{x} = (x_0, x_1).$$

Elements of a family of mutually similar Gabor functions are called wavelets when they are created by dilation and shift from one elementary Gabor function, i.e.

$$g_{\alpha,\xi,a,b}(x) = |a|^{-1/2}\, g_{\alpha,\xi}\left(\frac{x-b}{a}\right)$$

for 2 $\in$ R^+ (scale) and b $\in$ R(shift). By convention, the mother wavelet has the energy confined around x = 0 as well as all of the wavelets are normalize ||g|| = 1. Although the Gabor wavelet does not form orthonormal base which is the discrete set of them form.

This method includes four main steps:

1. Parameter Setting are width = 45, height = 45, kmax = pi / 2, f = 1.41, delta = pi/3 ;
2. Create the Gabor wavelets using Gabor Kernel
3. Use default superposition method
4. Finally normalize the output

Without Clustering

With Clustering

III. EXPERIMENT AND RESULTS

The proposed system was developed using MATLAB R2012b and it have tested with different images, its performance have compared the existing edge detection algorithms and it have observed that the outputs of this algorithm provide much more distinct marked edges and thus have better visual appearance than the standard existing.

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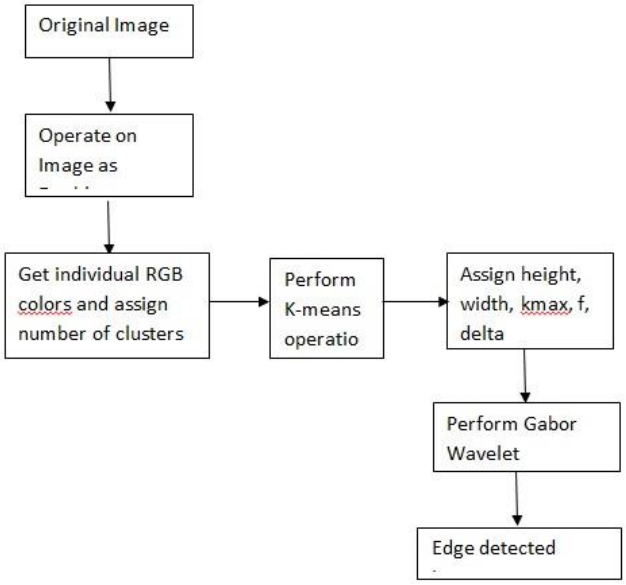


Block Diagram of proposed algorithm

Figure 1: (296059.jpg)

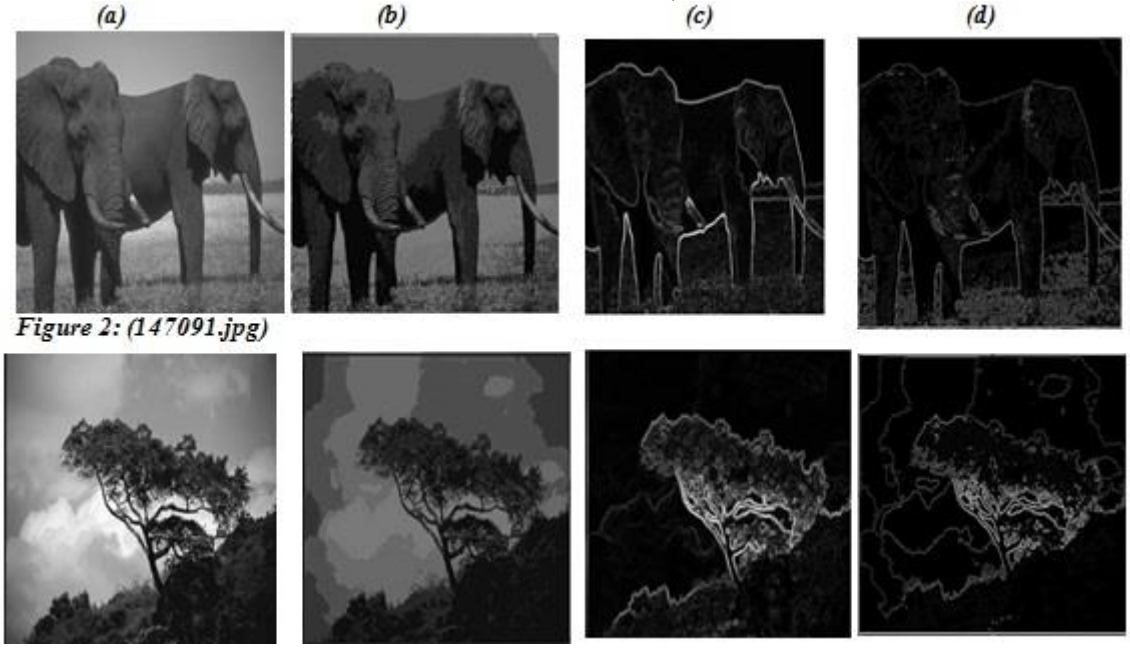
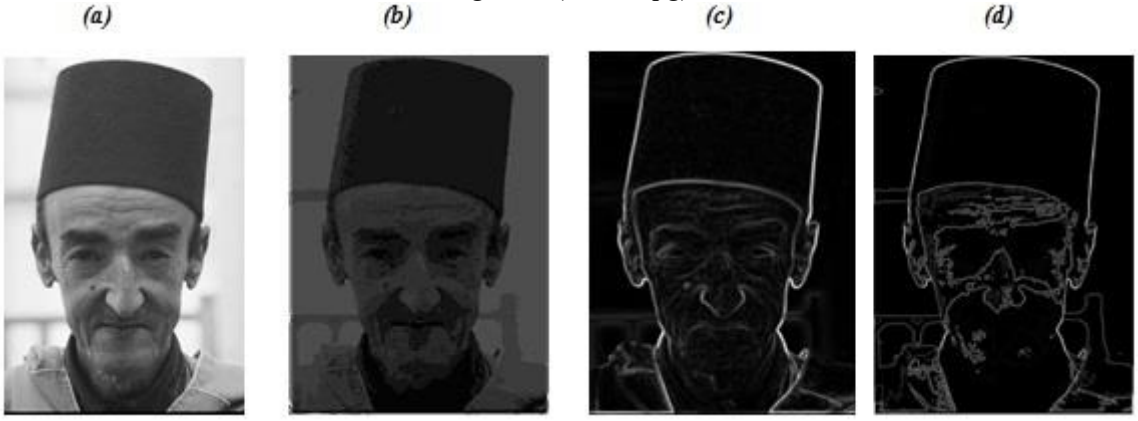


Figure 2: (147091.jpg)

Figure 3: (189080.jpg)



Edge detection: (a) input image, (b) K-means clustered image, (c) Gabor Wavelet image, (d) Both K-means clustering and Gabor Wavelet

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The experimental results of various pictures in Berkley dataset are shown below and other images to test our segmentation and edge detection methods. We obtained output images that comprise of all edge information and regions about the input image.

IV. CONCLUSION

In this paper, we have proposed a very simple and small but a very efficient, K-means and Gabor wavelet based edge detection algorithm which infuse the concepts of artificial intelligence and digital image processing. Displayed results have shown the accuracy of the edge detection using the K-means and Gabor wavelet based algorithm over the other method.

Finally, the disadvantages of these techniques depend mainly on k-means results, where if the clustering procedure is not implemented correctly, the results are incorrect by the other techniques we used. However, in this paper we have solved the problem of undesirable over segmentation results produced by the Gabor wavelet algorithm.

The future plans include additional improvement of the robustness of the method and development of the realtime facial expression system.

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DESIGN OF IONOFREE MICRO STRIP QUAD HELIX ANTENNA FOR GPS

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Abstract: *The quad filler helix antenna will furnish circular polarization. If thoughtfulness of micro strip technology the area postulated to place antenna is scaled down and it often furnishes the wide range of radiation and more bandwidth. The concept is enforced GPS receivers for L1/L2 applications. This will scale down ionosphere delays or refractions. L1/L2 designates it maneuvers at two frequencies to concurrently know the time and place of the particular object. One of the major problems with conventional quad filler helix antenna is hard to operate at multi frequencies. Several technologies have been depicted that would have some limitations and advantages with respective time and performance.*

Keywords: Micro strip Quad helix antenna, GPS, Ionosphere refraction.

I INTRODUCTION

Helix antenna is a basic type of radiator and perhaps it is the merest antenna to provide circularly polarized waves or nearly so which are used in extraterrestrial communications in which satellite relays etc. are involved. Helical antenna is broadband VHF and UHF antenna to provide circular polarization characteristics.

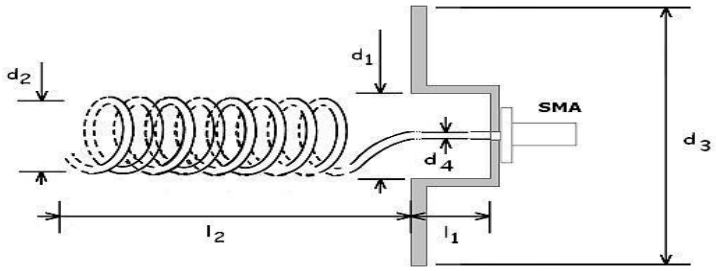

Fig 1.0 Helical antennas

Coaxial line is coincident with the helix axis and the feed wire lies in the plane through helix axis. A helical antenna may radiate in many modes, but prominent modes of radiations are two i.e. normal and axial mode of radiation. It permits you to record or create

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locations from places on the earth and help you navigate to and from those places. The main deviation between micro strip antenna and helix antenna is its more sensitive in the direction along axis whereas helical is sensitive along the axis. By placing 4 helical antennas and design a single antenna is called "Quard filler Helix antenna". Here helical wire as a radiator and fabrication of monopolies which furnishes high performance. It is used for wireless communications [2]. If thoughtfulness of antenna is bent, then the wavelength is decreased. QHF also applicable for half duplex communication because it furnishes positive gain. It lies of 4 antennas conducting and these are offered primary resonant frequency. The first two antennas out of four which furnishes primary resonant frequency and remaining two provide secondary resonant frequency.

QHF maneuvers in different modes of axial, normal or a combination of both. To attain axial mode, the axial length of each antenna is quietly larger than the wavelength in which antenna is to operate and it furnishes a high gain radiation pattern so it says it is high direction. If it is operating in the normal mode helix is fed at the top and arms are of resonant length of 1/4 λ, 1/2 λ. To attain pattern of satellite communication it furnishes quasi-hemispherical radiation pattern. In QHF by honoring above modes of operation, it is limited by power transfer thoughtfulness. This total concept will depend on the voltage standing wave ratio.

The QHA is mere and solution ate to the problem of non geosynchronous satellite research and it is very mere to design particularly for GPS applications. Its provide good horizon overhead direction. Mainly QHA lies of 4 helical antennas which have equal amplitude and phase of 0, 90,180,270 degrees. Over a long reign, these antennas transmit and receives circularly polarized waves. The shape depends on pitch angle, diameter, and shape. These 4 antennas have a separate and different types of phase feeding systems. Phase quadrature that generates separate feeding network. Another alternative approach is a balance approach system with separate 90 degrees pattern. It permits low microwave bands which are L bands and X-bands. One to one type of helix antenna major deviation is back lobe radiation.

The antenna is exciting from the feeding point of ground plane. Below figure lies of patch antenna which is more preferable for GPS applications. It first starts with the ground plane, above ground plane owning a dielectric substrate on the below surface. By thoughtfulness of width and length rations the micro strip antenna or patch antenna is located. That is shown in dark in the figure. Below the micro strip antenna owning a measure of thickness. The directivity of patch antenna is approximately 5-7 dB. The fields are linearly polarized in a horizontal manner. Half wave long patch maneuvers in fundamental mode. By thoughtfulness of electric field is 0 in the center of patch antenna and maximum at one side of the patch and the minimum at the other ended of patch antenna. The phase of the RF signal will vary from taking the minima and maxima thoughtfulness with respect to micro strip antenna. It is often applied theory of TM10 mode.

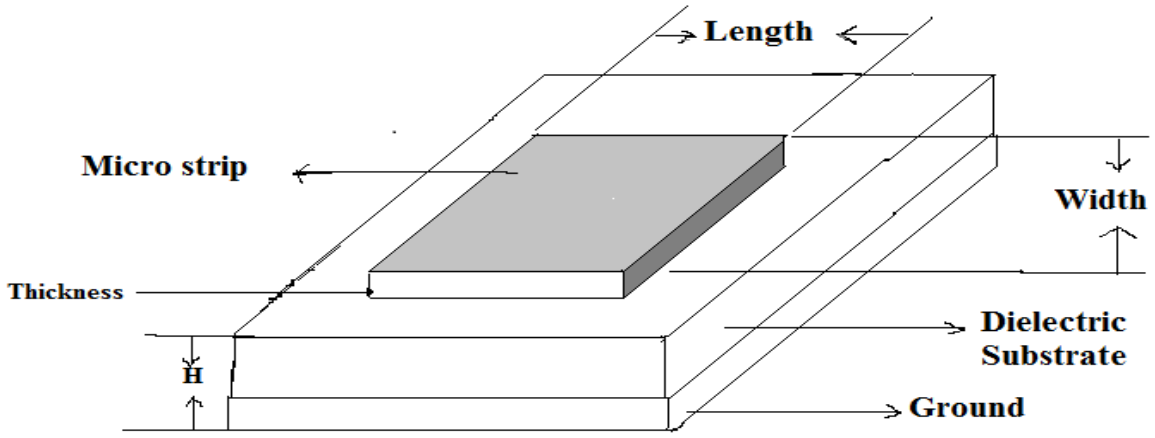

Fig 2.0 Patch antenna

Placing the micro strip or patch on a dielectric substrate above the ground plane. A good antenna furnishes better efficiency, large bandwidth and better radiation, which it is desirable by a thick dielectric substrate with a low dielectric constant. The micro strip antennas used in 10-30 GHz (microwave frequency). Because the size of micro strip antenna is directly tied with wavelength. This antenna generally used at microwave frequencies, these are also called patch antenna. It lies of a metallic patch with relative permittivity and permeability. The advantage is low profile, substrate is thin. If this is like, thin it is flexible to bent conform to bend it a curved surface. An important advantage of this antenna uses 4 helical antennas using the top and ridding of the disadvantage of bottom-fed antenna. Micro strip antenna length $L = \lambda/2\sqrt{\mathcal{E}r}$

Frequency of micro strip antenna $= c/2L\sqrt{\mathcal{E}r} = 1/2L\sqrt{\mathcal{E}r\,\mathcal{E}o\,\mu o}$. (1)

The microwave antenna furnishes narrow band and wide beam. A thicker substrate will increase the radiation power and the scale down conductor loss and improve bandwidth. The shape of micro strip antenna such as rectangular, square, triangular and circulated.

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	without cross dipole	cross dipole as director	cross dipole as reflector
R	11	11	11
Laz	52	52	52
P	138	138	138
L	-	50	70
H	-	15	15
85 degrees	0.14	-2.40	1.14
0 degrees	3.18	5.65	0.14

Table1 conventional QHA without cross dipole

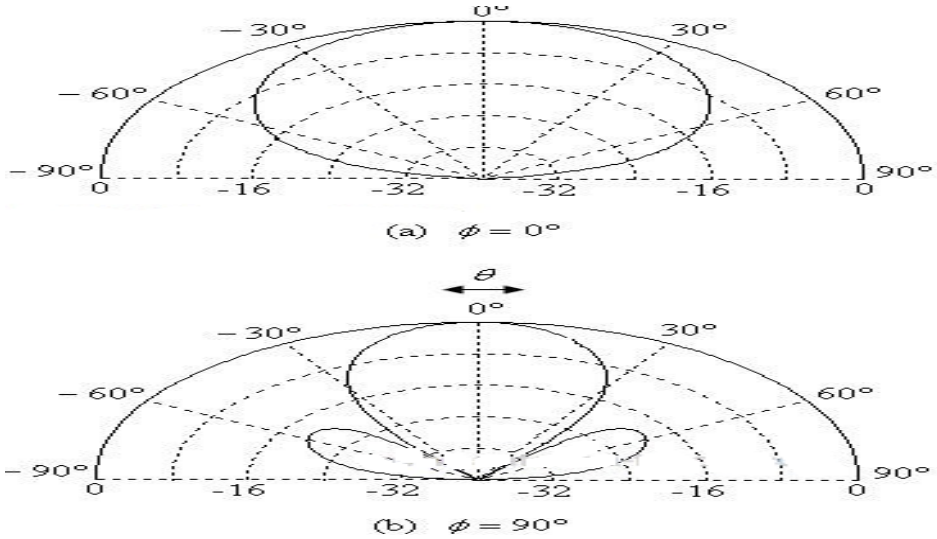

Fig 3.0 Micro strip Patch antenna

$$E\theta = \sin(kw\sin\theta\sin\phi/2)/kw\sin\theta\sin\phi/2\ \cos(kL/2\sin\theta\cos\phi)\cos\phi \quad (2)$$

$$E\phi = \sin(kw\sin\theta\sin\phi/2)/kw\sin\theta\sin\phi/2\ \cos(kL/2\sin\theta\cos\phi)\cos\phi\sin\phi \quad (3)$$

The wave frequency is refracted by ionized layer should depend upon the angle where the wave enters due to deviation in density.QHA utilizes a resonant structure. The first resonance occurs when a filer length is near a quarter wavelength at the center of the cylindrical structure length of helical and radius lengths are common. While calculating bandwidth of the antenna diameter plays a major role. QHA series is a omnidirectional and these are rugged all weather model, uses alloying. The compact size of omni permits transmitting, receiving, monitoring, handling, shipping. Without the requisite of multiple frequencies QHA furnishes communication between ground to air applications. According to technology of antenna theory by using circular polarization which minimizes the outcome of multipath interference. These commercial grade antenna plays a great performance as compared to other products. If thoughtfulness of patch antenna and helical antenna both will not be the same, application wise it is somewhat different. Small deviations between helical and the patch is in terms of aperture.

II Design Procedure

In GPS system the Electromagnetic waves are travelling in the ionosphere layer. When the signals are travelling in this that will pretend by the radiation of solar means the free electrons which is produced by X-rays and UV rays recombined with Electromagnetic signals [5]. Then the velocity of EM waves scale down due to the reduction of electron density. The delay will increase due to the signal refraction in ionosphere layer [4]. For GPS application, we cannot conclude that whether the patch antenna is better or helical is better? According to a survey of this project no one is better between two. But sincerely can say helix is better for GPS applications. Alternative can conclude is micro strip antenna or patch antenna. GPS owning a high gain towards the sky and gradually decrease towards the horizon. This is the best advantage if by taking thoughtfulness with unidirectional. The reason patch is more advantage than helical means it furnishes maximum gain towards the sky such that it is also very suits for GPS application. By thoughtfulness of isolation scenario, it is the coupling between two antennas. GPS is placed as long as placed by other antennas. Multipath occurs when the wave is emitted by the transmitter of a different line of sight path. This is called as signal fading. As shown in below figure when

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the signal is travelling towards the upper signal and lower signal by moving the signal isotropic delay is calculated using isotropic refraction. Finally by taking the above assumptions the delay will be calculated.

To Resolve

Now let us consider L1/L2 technique with two bands of frequencies. By thoughtfulness of first band

$D_{L1} = f_{L1}^2/f_{L1}^2-f_{L2}^2 (P_{L1}-P_{L2})$ (4)

Let's move to second band

$D_{L2} = f_{L2}^2/f_{L2}^2-f_{L1}^2 (P_{L2}-P_{L1})$ (5)

From these equations by calculating the phase by subtracting those two equations can observe or attain better accuracy and position of any object.

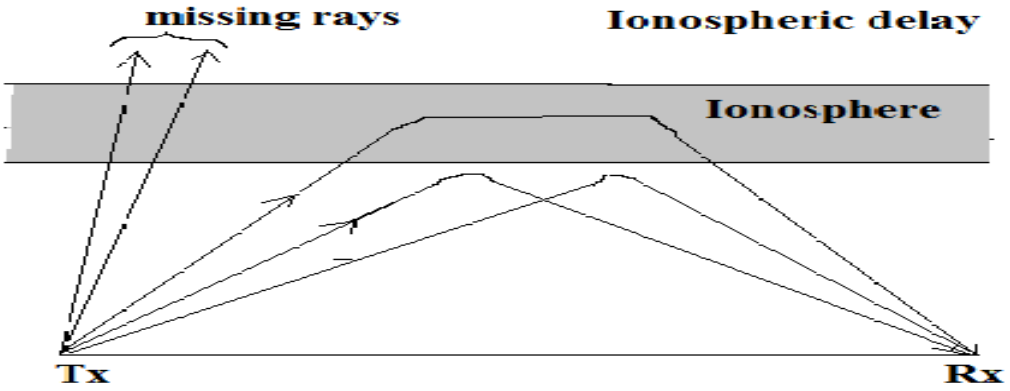

Fig 4.0 Ionosphere Refraction

In fig 3.0 by honoring the ionosphere delay are decreasing with thoughtfulness of upper and lower layers. From transmitting side the refracted rays are called missing rays. QFH furnishes circular polarization and reception completely which we need polar orbiting satellites and a 2m antenna will receive horizontal vertical and clockwise from all directions. The usual cross dipoles provide for satellite furnishes circular polarization. Quadrature of circular polarization is only for theoretical applications, but not in practice the QHA was in normal configuration operating in space mode. The Two current distributions are identical except in terrestrial mode. In fig 5.0 by honoring the current distribution process of a helical antenna owning with two types of modes, one is space mode and another one is terrestrial mode. Straight line represents the terrestrial mode and dotted line points to the space mode. In between these two modes owning a geometry QHA. In space mode the top and bottom sections it furnishes 90 degrees of circular polarization. In terrestrial 8 overlap helix sections will be formed in the current distribution process. This furnishes 180 degrees of circular polarization. The final upshot will become by subtracting the polarizations of space and terrestrial by canceling the radiation pattern upshot will provide 90 degrees.

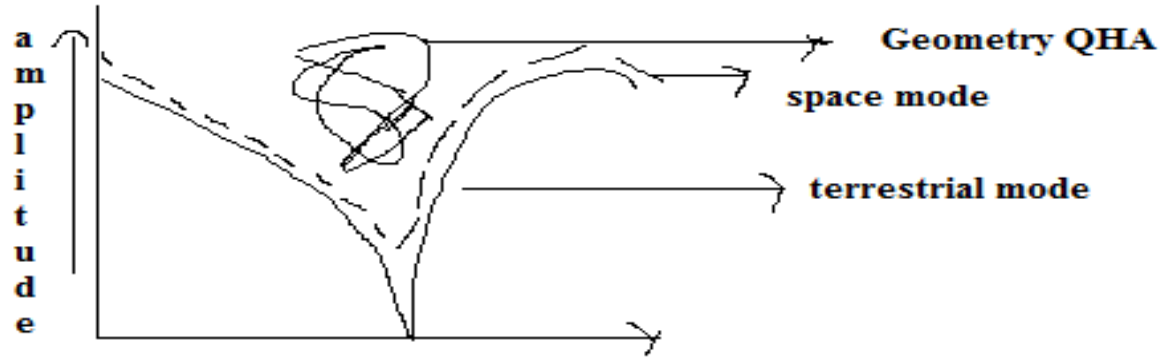

Fig 5.0 current distributions

III ANALYSIS AND UPSHOTS

The analysis of Propagation delay is proportional to the frequency of f1 of first band and f2 of the second band. Analyze the upshot of reducing the ionospheric delay of using two frequency bands as shown in fig 3.0.

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R	11.02
Laz	49
P	120
L	63.99
H	19.43

Table 2 Final Upshot

Four helical lines are manufactured with iron wires and coiled on the cardboard. The crossed dipoles and reflectors used for satellite reception to only provide circular polarization directly upwards when the strength is high. Upshot show that in QHA reducing the size of the antenna which causes input impedance is going to be decreases. Mutual coupling between helix is increasing. By decreasing input impedance radiation efficiency decreases. In order to increase the input impedance proposed folded inverted-F antenna. By splitting the patch into equal parts to exciting the circular polarization. And vary one of the phase angle by 180 degrees.

IV Conclusion

By thoughtfulness of micro strip technology the area postulated to place antenna has scaled down and it often furnishes the wide range of radiation and more bandwidth. The concept is enforced for GPS receivers for L1/L2 applications. This scale down ionosphere delays. L1/L2 designates its maneuvers on two frequencies to concurrently know the time and place of a particular object. Overcome the problem with conventional quad filler helix antenna is hard to operate at multifrequencies. Proved with it several technologies have been depicted that would have some limitations and advantages with respective time and performance.

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AN ORDERED FUZZY RULE INDUCTION BASED CHURN MINING FOR TELECOM INDUSTRY

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Abstract: *Distributed Strategies using outlier mining can result in vast time savings and communication cost while predicting churns in large data sets. However, rule based on the data mining procedure is not obtained with good solutions. Classification Rules based on time series using polynomial modeling was proposed to reduce the churn. But comprehensibility rule set was not addressed while predicting the churns (i.e., faults). In this paper, we propose an Ordered Fuzzy Rule Induction based Churn Mining (OFRI-CM) model to perform the rule mining operation on the clustered churn. The OFRI-CM model develops a system based on the rule that mine the churn from higher order to lower ones. A Fuzzy Data Mining model is first constructed to attain better solution using soft boundaries that perform aggregation operators for combining fuzzy rules, aiming at reducing the true positive rate of churn being detected. Then, we propose a divide and conquer strategy, based on the new sub group pattern of churns (i.e., multiple churns). The final best churns are predicted using divide and conquer strategy that recursively breakdown the churns into two or more churns and are finally aggregated to perform high region of search space with minimal processing time. This process is repeated until a churn mining criterion with comprehensibility rule set is generated. Finally, we present Churn Mining-based Greedy algorithm to improve the accuracy of comprehensibility rule set being generated. Experiments are conducted on Ericson GSM and Nokia Siemens GSM systems and the results show that the Churn Mining-based Greedy algorithm is efficient and that its average processing time of rules scales quite well for an increasing number of subscribers.*

Keywords*:* Classification Rules, Churn Mining, Fuzzy Data Mining model, Divide and Conquer strategy

I. INTRODUCTION

With the rapid increase in the competitive business environment, one of the most important in all Telecom Industries is customer churn. Distributed Strategies for Mining Outliers in Large Datasets (DSMO-LS) [1] was designed to mine outliers. But, rule based on the data mining was not considered that provide good solutions. Mining Comprehensible Classification Rules for Time Series (MCCR-TS) [2] designed efficient classification rule used polynomial modeling to obtain good solutions, but comprehensibility rule set was not considered.

A partial churn detection model was designed in [3] with the motive of improving churn detection rate using classification technique. However, the technique applied was restricted to a specific segment without addressing online market. Another method to detect

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churn rates on financial company was designed in [4] using customer lifetime value based on classification technique. However, the churn prediction was made on the basis of the threshold value, with which the increase in the threshold value, may provide with irrelevant churn factors.

The data mining techniques was applied without fixing any constant value in for obtaining the churn factors in [5]. However, social factors were not considered while measuring the churn factors. Customer churn decisions based on the social factors [6] was designed with the motive of improving the customer retention rate using Hazard rate models, but compromised scalability. Scalability issues were addressed in [7] using flat and hierarchical gossip model. Though scalability was addressed, accuracy was compromised. Two data mining algorithms called, logistic regression and decision was designed to improve the rate of accuracy for credit card companies in [8]. Churn detection using association rule mining has received great attention with the increased attrition rate. Fast Distributed Mining was applied in [9] to measure the churn rate (i.e., multi party) with the objective of reducing computation cost. Various ensemble learning techniques was applied in [10] to learn the churn rates in all industries. Six Sigma Methodology [11] were used to determine the churn rate with the help of Bayesian model to improve the probability of gain being detected.

One of the most debated researches received in the industry for more than ten years is the churn detection model. Prediction model based on the design of data mining techniques was applied in [12] to improve the prediction rate of churn being detected using SVM and Decision tree. However, scalability issues were not addressed. With the increase in the customer, prediction rate also increases. To address this issue, decision support system using data mining was designed in [13] with the objective of improving the scalability factor.

Another method for determining churn factor in telecom industry was designed using decision tree and logistic regression [14] to address scalability and accuracy. However, the model was restricted to cellular industries. A churn prediction model using probability data mining algorithm [15] was designed for financial service sector. Index churn customers that included financial, insurance and telecommunication sector was designed in [16] using classification methods with the objective of improving the accuracy of index churn being detected. A unifying model for determining churn factors [17] was designed to improve the accuracy rate using the poisson distribution model. However, churn detection for online tools was not addressed. Churns related to E-commerce industry [18] was addressed using multiple instance learning. Characterization and prediction related to churn was addressed in [19] using question and answer model, aimed at improving the churn detection rate. Clustering mechanism was applied in [20] to improve the outlier detection using graph clustering.

In this work, an Ordered Fuzzy Rule Induction based Churn Mining (OFRI-CM) model is presented to perform the rule mining operation on the clustered churn, based on the concept of Fuzzy Data Mining model. The contributions are summarized as follows:

(i) The Fuzzy Data Mining model is presented to improve the true positive rate by identifying the key factors based on the soft boundaries and rule set.

(ii) The proposed model exhibits accuracy by applying Divide and Conquer strategy by extensively dividing the problem instance and effectively conquering the sub group patterns using recursive search.

(iii) Other than finding sub group patterns using Divide and Conquer strategy, the proposed OFRI-CM model also aggregates the churns until a churn mining criterion with comprehensibility rule set is generated using the Churn Mining-based Greedy algorithm.

(iv) Experiments also confirm the efficiency of the model in terms of true positive rate, accuracy and processing time compared to the state-of-the-art methods.

II. ORDERED FUZZY RULE INDUCTION BASED CHURN MINING (OFRI-CM) MODEL

One of the most important terms used in the Information and Communication Technology (ICT) is "customer churn". The customer churn in ICT refers to those subscribers or customers who leave for a new competitor. Predicting this behavior on the clustered churn is very significant for Telecom Industry. In this section, an Ordered Fuzzy Rule Induction based Churn Mining model is described.

The proposed Ordered Fuzzy Rule Induction based Churn Mining model includes three parts, (1) Identifying soft boundaries and discovering rule set using Fuzzy Data Mining model, (2) Dividing the rule set and Conquering the sub group patterns using Divide and Conquer strategy and (3) Churn Mining-based Greedy algorithm to obtain the final solution using rule mining operation on the clustered churn.

The proposed model is divided into three sections namely (i) Fuzzy Data Mining model (ii) Divide and Conquer Strategy and (iii) Churn Mining-based Greedy algorithm. The elaborate description for churn mining is explained in the forthcoming sections.

a. Fuzzy Data Mining model

One of the major obstacles in the Telecom Industry is customer churn. Research focused on Telecom Industry shows that retaining an existing customer is more difficult than obtaining a new customer. Customer retention in Telecom Industry can be measured by understanding the reasons for churn. In this work, an Ordered Fuzzy Rule Induction based Churn Mining (OFRI-CM) model uses Fuzzy Data Mining model to assist Telecom Industry in achieving the effective churn management, that extensively obtains elation analysis to selects the key factors for churn management processes.

The Fuzzy Data Mining model identifies the churn rate key factors for various customers. The Fuzzy Data Mining model obtains soft boundaries based on fuzzy correlation coefficient. Based on the soft boundaries, the rule set is discovered using the correlation coefficient and the proposed data mining rule set are obtained. This, results in reducing the true positive rate of the churns being detected.

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OFRI-CM model concentrates on designing an efficient customer retention mechanism to assist the Telecom Industries for effective churn reduction rate using Fuzzy Data Mining model. The Fuzzy Data Mining model measures the responses obtained from several group of customers by identifying the key factors and therefore improving customer retention rate.

Let us consider that two fuzzy sets (i.e., two different customers) '$X, Y \in FS$', where 'FS' represents the fuzzy space, then, the two fuzzy sets X and Y are defined with membership functions, 'μ_X, μ_Y' Then the fuzzy sets X and Y is given as follows

$$X = (u, \mu_X(u) | u \in U) \quad (1)$$

$$Y = (u, \mu_Y(u) | u \in U) \quad (2)$$

$$where\ \mu_X, \mu_Y \rightarrow (0,1)$$

In order to obtain better solution, soft boundaries are used to perform the aggregation operators for combining the fuzzy rules. The soft boundaries are evaluated using the correlation coefficient between the fuzzy sets X and Y and is given as below

$$SB_{X,Y} = \frac{(\mu_X - \mu_{X'})(\mu_Y - \mu_{Y'})}{SD_X * SD_Y} \quad (3)$$

$$where\ \mu'_X = \sum_{j=1}^{m} \mu_X(u_j), SD_X - Standard\ Deviation\ of\ sample\ X$$

$$where\ \mu'_Y = \sum_{j=1}^{m} \mu_Y(u_j), SD_Y - Standard\ Deviation\ of\ sample\ Y$$

The OFRI-CM model using Fuzzy Data Mining model supports to develop a system with the data mining rule set to mine the churn from higher order to lower order gradually. The combined soft boundaries from (3) help in discovering the new sub group pattern of churn using this proposed data mining rule set (RS_i) as given below

$$RS_1 = if\ SB_{X,Y} \sim 0, then\ fuzzy\ set\ (X,Y)\ are\ high\ churners$$

$$RS_2 = if\ SB_{X,Y} \approx 0, then\ fuzzy\ set\ (X,Y)\ are\ barely\ churners$$

$$RS_3 = if\ SB_{X,Y} > 0, then\ fuzzy\ set\ (X,Y)\ are\ churners$$

$$RS_4 = if\ SB_{X,Y} < 0, then\ fuzzy\ set\ (X,Y)\ are\ non-churners$$

$$RS_5 = if\ SB_{X,Y} = 0, then\ fuzzy\ set\ (X,Y)\ are\ neutral$$

Based on the above rule sets, new subgroup pattern of churn are identified, minimizing the true positive rate of churn being detected. Once the new subgroup pattern of churns is obtained, final best churns are measured using the Divide and Conquer strategy that is discussed in the forthcoming sections.

b. Divide and Conquer strategy

The design of churn mining model should be in such a way that both comprehensibility and accuracy be ensured, developing a more effective retention strategy. So, comprehensibility of the churn mining is one of the important requirements in churn based learning process. In this work, a Divide and Conquer strategy is designed based on the new sub group pattern of churns (i.e., multiple churns). This process is repeated until a churn mining criterion with comprehensibility rule set is generated.

To start with, the rule sets obtained from Fuzzy Data Mining model is divided into sub group patterns. Next, the possible sub group patterns are extracted in a recursive manner, aimed to maximizing the accuracy of the possible sub group patterns being generated. Finally, in order to obtain the final solution (i.e., churn rates), the sub group patterns are aggregated using the Churn Mining-based Greedy algorithm, aimed at minimizing the processing time of churns being detected.

The purpose of Divide and Conquer strategy is to select an attribute (i.e., membership functions) for different rule sets (RS_i) to place at the root node and "divides" the entire structure of the tree by making branches for each possible value of the attribute (i.e., membership functions). The final best churns using Divide and Conquer strategy that recursively breakdown the churns into two or more churns and are finally aggregated to perform high region search space with minimal processing time to be used for mining fuzzy rules.

First, a set of decision rules is built by applying the proposed data mining rule set on the training set. Each data mining rule set contains a number of correlation factors (i.e., high churners, barely churners, churners, non-churners). Let us denote the set of soft boundaries 'SB' where 'SB' = '$SB_1, SB_2, SB_3, \ldots, SB_m$' and a number '$u$'.

The Divide and Conquer strategy in the proposed OFRI-CM model recursively breakdown the churns involves three steps namely Divide problem instance (i.e., rule sets) into sub group patterns of churns as given below,

$$u = SB\left[\frac{m}{2}\right] \quad (4)$$

Conquer the sub group patterns of churns by solving recursively as given below

$$(i) if\ u < SB\left[\frac{m}{2}\right], then\ perform\ recursive\ search$$

$$Recursive\ Search = SB\left[1, \ldots \left[\frac{m}{2}\right] - 1\right] \quad (5)$$

$$(ii) if\ u > SB\left[\frac{m}{2}\right], then\ perform\ recursive\ search$$

$$Recursive\ Search = SB\left[\left[\frac{m}{2}\right] + 1, \ldots, m\right] \quad (6)$$

Finally, the sub group patterns are aggregated to obtain final solution (i.e., churns). The aggregation of sub group patterns in OFRI-CM model is performed using the Churn Mining-based Greedy algorithm which is elaborated in detail in the forthcoming section.

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c. Churn Mining-based Greedy algorithm

The aggregation of sub group patterns in OFRI-CM model is done with the help of Churn Mining-based Greedy algorithm. According to the above description, the proposed Churn Mining-based Greedy algorithm for performing Fuzzy Rule Induction based Churn Mining based on the Divide and Conquer strategy is described next.

INPUT: Training Dataset D, Customer size $Cust_i$, fuzzy sets X and Y, Membership Functions, μ_X, μ_Y, Rule Set RS_i, Number 'u'.
OUTPUT: Finally best churns are mined
Step 1: **Begin**
//Fuzzy Data Mining model
Step 2: Obtain the initial population (i.e., customer size) and membership functions μ_X, μ_Y for each customer
Step 3: Evaluate fuzzy sets X and Y from (1) and (2)
Step 4: Calculate correlation coefficient between the fuzzy sets X and Y using (3)
Step 5: Generate data mining rule set RS_i
//Divide and Conquer strategy
Step 6: Divide data mining rule set RS_i into sub group patterns of churns using (4)
Step 7: Perform recursive search
Step 8: $if\ u < SB\ \left[\frac{m}{2}\right]$ then
Step 9: $Recursive\ Search = SB\ \left[1, \ldots \left[\frac{m}{2}\right] - 1\right]$
Step 10: else
Step 11: $Recursive\ Search = SB\ \left[\left[\frac{m}{2}\right] + 1, \ldots, m\right]$
Step 12: End if
//Greedy solution
Step 13: Repeat
Step 14: Given churn factors $CF = \{CF_1, CF_2, \ldots, CR_n\}$, there is an optimal factor CF_i
Step 15: Suppose $Churns \subseteq CF$
Step 16: $if\ CF_i \in Churns$, then
Step 17: Optimal churn factors arrived at
Step 18: end if
Step 19: $if\ CF_i \notin Churns$ then
Step 20: Let first churn in $Churns$ be CF_j
Step 21: Obtain new churn factor by removing CF_j and using CF_i instead
Step 22: end if
Step 23: Until (all churn factors for each customer are validated)

Algorithm 1 - Churn Mining-based Greedy algorithm

The above Churn Mining-based Greedy algorithm is divided into three sections. The first section applies fuzzy data mining model to evaluate the fuzzy sets and obtain the correlation coefficient between the fuzzy sets in order to generate and mine the possible churn factors. Then, divide and conquer strategy is applied to the mined churn factors that efficiently divides the data mining rule set into sub group patterns of churns and perform recursive search in an iterative manner. Finally, greedy solution is applied to the result sets to derive the optimal churn factors based on fuzzy data mining. This greedy solution starts by finding dynamic programming type solution by performing recursion through greedy choice. Finally, the recursive solution for churn mining is identified based on greedy choice.

III. EXPERIMENTAL RESULTS

To check the effectiveness of the proposed model, an Ordered Fuzzy Rule Induction based Churn Mining (OFRI-CM), the performance of Churn Mining-based Greedy algorithm is performed using the JAVA platform. This JAVA platform uses the code to perform the rule mining operation on the clustered churns in telecom industry. Experiments are conducted using the real-world datasets, Ericson GSM systems and Nokia Siemens GSM systems.

Ericson GSM systems provides services to deliver the highest return on partners' network assets, by providing optimal visibility, quality and availability throughout for the effective result. Nokia Siemens GSM systems provide the telecommunication information related to the Nokia Company. The services ensure the assets and track maximum customer services and identify the churns. Ordered Fuzzy Rule Induction based Churn Mining (OFRI-CM) model compares the work with the existing system such as Distributed Strategies for Mining Outliers in Large Datasets (DSMO-LS) [1] framework and Mining Comprehensible Classification Rules for Time Series (MCCR-TS) [2] . Experiment is conducted on factors such as true positive rate of churn being detected, processing time and accuracy of comprehensibility rule set being generated.

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IV. DISCUSSION

To validate the efficiency and theoretical advantages of the proposed Ordered Fuzzy Rule Induction based Churn Mining (OFRI-CM) model with Distributed Strategies for Mining Outliers in Large Datasets (DSMO-LS) [1] framework and Mining Comprehensible Classification Rules for Time Series (MCCR-TS) [2], experimental results using JAVA is presented. The parameters of the OFRI-CM model are chosen as provided in the experiment section.

Scenario 1: Impact of true positive rate

True positive rate using OFRI-CM model is the fraction of positive instances of churn being detected correctly.

$$TPR = \frac{Number_{PCCD}}{Number_{PCCD} + Number_{PCWD}} \quad (7)$$

Where $Number_{PCCD}$ refers to the number of positive churns correctly detected whereas $Number_{PCWD}$ refers to the number of positive churns wrongly detected as negative.

Table 1 Tabulation for true positive rate

No. of subscribers	True positive rate of churn being detected (%)		
	OFRI-CM	DSMO-LS	MCCR-TS
10	70	60	50
20	75	65	55
30	78	69	60
40	83	74	64
50	74	63	54
60	78	65	60
70	80	72	63

The efficiency of true positive rate in OFRI-CM model is obtained using the value from (7). Higher the true positive rate, more efficient the efficiency is said to be. It is measured in terms of percentage (%). To better understand the effectiveness of the OFRI-CM model, extensive experimental results are reported in table 2.

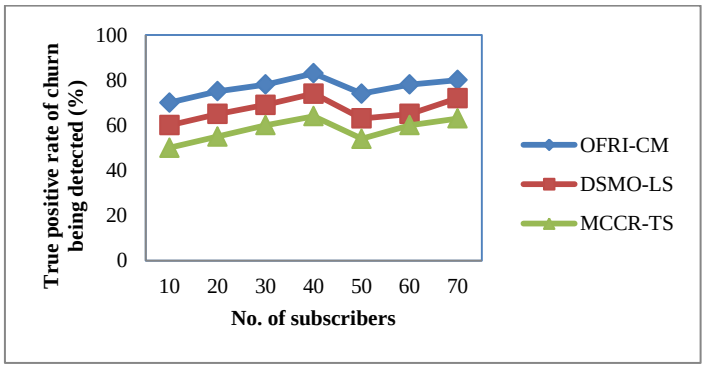

Figure 1 Measure of true positive rate

Figure 1 shows the true positive rate based on the number of subscribers in telecom industry considered for experimental purpose. The proposed OFRI-CM model performs relatively well when compared to two other methods DSMO-LS [1] and MCCR-TS [2]. The true positive rate efficiency is improved in the OFRI-CM model by the application of fuzzy data mining model. With the application of fuzzy data mining model, based on the soft boundaries, the result set are obtained. By using the result set during churn detection, whenever a subscriber enters into the network, the OFRI-CM model correctly analyzes the result set which helps in improving the true positive rate efficiency by 13 % compared to DSMO-LS. The result set based on the correlation coefficient between the fuzzy sets efficiently collects and detects the churn using the result set according to the data mining rule set which then helps in increasing the true positive rate efficiency by 24.5 % compared to MCCR-TS.

Scenario 2: Impact of processing time

Processing time using OFRI-CM model refers to the time taken to divide the rule sets into sub group of churns. The processing time is measured in terms of milliseconds (ms). Lower the milliseconds, more efficient the method is. The formulation for processing time is given as below

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$$Processing_{time} = Time\ ([RS_i] * No_{subscribers}) \quad (8)$$

Where RS_i refers to the rule sets generated and processing time is the time taken to generate the rule set.

Table 2 Tabulation for processing time

No. of subscribers	Processing time (ms)		
	OFRI-CM	DSMO-LS	MCCR-TS
10	120	150	180
20	176	192	202
30	220	235	245
40	235	243	253
50	255	264	274
60	269	279	286
70	292	302	322

The targeting results of processing time using OFRI-CM with two state-of-the-art methods [1], [2] in table 2 presented for comparison based on the number of subscribers in telecom industry.

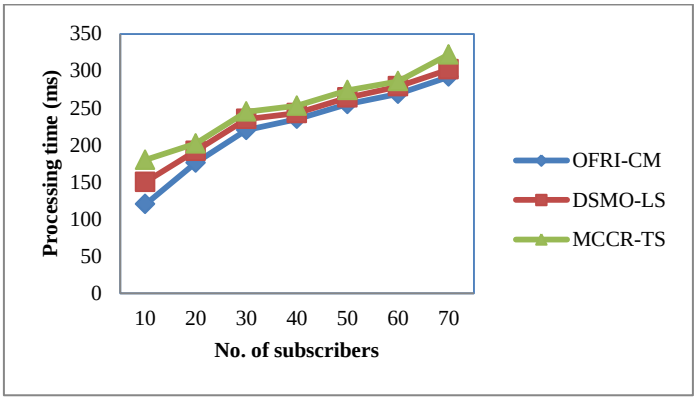

Figure 2 Measure of processing time

From figure 2, it is evident that the processing time is reduced using the proposed OFRI-CM model. The processing time are reduced by applying divide and conquer strategy in OFRI-CM model. The divide and conquer strategy on new sub group pattern of churns repeats a churn mining criterion with comprehensibility rule set is generated. By evaluating the rule set, the optimal churns (i.e., factors to remain the subscriber) are easily measured using OFRI-CM model and accordingly those churn factors are considered while designing a new product in telecom industry. This in turn reduces the processing time for obtaining the rule set using OFRI-CM model by 14.2 % compared to DSMO-LS [1] and 28 % compared to MCCR-TS [2] respectively.

Scenario 3: Impact of accuracy

Accuracy using the proposed OFRI-CM model measures the percentage of correctly detected churns over the total number of instances.

$$A = \frac{Number_{PCCD} + Number_{PCWD}}{Number_{PCCD} + Number_{PCNCD} + Number_{PCWD} + + Number_{PCNWD}} * 100 \quad (9)$$

Where $Number_{PCCD}$ refers to the number of positive churns correctly detected as positive whereas $Number_{PCWD}$ refers to the number of positive churns wrongly detected as negative, $Number_{PCNCD}$ refers to the number of positive churns not correctly detected as positive and $Number_{PCNWD}$ refers to the number of positive churns not wrongly detected as negative.

Table 3 Tabulation for accuracy

No. of subscribers	Accuracy (%)		
	OFRI-CM	DSMO-LS	MCCR-TS
10	58.31	52.13	47.23
20	63.25	58.22	52.17
30	69.22	64.19	60.14
40	66.45	61.42	57.37

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50	71.35	65.32	61.27
60	74.28	69.25	62.20
70	77.29	72.26	67.21

As listed in table 3, OFRI-CM model measures the amount of accuracy of comprehensibility rule set being generated which is measured in terms of percentage (%). The value of accuracy using OFRI-CM model offers comparable values than the state-of-the-art methods.

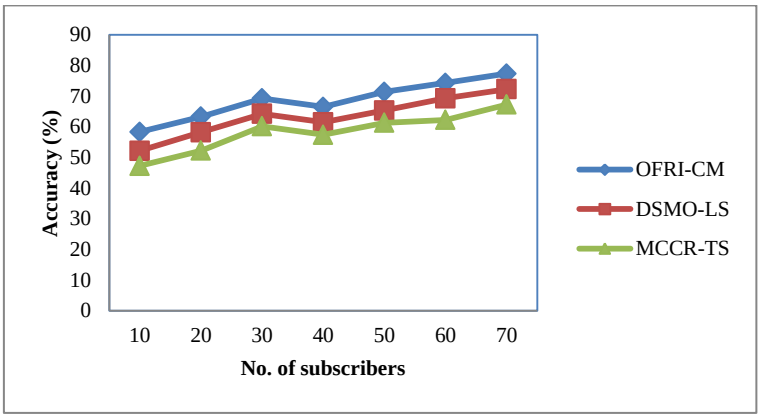

Figure 3 Measure of accuracy

Figure 3 presents the accuracy of OFRI-CM model over different number of subscriber in telecom industry. All the results provided in figure 3 confirm that the proposed OFRI-CM model significantly outperforms the other two methods, DSMO-LS [1] and MCCR-TS [2]. The accuracy is improved in the OFRI-CM model using the Churn Mining-based Greedy algorithm. With the application of Churn Mining-based Greedy algorithm, a greedy method is applied until the optimal factors (i.e., optimal churn factors) are obtained using the dynamic programming through recursive model. In addition, the recursive solution for churn mining is identified based on greedy choice. So, the accuracy obtained using OFRI-CM model is higher and efficient by 8.54% and 16.02% compared to DSMO-LS [1] and MCCR-TS [2] respectively.

V. CONCLUSION

In this paper, an Ordered Fuzzy Rule Induction based Churn Mining (OFRI-CM) model is provided based on the Fuzzy Data Mining model for churn detection in Telecom Industry. This model addresses a system based on the rule that mine the churn from higher order to lower ones. The model uses soft boundaries value in a dynamic manner for combining fuzzy rules which increases the efficiency of true positive rate for the churn rate being detected. The proposed fuzzy data mining model using fuzzy sets and membership functions perform the aggregation operators for combining the fuzzy rules improving the true positive rate. By applying the Divide and Conquer strategy in OFRI-CM model, improves the aggregation of sub group patterns being generated reducing the processing time for detecting churn rates. Finally, with the application of proposed Churn Mining-based Greedy algorithm using Greedy principle, achieves higher rate of accuracy with relatively lower processing time improving the efficiency of the system and the churn rates being detected. Different number of subscribers at different time period using OFRI-CM model carefully analyzes the possible churn factors to significantly reduce the attrition rate of customers. A series of experiments are performed to test the efficiency of true positive rate, accuracy and processing time to measure the effectiveness of OFRI-CM model. Experiments conducted on varied simulation runs shows improvement over the state-of-the-art methods.

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Fabrication and physical characterization of Zn (OH) 2/PVA and ZnO nanofibers using Electrospinning nanofiber generator

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Abstract: *Zinc oxide nanofibers were prepared using the polymer - Zinc acetate solution, by a modest programmable microcontroller aided electro spinning technique. The prepared and calcinated nanofibers were characterized using standard analytical methods. The hexagonal wurtzite structure for calcinated nanofibers of diameters ranging between 10-13 nm were inferred from structural analysis. The Field Emission Scanning Electron Microscope analysis showed that nanofibers sizes are varied from 100 to 500 nm for the prepared and calcinated samples. The optical absorption analysis evidently showed the presence of nanophase Zinc Oxide by means of a strong blue shift (372 nm) in the band edge absorption region. The functional group analysis showed the presence of organic bands related to Polyvinyl Alcohol for uncalcinated nanofiber. This article proposes that an indigenously manufactured electro spinning system can cover the active research area of preparing ceramic and composite nanofiber with various compositions and properties.*

Keywords: microcontroller, nanofibers, optical properties, thin films, X-ray diffraction

I. Introduction

Over the past few decades, several methods have been proposed by various researchers for the preparation of nanostructured materials. Enormous efforts have been devoted by their teams to optimize the growth process to achieve uniform and ultrathin one dimensional nanostructure [1, 2]. Vapor Liquid Solid (VLS) method, Chemical Vapor Deposition (CVD) method, Molecular Beam Epitaxial (MBE) method, and Template Assisted Wet Chemical Synthesis method have been widely employed in the production of nanostructures with limitations such as highly expensive, complicated procedures, [3-6]. Electro spinning is a simple, economical and versatile method for generating a rich variety of ultrathin fibrous materials that include polymers, composites, ceramics etc., [7]. The basic principle of electro spinning is non-mechanical, but electrostatically charging the surface of the ejected polymer droplet by a liquid jet through spinneret arrangement (using high voltage electrostatic field) Fig. 1. An electrical potential is applied between the polymer droplet or melt, held at the end of a capillary tube and grounded collector. When the droplet overcomes the surface tension

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by the charged jet of polymer solution ejected. The charged jet is controlled by an externally applied electric field. The jet exhibits bending instabilities caused by repulsive forces between the charged spiraling loops. As the loops increase in diameter, the jet grows longer and thinner fibers, until it solidifies on the collector [8].

Recently, automated equipment's are used in various manufacturing processes that are used in healthcare and industrial companies to develop accurate and high quality products with benefits such as reduced production cost, number of laborers, and minimum time [9-11]. Microcontroller based electro spinning generators are used in nanofiber generation, in order to produce uniform nanofibers with accurate and high aspect ratio. The variety of fibers with different lengths and diameters is electronically controlled by experimental parameters. The electro spinning process is conducted at room temperature under various atmospheric conditions. The nanofibers prepared by this method exhibit very high surface area and porosity. More than 100 types of polymers have been reported, namely, poly vinyl alcohol (PVA), poly acrylic acid (PAA), poly lactic acid (PLA); collagen and organic compounds such as nylon, polyester, peptide and cellulose are the precursors in nanofiber production [12-15].

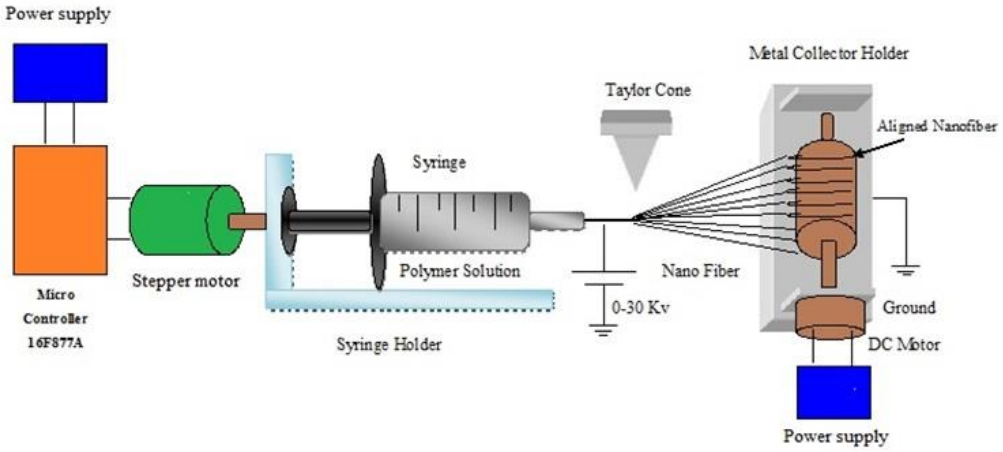

Fig. 1 Schematic diagram of electrospinning nanofiber generator.

Tremendous research works are under way for the development of one dimensional inorganic nanomaterial. Among the various inorganic systems such as III-V, IV, I-III-V and II-VI compound semiconductor, Zinc oxide (ZnO) is considered as one of the best multifunctional semiconductor systems with distinguished potentials that are suitable for electronic, optic, photonics and optoelectronic device oriented industries. It has also served as the best application in the fabrication of solar cells, sensors, varistors and piezoelectric devices. Various methods are available for the preparation of one dimensional ZnO nanostructures - hydrothermal synthesis, sol–gel method, chemical vapor deposition, bio-template assisted method… [16-20].

The combination of sol gel technique with electro spinning was first reported by Larsen et al in the production of nanofibers made from inorganic oxides and hybrid (organic/inorganic) materials with diameters ranging between micrometer and sub micrometer [21]. Yang et al reported that ZnO nanofibers have been prepared by electro spinning set up, using poly vinyl alcohol as the organic system and zinc acetate as the zinc precursor [22].

In the present study, a systematic investigation has been carried out to fabricate highly oriented uniform ZnO nanofibers after 480°C of calcination. The prepared nanofibers were characterized via standard analytical tools: X-ray diffraction (XRD) analysis, field emission scanning electron microscopic method (FESEM), ultra violet (UV) - visible absorption analysis and Fourier transform infrared (FT-IR) absorption spectroscopy methods. Electro spinning is an assured standard method for cost effective, less complicated procedure for the highly uniform fabrication of ZnO nanofibers.

II. Materials and Methods

Well aligned nanofibrous ZnO systems were prepared by microcontroller 16F877A assisted nanofiber generator using PVA dissolved in millipore water as the solvent and zinc acetate dehydrate as Zn precursor. In order to obtain uniformly distributed $Zn(OH)_2$ / PVA solution, 1.5g zinc acetate dehydrate and 3.0g PVA were added to the 40 ml of millipore water and continuously stirred for 6 hours. The prepared solution was preserved in an air tight container for a 3 hour ageing period, and further used for the generation of $Zn(OH)_2$ /PVA nanofibers. The electro spun nanofibers were calcinated at 480°C and as a result, well aligned nano ZnO fibers were derived.

The microcontroller based electrospinning nanofiber generator consists of three major units: high voltage variable power supply- 0 to 30 kV, syringe/spinneret-solution feeding unit, and a grounded collector unit. Microcontroller unit energized by a 12 V power supply was used to control the mechanical force that maintained forward and reverse movements of syringe tab via stepper driver and stepper motor. The key component of this circuit is Microcontroller 16F877A, to generate pulse width modulation (PWM), where the PWM is an inbuilt circuit. The frequency of the PWM was adjusted using variable potentiometer, and connected across pin numbers 1, 2, and 10 of the microcontroller. High voltage variable power supply was energized by Alternating Current (AC) main through transformer and its 24 V secondary voltage was rectified by full-wave bridge rectifier followed by a filtering process through

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three 1000μf electrolytic capacitors which produced ripple free DC output 24 V. The ripple free 24 V was fed to fly-back transformer which was useful in generating high output voltages (0 - 50 kV), alternatively low currents. Syringe pumps, also known as spinnerets, are small pumps precisely operated via "C" language programmed microcontroller 16F877A, automated Direct Current (DC) motors that produce controlled mechanical force or torque to accurately move the syringe tap in forward and reverse direction. Grounded collector system which consists of a rotatable flat plate collector (0-3000 rpm) is made up of aluminum or stainless steel rectangular plates. A high voltage negative potential is connected to this grounded collector terminal. During nanofiber generation, the collector must be grounded or maintained at high negative potential; a positive potential is connected to the tip of the syringe or spinneret.
The final products - Zn (OH) 2/PVA nanofibers and 480 °C calcinated ZnO branched nanofibers were examined for their structural and phase identification using X-ray diffraction analysis. To this, Rigaku-Dmax 2500 diffractometer was used and it was operated with voltage and current settings of 40 kV and 200 mA respectively, and Cu-Kα radiation (1.5405 Å) was used. Qualitative study was performed by recording XRD diagrams in an interval of $20° \leq 2\theta \leq 90°$ at the rate of scanning 2°/min. The Zn(OH)2/PVA nanofiber and 480 °C calcinated ZnO branched nanofiber samples were subjected to morphological characterization, using field emission scanning electron microscope (FEI – QUANTA – FEG 250), with accelerating voltage, ranging from 200 V to 30 kV, magnification 20X to 106 X, resolution 1 nm. The optical absorption characteristics of $Zn(OH)_2$/PVA nanofiber and 480°C annealed ZnO branched nanofiber for the UV Visible region ranging from 400 to 1100 nm were performed by UV – 1700 series spectrophotometer, with a slit width of 1nm by dispersing the solids in the ethanol medium, for a path length of 1 cm. The samples were investigated by Fourier transform infrared radiation using Schimadzu make FTIR 8400 S series spectrophotometer. For analysis, Zn(OH)2/PVA nanofiber and 480 °C calcinated ZnO branched nanofiber were directly exposed to the infrared radiation range 400 to 4000 cm-1 at a scan rate of 25 scans/min with 4 cm-1 resolution.

III. Results and Discussion

3.1 Structural Analysis

The preparation of different nanostructures use the following parameters which play a crucial role: reaction temperature, nature of precursor, dispersing agent, reactants concentration and addition rate. The structural properties of the prepared (Zn (OH)/PVA microfibers) and calcinated ZnO nanosystems were analyzed using XRD method. The XRD analysis clearly demonstrated the role of temperature on the formation of nano ZnO from Zn (OH)/PVA microfibers. The much broadened and less intense XRD peaks Fig. 2 (b) indicated the poor crystalline state of the product. The impact of temperature on the crystalline structure was confirmed by Fig. 2 (a), which exhibited less broadened and well separated sharp peaks as the signature of a good and highly oriented crystalline state. Various crystalline properties were calculated using standard formulae. The size of the crystallites was calculated using Debye Scherer formula. The particle size calculated from the study was found to be 18 nm. All peaks showed considerable broadening which was the cause of the nanophase formation with less internal stress.

The lattice strain and crystalline size was calculated from the following equation (1)

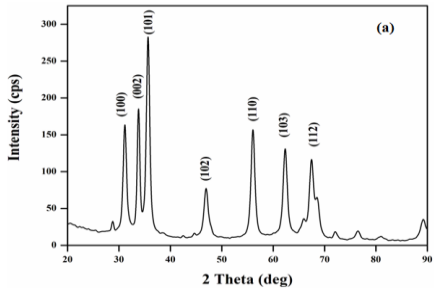

Fig. 2 (a) XRD analysis of annealed branched ZnO nanofibers.

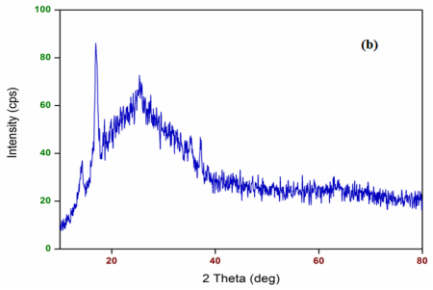

Fig. 2 (b) XRD analysis of unannealed Zn(OH)2/PVA nanofibers.

$$\frac{B Cos\theta}{\lambda} = \frac{1}{\varepsilon} + \frac{\eta Sin\theta}{\lambda} \qquad (1)$$

where B is the measured full-width at half maximum (FWHM), Θ is the Bragg peak angle of the peak in radians, $\boldsymbol{\lambda}$ is the wavelength of X-ray used for diffraction (1.59 Å), ε is the effective particle size in nm and η is the effective strain.
All the diffraction peaks were strongly adhered to the JCPDS card no.89-1397. The peaks at various scattering angles were identified at 31.07°, 33.74°, 35.53°, 46.88°, 55.93°, 62.31° and 67.53° and were of the reflection planes (100), (002), (101),(102), (110), (103), and (112) respectively. The crystal structure was identified by calculating the unit cell parameters a = b = 3.261 Å and c = 5.228 Å and was inferred as hexagonal wurtzite structure with space group (C6V=P63mc). The increase in the values of cell parameters were attributed to the local crystalline defects of the nanofiber. The results inferred from the XRD analysis strongly adhered to that of the electron microscopic data.

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3.2 Morphological Analysis

The morphological properties of Zn (OH)2/PVA nanofibers were analyzed using FESEM method Fig. 3(a). It is inferred that the prepared nanofibers were formed in clustered state and bundled form. The fibers also formed in branched structure, made up of small spheres or faceted particles. The diameters of the fibers were measured using a 5 millimeter scale; the number of fibers within the scale, was estimated using different values of average diameters. The inset picture represents the magnified image selected from Fig. 3 (a) and was measured using a 2 millimeter scale. It was noted that fibers were in branched structure and in free standing state. The sample annealed at 480 °C was also analyzed using FESEM method Fig. 3(b). The surface morphology of the annealed fibers was found in branched structure. It is presumed that the evenly distributed ions in PVA matrices were oxidized during calcination process. The inset picture clearly depicts the clustered state of ZnO particles adhering to each other, and thus forming the branched nanofibrous structure. The aggregation of nanoparticles has been discussed by various authors and theories. The following assumption is made for the aggregation of nanocrystals that lead to the formation of branched ZnO fibers. Reaction under controlled growth regime, at the initial stage of formation of ZnO nanofibers, an excess number of monomers were injected to the growth site to initiate growth process. In this state, the effect of diffusion was limited to large number of monomers, the diffusion process occurred only whenever there was free space in the growing crystal. Hence, the incorporation rate depended only on the number of available sites on the surface of the crystal, which resulted growth of single crystallite. More individual growth occurred and aggregated in further process.

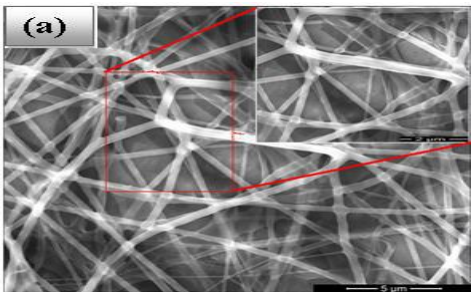

Fig. 3 (a) FESEM images of unannealed Zn (OH) 2/PVA nanofibers.

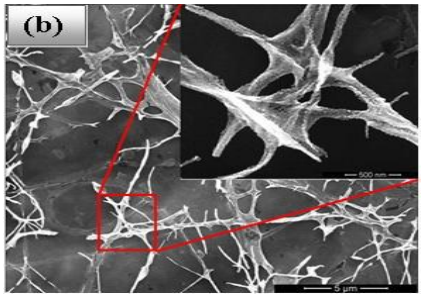

Fig. 3 (b) FESEM images of annealed branched ZnO nanofibers.

The branched structure was reasoned as follows, during growth, monomers were deposited onto the high energy facets of the arms, i.e. On their tips, whereas deposition of monomers onto the lateral facets of the arms was hindered. The main difference in the growth process resided in the nucleation event during the early stage of the growth. The octa twin model further explains the formation mechanism as follows: It describes the branched or tetrapod structure as composed of several domains that are exclusively in wurtzite structure, in which the core is composed of eight wurtzite domains. Such domains have two different types of tetrahedral shape: one type has the basal facet (0 0 0 1) of wurtzite structure and the second, top facet of (0 0 01_). Two different types of tetrahedral of are interconnected through a twin plane. This twin structure shows an inverted symmetry. As domains of the first are connected preferentially to domains of the second type and vice versa, the octahedron formed by eight of these domains, exposes an alternating pattern of (0 0 0 1) and (0 0 0 1_) facets. These facets exhibit hexagonally organized atoms, identical to ± (1 1 1) facets of cubic structure [23, 24]. The internal strain of the crystallites created broadening in the XRD pattern and obstructed the completion of cell volume of eight wurtzite domains. In the FESEM micrograph of the sample annealed at 480 °C, the inset picture depicts the agglomerated state of plague -like morphology, which originated from the less negative potential among crystallites that were contributed for the formation of branch- like morphology. The polymer matrices also act as the encapsulating agent for Zn (OH)2 molecules that hold the above said molecules from individual growth that resulted with agglomerated nano ZnO systems.

3.3 Infrared and Optical Analysis

The functional group analysis of the prepared Zn (OH) 2/PVA nanofiber and 480°C annealed ZnO branched nanofiber were characterized using FT-IR absorption analysis. From Fig. 4(a), it is seen that the unannealed Zn (OH)2/PVA nanofiber exhibited both the metal oxygen as well as the fundamental functional groups of poly vinyl alcohol polymer. The strong vibrational band observed between 2960 and 3730 cm-1, was attributed to the presence of coordinated water molecules in the sample. The altered medium stretched C-H vibrations were observed from 2280 to 2430 cm-1. The strong stretching vibrational bands belong to C=O and C-O and CH2. Wagging mode vibrational groups were observed at 1500 - 1770 cm-1 and 1360 -1470 cm-1 respectively. In addition, the out of plane bending vibrations of CH2 functional group was noted at 960 -1050 cm-1. The characteristic hydrated metal group vibrational bands were observed for the unannealed sample and they were attributed between 470 and 540 cm-1. From the study, it is inferred that the Zn(OH)2 molecules were strongly encapsulated by PVA polymer, and further presumed that the existence of various functional groups in the IR spectrum may also have originated from Zn precursor (in the present study it is zinc acetate dehydrate). The sample annealed at 480°C was analyzed for functional groups using FT-IR technique Fig. 4(b). The sample

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showed that formation of metal oxygen υ M-O bands appearing between 470 and 540 cm-1 were attributed to the presence of ZnO in the sample [25]. The additional strong stretching band arising between 3200 and 3600 cm-1 was attributed to the presence of superfluous (-OH) vibrations on the formed ZnO branched nanofiber.

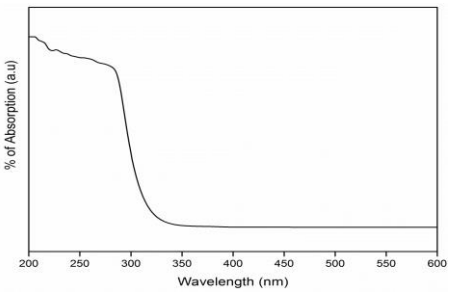

Fig. 4 (a) FT-IR absorption analysis of unannealed Zn (OH) 2/PVA nanofibers.

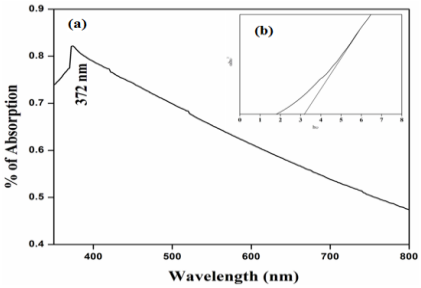

Fig. 4 (b) FT-IR absorption analysis of annealed branched ZnO nanofibers.

In order to investigate the quantum size effect in nanosized materials, optical studies provide excellent support., UV-visible absorption analysis Under optical studies is regarded as an useful tool for the investigation of semiconductor nanostructures that exhibit the quantum size effect caused by photo induced electron – hole pair formation. According to Calandra et al, the UV visible absorption spectrum of the semiconductor nanosystems is the function of their sizes and the absorption maximum decreases upon increasing size of nanoparticles. The unannealed Zn (OH)2/PVA nanofibers were also analyzed using UV visible absorption analysis and it showed an absorption edge at 272 nm Fig. 5 (a). The estimated band gap value is found to be 4.22 eV using the relation Eg = hc/λ eV, where h is the Planck's constant (4.135 ×10-15 eV), c is the velocity of light (3×108 m/s) and λ is the wavelength of absorption (277 nm). From Fig 4, it is observed that the absorption peak for 480°C annealed ZnO branched nanofiber was seen at 372 nm. The position of absorption edge was found decreased in wavelength and is applicable to the nanodimensional semiconductor systems. This absorption shift was the cause of quantum size effect which originated from the change in band gap along with excision features. It also resembled the particle size and size distribution state [26]. The energy gap of the material is calculated using Tauc plot method; the plot resembles the direct allowed transition process of the electron hole pair. The calculated energy gap value was found to be 3.33 eV, inset picture of Fig. 5 (b). On comparison with the bulk band of ZnO, the estimated value was found to be high and it further confirmed that the annealed ZnO nanofiber was in nanodimensional state.

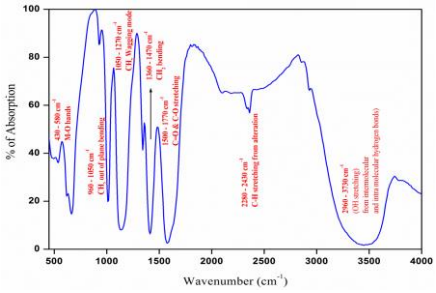

Fig. 5 (a) UV-Visible absorption analysis of unannealed Zn(OH)2/PVA nanofibers.

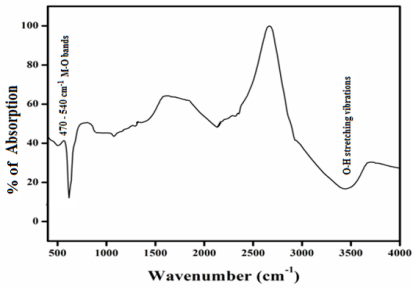

Fig. 5 (b) UV-Visible absorption analysis of annealed branched ZnO nanofibers.

4. Conclusion

The branched ZnO nanofibers were prepared by cost effective, simple, indigenously designed and constructed microcontroller based electro spinning set up. From the analytical techniques, the following conclusions were arrived at: The existence of hexagonal wurtzite structured phase, multiple faceted ZnO nanofibers with particle size 13 nm were inferred for calcinated systems and amorphous nature was inferred for unannealed sample. The electron microscopic analysis exhibited the free standing monodisperse nanofiber (Zn (OH) 2/PVA) with varying diameters ranging between 500 nm and 10 μm and the annealed method possess the branched ZnO nanodimension with clustered state. The optical absorption analysis clearly witnessed nanophase ZnO through strong blue shift band edge absorption at UV region and FT-IR analysis, the functional groups related with PVA and metal oxygen band were identified. This article proposes that the developed electrospinning system can cater to the potential research area of producing ceramic and composite nanofibers with various compositions and properties.

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Enhancing Performance and security for 'Data in Motion ' in BIG DATA

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Abstract: *As the big data systems increases its size from Terra bytes to Peta and Zeta bytes with its structured, semi-structured and unstructured characteristics; securing the data in its storage and motion is the highest priority in business now. As security is rather a novice topic in big data business, organization such as NIST is currently working on standardizing the architecture framework for Big Data Security. This paper discuss the need, challenges and solutions for the security and privacy of data in motion in a big data security framework. Standard network protocols like Kerberos, SSL, TLS and Big Data specific protocols such as Hadoop RPC and HDFS can be collaborated with secured motion of big data. This paper initiates a collaborated mechanism by using AES cryptographic algorithm with its variants to transfer the big data contents. This paper focus on AES cryptography scheme and how to tune this scheme for better performance for achieving great result in Big Data scenarios. Focusing on the efficiency and performance factors, a Five Steps structure is proposed here that can be adopted in big data systems such as Hadoop.*

Keywords: Hadoop; SAP HANA; Big Data; Data in Motion; Data at Rest; Cryptography ;Symmetric encryption; AES;AES-NI;Security Framework; Advanced Encryption Standard

I. INTRODUCTION

A. Big Data and Security-A Hadoop Approach

In distributed Big Data environment, processing of data happens upon availability of resources in a parallel processing heterogeneous environment. Data is sliced into fragments in different servers. Big Data system nodes communicate and execute its application programs across systems using communication protocols and remote calls on TCP/IP. Most cloud based Big Data implementations uses web based user interfaces and need access control at the schema level and most times granular level in heterogeneous and complex systems[13].

Mandated by industry requirements, different Big Data architecture brings unique security challenges. Distributed, scalable and redundant implementations such as Hadoop File System (HDFS) bring unique challenges because it is totally different from conventional systems such as RDBMS database systems [13]. In the past, due to its insecure nature, a malicious user could easily get into a Hadoop node and get access to its file system data hacking the block ID and thus deploying a secure Big Data system was almost impossible. Authentication, authorization, keeping privacy & Personally Identifiable Information (PII), file permission, application program security

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and security of data in transit were all weak in Big Data system implementations [5]. Application program code could randomly travel across network and can be submitted as a job in Big Data system [11].

B. Data Privacy

Major challenge in PII is managing user details, payment details, family data and many other private data. Various standards such as Payment Card Industry Standard(PCI DSS), Health Insurance Portability and Accountability Act (HIPAA) and government mandates to follow information security standards enforces to use security mechanism to protect the big data while it is at rest and at motion[13][14][15]. Big Data systems such as Hadoop are still maturing on its security architecture and credibility across organization to achieve the privacy of data. In order to comply with standards and organizational security policies, different security layers are required such as done using Kerberos, Apache Knox, and Apache Rhino in a Big Data lake [11]. Sensitive data within Big Data needs special kind of protection and should be secured both at rest and in motion [10].

C. Big Data Security Challenges and Limitations

Security challenges such as unauthorized access, unauthorized modification of data and denial of service are still a challenge to Big Data industry. Tasks such as Identifying sensitive information, determining the volume of data at risk, limiting the search facilities, securing the data during transmission, establishing security surveillance, governance mechanism and security scanning tools are very important in Big Data environment these days [1][13]. As of today the authorization model in Hadoop is fragmented and manual. Data by default is unprotected and there is a lack of central authentication and authorization component [2].

D. Security of Data in Motion (Data in Transit)

The term "Data in motion" is mostly used in association with privacy of data while it is transmitted from one place to another place. Sometimes this term is used in association with the term "Data in Use" where moving the data from storage to the system processor and volatile memory is also sometimes considered as moving data, especially in Big Data scenario where the processing and other computing resources are distributed.

Protecting data while it is moving is important in Big Data systems. The Data in motion is not limited to transfer of data and other information between system nodes, but also it includes the moving data among sensors and smart devices. The volume of Data in motion is increasing rapidly. For instance, statistics shows google system has a volume of five Exabyte of information flowing in their systems which include structured, semi-structured and unstructured data. Industries like Healthcare, retail, supply chain, energy production and network intelligence brings unique requirements and standards for securing data in motion [17].

Hadoop solutions today uses simple authentication and security layer (SASL) for authentication and encryption of data in Motion with built in authentication mechanisms using DIGEST-MD5 and CRAM-MD5. Hadoop supports network security protocols such as secure RPC, HTTPS, SSL, and TLS for securing data in motion with its encryption and masking techniques. Intel distribution offers encryption and compression of files [15]. Project Rhino enables block-level encryption. [5]

E. Performance and Framework Component of Data in Motion

The performance of encryption techniques for the moving data in Big Data scenario depends not only on the speed of algorithm and the throughput, but on different framework components of the environment and systems. Government legal framework, guidelines adopted by organizations, intellectual property contracts, the hardware and software vendor selection, auditing and monitoring all have an impact on the security mechanism and performance of encryption schemes [18].

II. Existing Solutions

F. Overall Big Data Security and Frameworks

Most of the existing Big Data solution can be visualized as shown in the *figure 1* including Hadoop. At the top level, data management involves data classification & prioritization, data discovery and data tagging. As of today, for user validation, identity and role management (RBAC), tools such as Kerberos, LDAP and Active Directory are used for establishing a single point of truth.

Regarding data protection at rest, different encryption schemes are used to protect against privileged users or applications with direct access to files with a central key management server. For data protection in transit, along with SSL/TLS protocol, native communication also requires encryption schemes such as remote procedure calls and socket communications [10]. All unencrypted data using different protocols such as DTP, HTTP, RPC, JDBC/ODBC need to be kept safe with privacy measures.

In order to achieve governance and auditing, different tools should produce uniform log information which could be analysed and could form business intelligence on top of the audit and governance data. The Risk and Governance (GRC) policies groups the sensitive data types in alignment with regulations by defining the rules to control the data flow (PCI,PII etc) for organization compliance[2][14].

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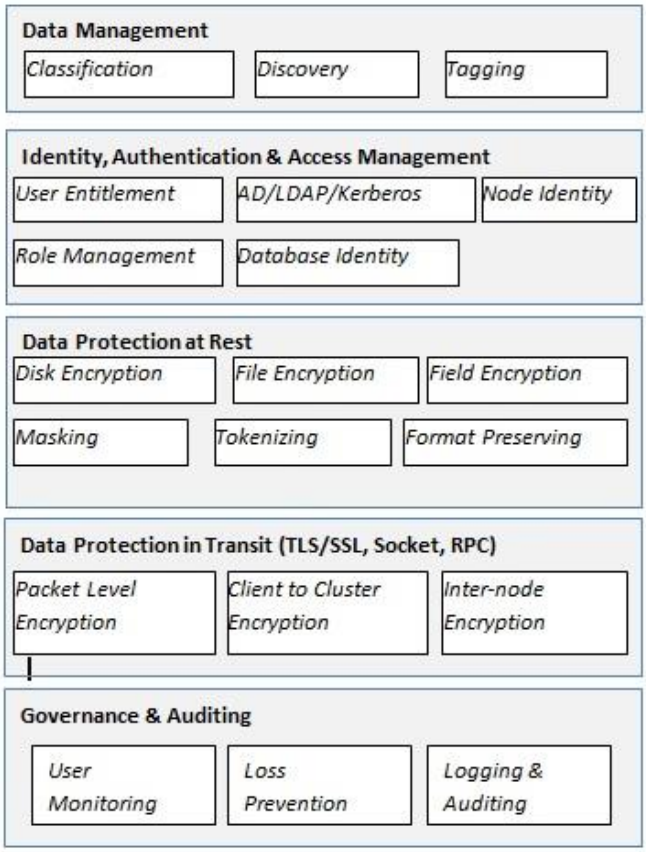

Figure 1: Proposed architecture for general security of data for big data.

G. *Existing Solutions for Securing Data in Transit*

AES (Advanced Encryption Standard) is the most widely used encyption scheme for data in motion.This scheme is used in most of the Big Data methodologies varying from authenticaiton, authorizaiton, SSL,TLS, socket data encryption to remote procedure calls. For example Kerberos strong authentication relies on the Kerberos tickets. By default, Kerberos will attempt to use 256-bit AES encryption with the Kerberos Ticket Granting Ticket [5]. Other encryption schemes are also used in Big Data, such as HMAC-SHA1, a symmetric key cryptographic algorithm distributing the symmetric key used in the HMAC-SHA1 to the Name Node and every Data Node in the cluster.

III. Efficient Encryption Scheme For Big DATA

H. *Suitable Algorithm for Data in Motion*

Based on statistics and performance benchmarks [20][21][22][23][24][25], AES is found as the best in performance as well as strength in the family of symmetric cipher. Conventional AES has time complexity of 2^{48} and a memory complexity of 2^{32} [43]. Most of the latest Big Data implementation now supports standard AES algorithms with its key variants, modes and other parameters; besides the alternative and less secure standards such as 3DES and RC4. *Figure 2* shows the encryption performance of a conventional symmetric cryptosystems.

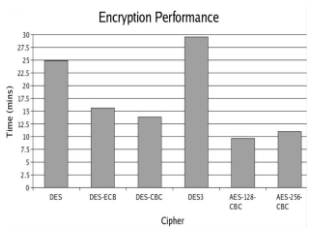

Figure 2: Performance of symmetric algorithms using OpenSSL with 8 gigabytes of data on a 1.0GHz Intel Server [23].

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B. AES Encryption Scheme and Computational Overhead

AES is based on Rijndael algorithm and has a fixed block size of 128 bits and a key length of 128, 192 or 256. It calculates a temporary round key from original symmetric key and it takes a 4x4 array (state) of data at a time and transforms the data using Round Keys. The process is repeated 10 to 14 times based on the block size. The transformation has four steps and the Galois Field (GF) calculation is used in steps. The first step in each cycle is called SubByte, which is substitution of values from an S-Box table calculated using special Galois Field mathematics. Secondly ShiftRow step re-orders shifting the data in a specific order. Third step is called MixColumn which will diffuse the data evenly to all the sections of the selected byte array using GF(2^8) multiplication. Fourth step is AddRoundKey transformation where the round key, which is calculated from original symmetric key, is used for the key expansion and then resulting value is used for transforming state. *Figure 3* shows the common AES encryption/decryption process.
The traditional AES implementation using Galois Fields (GF) computes the GF(2^8) multiplications. The storage requirement is from the 256-byte S-box and the main processing requirement comes from the GF(2^8) multiplications of the one-time RoundKey and multi-time MixColumn operations[28].

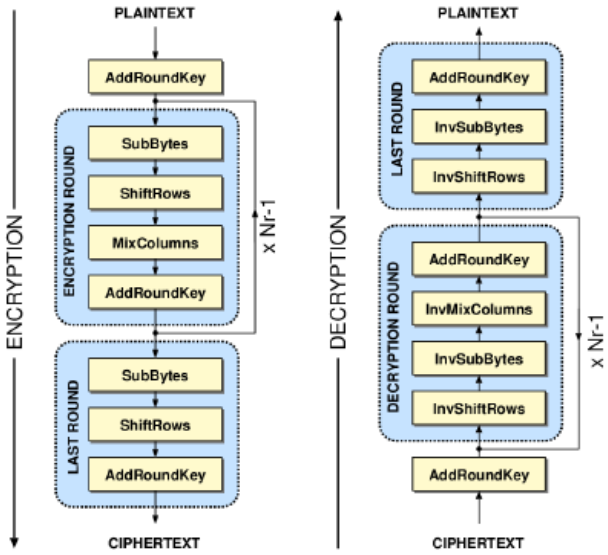

Figure 3: AES encryption & decryption Proc**ess**

C. *AES Performance*

Network infrastructure, implementation algorithms, programming language used for implementation, key size, platform of choice, chipset for execution, processor and encryption hardware are the factors that affects the performance of the encryption and decryption of Data in Motion.

Figure 4 chart shows a benchmarking of different implementers on AES on the same environment and all other same parameters as an instance [24].

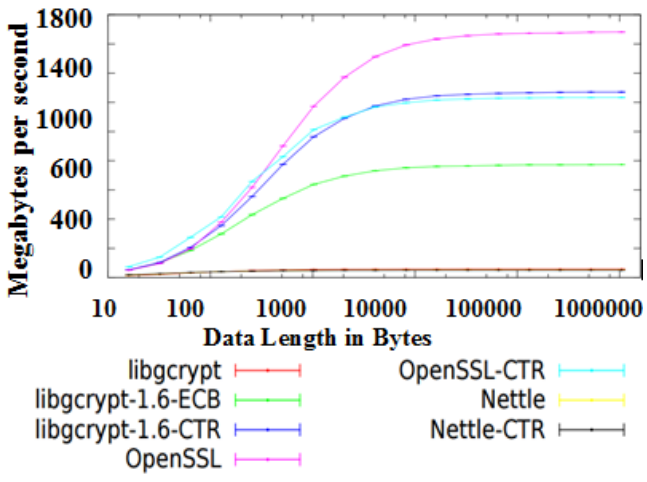

Figure 4: Performance of AES algorithm from different vendors using Ubuntu Intel Pentium 4 Systems [24].

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D. AES Improved Performance and Optimization

From Big Data perspective, as data in motion is distributed in heterogeneous systems and complex network traffic with different network tools and solutions, it is quite challenging to formulate a method for having a high performing secure environment. A formula is proposed in this paper that can be adopted to provide a secure data in motion.

IV. PROPOSED SYSTEM

Based on the literature survey and our experiments a simplified *Five Steps structure* has been proposed to achieve high performance in moving data in Big Data systems as illustrated in Figure 5. As we focus on the Data in Motion, majority of data in motion will be transferred using symmetric encryptions such as AES [29-35].

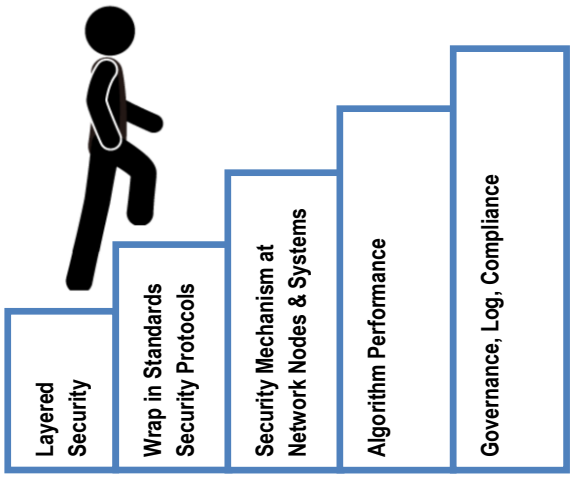

Figure 5: Proposed simplified Five Steps structure to achieve high performance in moving data in Big Data Systems

A. Layered Security

Apart from the network security layers explained in [32] and [33], Big Data implementation such as Hadoop provides security and privacy mechanism at different layers. These layers can be further tuned to make sure the confidential data is transferred after encryption. The layered structure will make sure which data need to be encrypted and which is not. Services like Key Management Server (KMS) store the keys including the temporal symmetric AES keys.
Integrity of network, servers and clients, security enforcement at various points in the network and implementation of security policies are also very important for a Big Data framework. Security effective processes, such as security policies, security awareness training and policy enforcement also need to be carried out for a successful layered security architecture [32][33][34][49].

B. Wrap Moving Data in Standard Security Protocols

Different layers of Hadoop facilitates secure file transfer (for instance FTP), secure query processing, secure message passing, secure control flow and secure data flow [49]. Wrapping these data using the well proven security protocol is very important in securing big data communications. For example Apache Knox for REST APIs for Hadoop will enable encrypted data moving over web. SSL and HTTPS provide AES key exchange securely so that the data transferred using AES algorithms will use temporary session key which will be destroyed after the communication. Available standards such as Java's Simple Authentication & Security Layer (SASL), Kerberos will help enforcing perimeter security with will provide authentication and strengthening authorization mechanisms. Current industry solutions are still using RC4 and 3DES[34] encryption schemes, but for secure communication it is always important to use unbreakable security using AES.

C. Security Mechanism at Network Nodes & Systems

Among many hardware solutions and accelerator [29][30] to support Big Data Security, Intel Advanced Encryption Standard New Instructions (AES-NI) and associated hardware framework provide support for Big Data Hadoop File System(HDFS). Data in transit performance could be achieved while encryption process happens between memory and HDFS file system. Intel AES-NI provides seven instructions that help to accelerate the most complex and compute-intensive steps of the AES algorithms [44][45]. Such solutions can be used at routers, nodes, access points where the machine crunching encryption and decryption happens with supporting protocols such as Network Security Services (NSS)[46][47][48] with support for SSL/TLS or similar standard protocols.

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Alternatively, solutions such as using graphics card resources with a gKrypt Engine [26] will improve the speed of processing many times than executing the AES in normal processor.

D. Algorithm Performance

There are many improvements and variations to AES algorithm suggested such as Dual Key[42], Single Lookup Table (LUT) [28], AES Hybrid Approach[51], AES Lightweight models, optimized software solutions for multi-core platforms [38-41].
The Single lookup AES reduce the processing steps on the GF lookup table. This method needs only 16 Load operations and 16 XOR operations to compute the new state, and consumes just about 1/100 of cycles consumed by GF(2^8).
As explained in the section "AES performance", selecting the right implementation and vendor suitable for the platform of choice is very important.

E. Governance, Log, Compliance

Monitoring the network traffic for possible intrusion and flows, keeping an eye on new possible threats, enable regular security updates on systems, installing a data protection solution are all equally important. A new style of intrusion prevention system (IPS) similar to that of normal data flow still needs to be evolved for systems like Hadoop [32-33].

V .Conclusion And Future Work

Securing data in motion is very important in Big Data implementations. After looking at the available literature, a global standard and formula to make the moving data secure is found to be not available. Here we attempted to propose a simplified framework and formula to make the data in motion secure in Big Data scenario with a focus on AES structure.
As authors are participants of National Institute of Standards and Technology (NIST) Big Data Working Group (NBD-WG), further study and framework components will be added in the global standard specific to the subject. The version 2 of the NIST Big Data interoperability Framework (NBDIF) might include such components, which is planning to be started by middle of 2015.

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AN IRRIGATION APPROACH AND SENSING OF PLANT MOISTURE CONTROL WITH AUTOMATION PROCESS

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ABSTRACT: *Agriculture plays a vital role in human life. Irrigation is an essential practice in many agricultural cropping systems in our day-today life with water is a major concern. Efficient water management is a major concern in many cropping systems. This paper aims to find the exact field condition and to control the wastage of water in the field. A method of reducing this problem is associated with farming as well as increase in food crop production. This is the implementation of a controlled technique to meet the soil moisture requirement for different food crops in respective location. For precisely monitoring and controlling of the agriculture field, soil moisture sensor and PIC microcontroller (16F877A) are used. In this system of irrigation, critical information (soil moisture content) is sent to a microcontroller. The microcontroller process the information to schedule irrigation by turning ON or OFF a motor that supplies water to the field.*

INTRODUCTION

In India, agriculture is most important in the country's economy. Since scorching summers threatens our planet every year, our farmers are unable to cultivate our traditional crops at their suitable seasons. On other hand farmers wasting water abundant without proper management. This leads to scarcity of water at the time of requirement. In conventional irrigation system, the farmers use the irrigation technique in the country manually, in which farmers must irrigate the fields at every regular interval. This project makes the irrigation automated. Improving irrigation efficiency can contribute greatly to reduce production costs of vegetables, making the industry more competitive and sustainable. Through proper irrigation, average vegetable yields can be maintained or increased while minimizing environmental impacts caused by excess applied water and subsequent agrichemical leaching. Recent technological advances have made soil water sensors available for efficient and automatic operation of irrigation systems. Automatic soil water sensor-based irrigation seeks to maintain a desired soil water range in the root zone that is optimal for plant growth. This project allows the farmers to apply the right amount of water at the right time. It consumes low power. It is a simple and low cost method of automatic irrigation and affordable to poor farmers. It is suitable for all climatic conditions.

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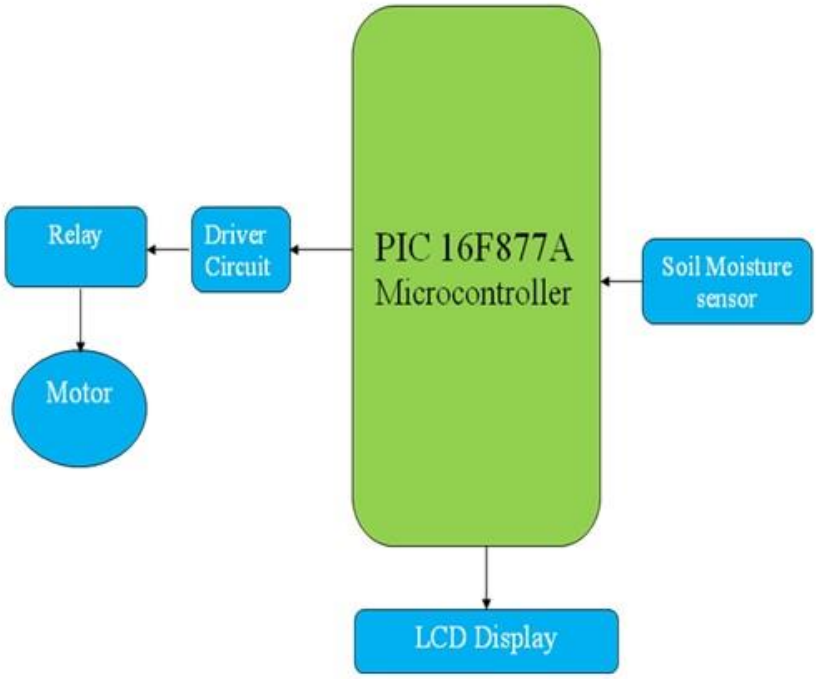
BLOCK DIAGRAM



DESCRIPTION OF BLOCK DIAGRAM:

SOIL MOISTURE SENSTOR:

The health of a plant is influenced by many factors; one of the most important is the ready availability of moisture in the soil. This Soil Moisture Sensor can be used to detect the moisture of soil or to judge if there is water around the sensor. This module can be inserted into the soil and then vary the on-board potentiometer to adjust the sensitivity [1]. The sensor will sense the moisture in soil and gives a high voltage when the soil is dry and a low voltage when it is wet [2][4]. The moisture content in soil can be displayed in LCD display as percentage.

PIC 16F877A MICROCONTROLLER:

A PIC microcontroller is the heart of this system. It is used for automatic irrigation process. PIC 16F877A is one of the most advanced Microcontroller from Microchip. The PIC Microcontroller consists of inbuilt analog to digital converter. It receives the values from the soil moisture sensor in the form of analog. According to the values it switch ON/OFF the motor to control the water supply [3].

LCD DISPLAY:

In this system 16 x 2 LCD display is used. An integrated Liquid crystal display (LCD) is used for real time display of data acquired from the sensor and the status of the motor [3].

DESIGN OF POWER SUPPLY:

Power supply consists of a transformer, bridge rectifier, and voltage regulating ICs 7805, 7812, 7912.+5 V,-5V,+12V DC power supply is designed to provide VCC as well as reference voltage to the various ICs.

RELAY AND DRIVER CIRCUIT:

The driver circuit is used to drive the relay to switch ON/OFF the motor. The driver circuit is made by using NPN transistor [5].

WORKING PRINCIPLE OF THE SYSTEM

This system works in a simple way, it consists of soil moisture sensor, PIC microcontroller and motor. PIC microcontroller constantly monitors the parameters of sensor. The PIC microcontroller converts the analog signal from the sensor which is buried inside the soil, to digital values. This is compared with a value which representing the minimum allowable moisture content of the soil. If that soil moisture content is low from predefined value, PIC Microcontroller will turn ON the relay, to run the motor and the water supply is made through the system to fields. And the moisture content of soil in percentage and status of the motor are displayed in 16 x 2 - Liquid Crystal Display (LCD) as shown in Fig 1. Once the soil has reached desired moisture level the sensor transmits the signal to PIC microcontroller and it turn OFF the motor. It updates the moisture content of soil and status of the motor in 16 x 2 - Liquid Crystal Display (LCD) as shown in Fig. 2. This system helps to save energy as well as improves the crops health. This process is termed scheduling. Every procedure in scheduling is controlled by the program fused in the PIC microcontroller.

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F

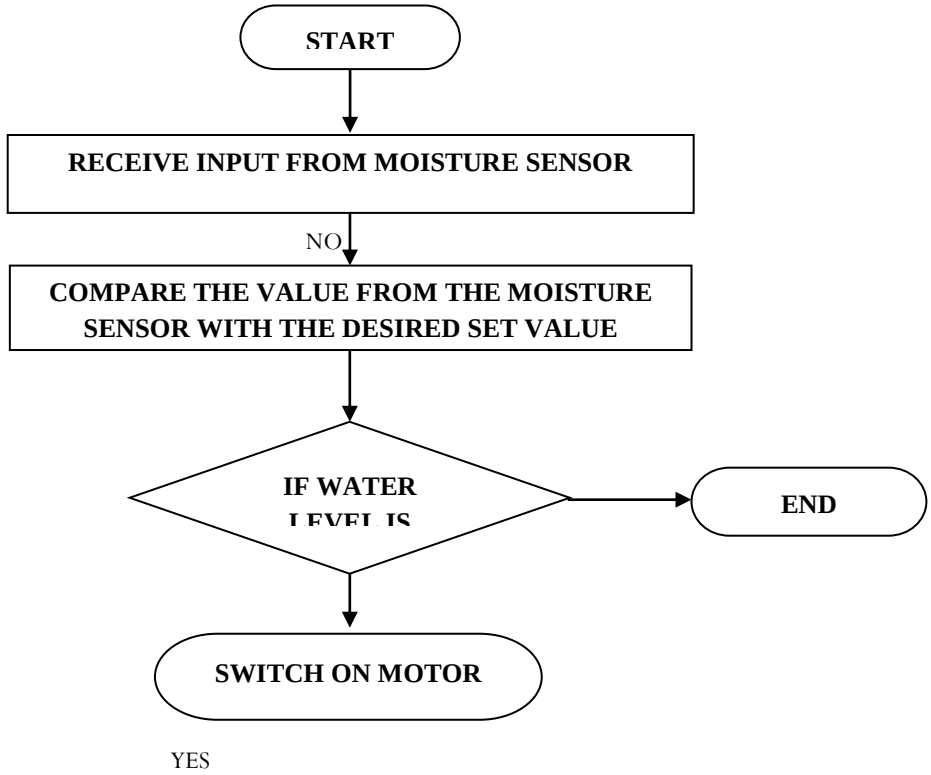
ADVANTAGES

- Increases growth – Right amount of water supplied at the right time. So it increases the growth and prevents soil erosion and nutrient runoff. Water penetrates deeply into the soil to get well down into the root zone.
- Saves time – It supplies the water to the field when it needs and it saves the time.
- Saves water – we can save water by using this method.
- Controls the disease to plants - It helps to grow quickly under moist conditions and controls the fungal disease to the plants.
- Easy Maintenance and low cost – This system is constructed with simple circuits, the process of maintenance is easy and it cost low.

APPLICATIONS

- Roof Gardens
- Lawns
- Agriculture Lands and Home Gardens

FLOW CHART



CONCLUSION

The proposed system provides with several benefits and can operate with less manpower. The system supplies water only when the moisture in the soil goes below the reference. With the help of this system, water is only delivered where it's needed. So the desired moisture level is maintained in the field, which helps to increase the food production. Thus the system is efficient and compatible to changing environment. In future we planned to add many features such as humidity sensor, temperature sensor and timer modes to enrich the automatic irrigation.

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A New Passive Snubber for Improvement of Efficiency in Soft Switched Boost PFC Converter for Battery Charging Systems

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Abstract: *This paper proposes a new passive snubber for enhancing the power conversion efficiency on a single phase ac-dc power factor correction (PFC) converter based on boost topology for battery charging systems. Soft switching can be achieved in the proposed converter with the proposed auxillary passive snubber circuit which is added to the conventional boost PFC converter. The converter switch is provided with zero current switching turn ON. The converter is analysed in the continuous conduction mode. The proposed converter achieves high input power factor, low line input current harmonics, simple control and soft switching at turn ON. Contrasted with the conventional boost converter, the proposed PFC boost converter has lower switching stresses and higher voltage gain. The new prototype of 100 W / 20 kHz, 40 V_{dc} output with 24 V_{ac} input is verified experimentally with an efficiency of 96% with near unity power factor.*

Keywords: Battery charging systems, Boost converter, Current stress, Passive snubber, Soft switching, PFC, Voltage stress, ZCS, ZVS.

I. INTRODUCTION

Hybrid Electric vehicles are being made by manufacturers to reduce the carbon dioxide releases and to lessen the traditional fuel energy utilization. As of late, vehicle manufacturers are developing plug-in hybrid electric vehicles (PHEV) which decreases the environmental contamination. These vehicles have an AC/DC converter that provides power from a commercial power supply to an on-board charger along with a DC/DC converter to provide energy to its accessories. In light of the constraint in the charging time and restricted space, the AC/DC converters should have to be designed efficiently [1-5]. Battery chargers are another key sections required for the development and acceptance of PHEVs. For PHEV applications, the recognized system incorporates utilizing an as a part of vehicle charger [6]. The common charger that is utilized as a part of PHEV incorporates an AC-DC converter with power factor correction (PFC) followed by an isolated DC-DC converter with input and output EMI filters. The front-end ac–dc converter is a key part of the charger system. Proper choice of this topology is fundamental to meet the regulatory requirements for input current harmonics, output voltage regulation and implementation of power factor correction. The boost converter is one of the straightforward and most broadly utilized topology for the battery charger/discharger converter when isolation is not required. In high power applications, the voltage and current stress can easily go beyond the range that one power device can handle. The main sources

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of switching losses in boost PFC converters are hard turn -ON of the MOSFET and the reverse recovery of the boost diode during its turn-OFF. Selecting the ideal topology and accessing power losses in power semiconductors are vital ventures in the design and advancement of these battery chargers [8].

The incorporated EV battery chargers into the electrical drive system have been accounted in the literature. Reference [9] presented the integrated battery chargers utilizing the inductor of induction motor during charging time to constitute a dc/dc boost PFC converter with the three-phase VSI. The battery voltage of this system should be more than maximum line-to-line peak voltage to ensure unity power factor operation. In [10], a single-phase integrated charger for an electrical scooter with an interior permanent magnet motor traction drive was shown. The battery system operated as a dc/dc boost PFC converter where the motor works as a coupled inductor, which utilised the three phase VSI as a switch in the charging mode. Different soft-switched boost converters with active or passive snubber circuits have been proposed. Power semiconductor devices commutate under two possible circumstances: hard and soft. With hard switching, the devices will change the states (ON or OFF) when both current and voltage are not zero. High switching stresses are because of overlap between voltage and current, and results in high switching losses.

Soft switching is intended to scale back the mentioned overlap between voltage and current at the commutation periods and can be classified in either active or passive methods. Snubber for a given application by and large varies.. Active methods will decrease the switching losses by using auxiliary switches. umfortunately, an auxiliary switch rises the complexity of both power and control circuits. The control strategy will be intense because of the issues connected with the proper understanding between control signals of the switches during Switching periods. Circuit cost is increased due to this and reliability is similarly affected by using active snubbers [11-14].Passive snubber circuits can achieve soft switching and lessen the reverse recovery current of a rectifier diode by using only passive components for example inductors, capacitors, and diodes without auxiliary switches. Compared with active snubber circuits, passive snubber circuits are by and large easier to design and have fewer components; therefore, they are less expensive, more reliable, and smaller [15]–[22].

A passive lossless snubber will effectively prohibit switching losses and EMI noise using no active elements and no power dissipative elements. No extra control is required and no circulating energy is produced. Circuit structure is as simple as RCD snubbers while circuit efficiency is as high as active snubbers and resonant converters. Less cost, good performance, and high reliability are the distinct benefits of a passive lossless snubber. The association of the paper is as follows: Section 2 gives the circuit of the proposed converter. Section 3 exhibits the experimental results. Comparison between the proposed topology and the conventional boost is given in Section 4. Section 5 concludes the paper.

II. THE PROPOSED PFC CONVERTER: PRINCIPLE OF OPERATION AND ANALYSIS

The circuit with the conventional boost converter incorporates boost inductor L_m, boost switch S, boost diode D_f and output capacitor C_o. Moreover, the proposed boost converter comprises of a passive snubber cell comprising of two inductors L_{S1}, L_{S2}, capacitor C_s and diode D_s. The proposed novel passive boost PFC converter comprises of five modes for one switching cycle. The equivalent circuit diagrams of the operation modes are given in fig. 2(a)–(e) respectively. The key waveforms related to the operation modes are shown in Fig. 1.

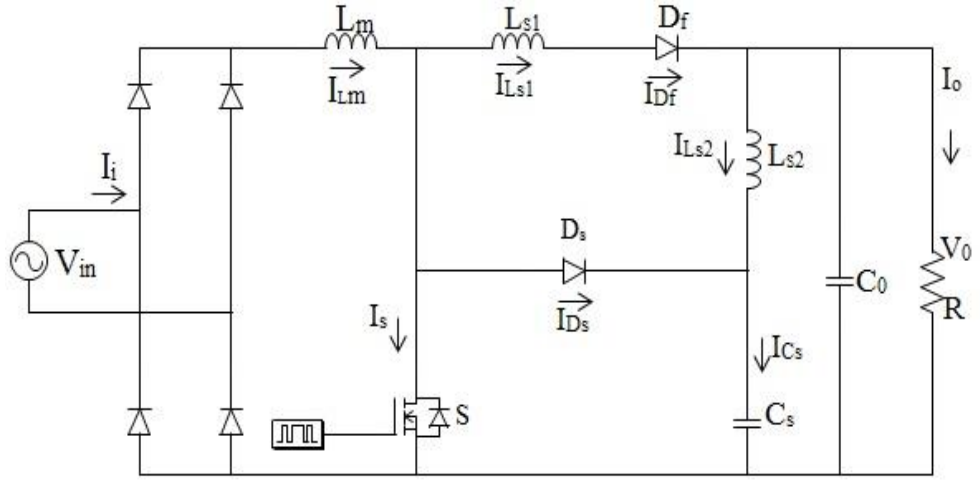

Figure. 1. Proposed Boost PFC Converter.

III. EXPERIMENTAL VERIFICATION

The performance of the proposed converter is verified by the experimental results based on a laboratory prototype. with rated specification and design.

Fig. 2 (a) demonstrates the waveforms of voltage and current of the switch S. As believed, the output voltage is seemed to be clamped across switch. It thus proved switch S is turned ON with ZCS.

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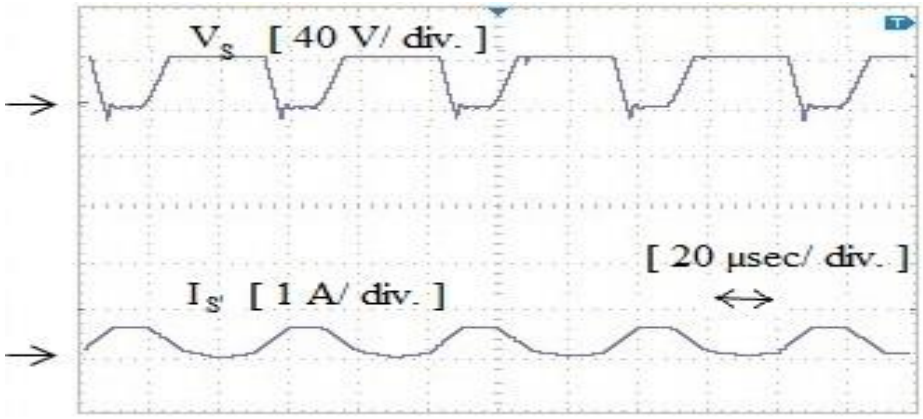
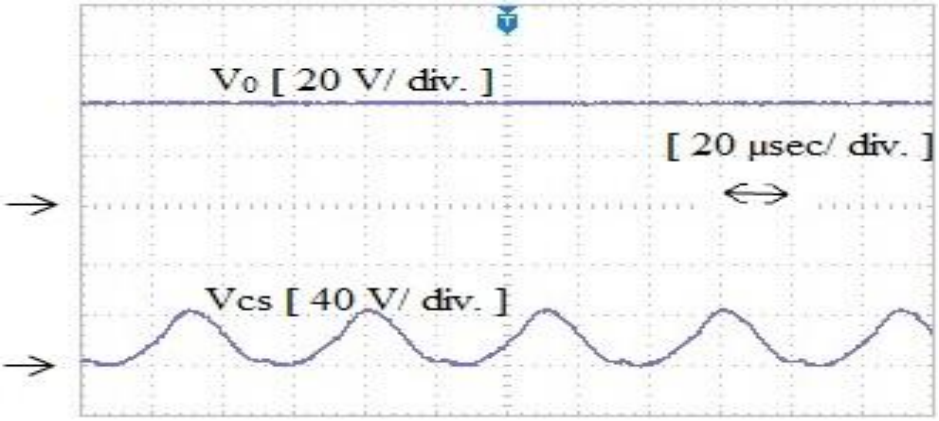


(a)



(b)

Figure. 2. Measured waveforms for the proposed converter (a) main switch voltage V_S and main switch current I_S; (b) output voltage V_0 and voltage across snubber capacitance V_{CS}.

The voltage and current waveforms for the main switch S shows no overlap between them. Fig. 2 (b) shows the output voltage waveform and voltage across the energy transfer capacitor respectively. Based on the measured input/output current and voltage waveforms shown in Fig. 2, the measured efficiency is about 96%. The measured waveforms are in a good agreement with the key waveforms.

IV CONVENTIONAL BOOST PFC VERSUS THE PROPOSED BOOST PFC RECTIFIER

The conventional boost topology used for PFC applications uses a diode bridge to convert input AC voltage to DC voltage. The diode bridge is then followed by a boost converter. The boost converter has circuit components like a boost inductor, switch, diode and an output capacitor connected to the output side load. The boost converter is a type of DC-DC converter that helps in increasing the DC output voltage more than the input DC voltage.

Table 1. Performance comparison of the proposed PFC converter and the conventional PFC converters

Circuit Type	Switching Features	Components Count	Power Factor	Efficiency (%)
Conventional Boost PFC	Hard Switching	No extra Component	0.9641	91.18
Proposed passive Boost PFC	S – ZCS Turn ON and turn OFF	2 inductor 1 capacitor 1 Diode	0.9897	95.3

The problem associated with the boost PFC circuit is that, at higher power levels, the losses across the circuit increase; thereby the efficiency is reduced. The output capacitor current has more ripples. Due to these drawbacks, more heat is dissipated for a smaller area. The output voltage is not in a regulated manner and the input current is not perfectly sinusoidal. The voltage stresses on the switch S_1 and the diode D_3 of the proposed converter is less than that for the conventional boost converter. Therefore, these reduced voltage stresses can make the proposed converter to use a power MOSFET with low RDS-ON and Schottky diodes to reduce the reverse recovery problem of diodes. The following table presents a comparative performance of the proposed PFC and conventional PFC converters. The circuit parameters for the conventional PFC boost converter are the same as those used for the proposed

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converter. An efficiency and power factor comparison between the conventional and the proposed boost rectifiers is performed based on simulation results. In this comparison, both rectifiers are assumed to operate in CCM with the same operating conditions and parameters. According to the simulation results, the simulated efficiency for the conventional boost is about 92 % while it is 96 % for the proposed boost rectifier with near unity power factor. It is clear that the efficiency of the proposed ZC-ZVS boost PFC converter is about 4 % higher than the conventional PFC boost converter at the full-load condition. The benefit obtained is the enhancement of overall circuit efficiency. The proposed converter achieves a near unity power factor at all output load levels and is comparatively higher than the conventional converters.

V. CONCLUSION

In this paper a passive snubber has been designed and developed for boost PFC rectifier in battery charging systems. The analysis was carried out in CCM mode. The converter switch is turned ON at zero current. The proposed draws perfect sinusoidal currents from the utility and has distinct good benefits like high power factor, low switching stresses and improved efficiency than that of the conventional PFC converters. The proposed converter is tested experimentally with a 100 W/20 kHz prototype. The converter efficiency is improved more than 4 % at full load. The proposed topology in this paper presents a simple and reliable technique for battery charging systems which is currently being researched and will be reported in the near future.

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Speed Control of Switched Reluctance Motor using PI controller with Modified Asymmetric Converter- Industrial Application

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Abstract: *This paper presents passive boost converter fed three phase switched reluctance motor using PI Controller. The operating mode of proposed converter circuit is discussed. The proposed converter is capable of minimizing the torque ripple because of faster excitation and demagnetization and also improving the average torque compared to the conventional converter circuit. The objective of this paper to achieve a desired speed response with effective controller. The simulation results are carried out by using MATLAB/SIMULINK and the corresponding results are presented. This paper shows the effect of load disturbance, effect of switching angle, speed variation on the speed of switched reluctance motor. The simulation results revealed that the effectiveness of proposed converter using PI controller on the motor performance. It is well suited for industrial application.*

Keywords: SRM, Speed control, torque ripple, Converter, PI Controller, Average torque.

I.INTRODUCTION

The SRM drives for industrial applications are of recent origin because of its simple construction and its easy operation. The switched reluctance motor encompasses straight forward and strong structure with low inertia and direct drive capability and is especially appropriate for top preciseness and high speed mechanism. Switched Reluctance Motor(SRM) seems to be an attractive solution for variable speed applications due to its certain advantages viz., simple and rugged motor construction, low weight, low production cost, unchallenged cooling, tremendous torque–speed characteristics, high torque density, high operating efficiency, and inherent fault tolerance.Adaptive Takagi-sugeno-kang fuzzy controller is used to control the speed of a SRM. The proposed system consists of TSK fuzzy and compensated controller. The compensated controller is used to minimize the approximation error between fuzzy and the ideal control law [1].Two torque control methods are proposed for SRM drive. First method is direct torque controller which uses hysteresis current controller and second method is indirect torque control method uses distribution function to reduce the torque ripple [2]. Modelling and prediction of dynamic performance in a SRM drive system is done by using radial basis function network based adaptive fuzzy system [3].In paper proposes a steady state digital control. The method is used to control the speed of motor by applying a high or low energy pulse. This method is applicable for both single speed and variable speed application [4]. A new soft switched converter for SRM drive is proposed to improve the performance using some control strategies such as flux or current linkage profile control [5]. The converter is an essential part of SRM drive system. The passive boost converter which adds three

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diodes and one capacitor to the front end of conventional converter to obtain high negative bias. The negative torque generation is suppressed and the output power is improved [6].The speed of SRM motor is controlled by using PI, fuzzy, fuzzy-PI controller. In fuzzy-PI speed settles faster without overshoot which leads to better performance and higher robustness [7].The intelligent current profiling approach is used to reduce the speed ripple and vibrations for a switch mode rectifier fed SRM drive [8]. The controller consist of outer loop contain PI^2D controller and inner loop contain tracking controller is used to solve the control problem of SRM without velocity measurements [9]. The converter which adds resistance in current path with proper selection of switching angle leads to eliminate the negative torque and improve the torque ripple percentage compared with conventional circuit [10]. The speed control of conventional converter fed 8/6 SRM is done by using both PI and fuzzy logic controller. The speed settles faster compared to conventional PI controller [11].

The high torque density and better efficiency is important for designing variable drive system with SRM which is achieved by reducing the torque ripple. The influences of switching angle on current shapes and torque in SRM is analyzed and proper selection of parameter lead to reduce the torque ripple in SRM [12]. Various types of power converter fed SRM are analyzed. The fast rise and fall time of current and negligible shoot through fault of asymmetric converter with MOSFETs are suitable for high speed operation [13]. A fuzzy PI controller is proposed to regulate the speed of SRM drives. The robustness of the controller is verified by changing the parameters and applying external disturbance to the controller [14

This paper presents the speed control of proposed converter fed three phase SRM using PI controller. The operating principles of proposed converter are discussed and the speed waveform of SRM using PI Logic Controller is presented. The remainder of this article is organized as follows. In section 2, we present the operation of SRM with proposed converter. In section 3,the mode analysis of proposed converter is discussed. In section 4, the simulation results are discussed. We conclude the paper in section 5.

II. OPERATION OF PROPOSED CONVERTER

The proposed converter circuit diagram is shown in Fig.1. Compared with conventional converter circuit it increases a switch S9, a diode D9 and a boost capacitance C1.Because of higher voltage applied to phase winding and it can obtain faster excitation and demagnetization current. So the torque ripple is reduced compared to conventional circuit. It also improves the performance when the converter supplies an additional boosted voltage to SRM.

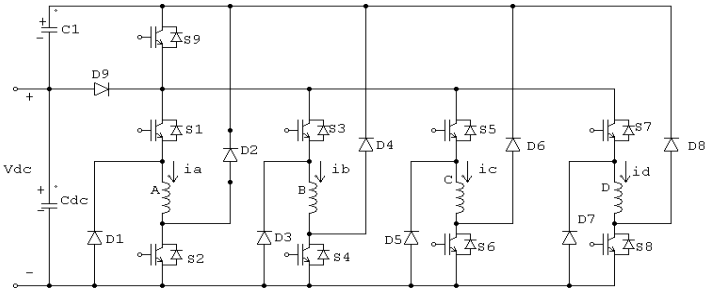

Fig. 1 Circuit diagram of proposed converter

Table 1 Operating modes of Proposed Converter

Mode	Switch States	Phase voltage
Mode 1	S_1,S_2,S_9(On), D_1,D_2,D_9(Off)	$v_a = (v_{dc} + v_{c2}) - 3i_a v_{sw}$
Mode 2	S_1,S_2,D_9(On),S_9,D_1,D_2(Off)	$v_a = v_{dc} - 2i_a v_{sw}$
Mode 3	S_2,D_1(On), S_1,S_9,D_9,D_2(Off)	$v_a = -(i_a v_{sw} + v_f)$
Mode 4	D_1,D_2(On), S_1,S_2,S_9,D_9(Off)	$v_a = -(2v_f + v_{dc} + v_{c2})$

The operating principles of proposed converter are divided into four modes. In mode 1, two phase switches and switch S9 all turn on and the higher voltage is applied to phase winding. In mode 2, two phase switches turn on and switch S9 turn off. In mode 3, one of the phase switches turn on and the switch S1,S9 turn off. The above two modes are similar to that of excitation and freewheeling mode in conventional converter circuit. In mode 4, all phase switches and switch S9 are turn off and higher negative voltage is applied to

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phase winding. The stored magnetic energy is returned to the supply. Because of higher negative voltage applied to phase winding, it can obtain faster demagnetization. So the torque ripple is reduced compared to conventional circuit.

V. RESULTS AND DISCUSSIONS:

In order to verify the performance of switched reluctance motor, the proposed converter using PI controller was simulated by MATLAB/simulink with different load condition and switching angle are shown in Figure.6 - 9.The controller control the speed of SRM under variable speed.The peak overshoot is minimum when the speed is changed.The performance of motor using PI controller is shown in Figure.2-Figure.5. Speed response of SRM with switching angle (Θ_{ON}=35°,Θ_{OFF}=70°) 200A TL=0Nm under No load is shown in figure 6.When the switching angle is varied (Θ_{ON}=45°,Θ_{OFF}=75°) 200A ,TL=0Nm under no load is shown in figure.7. The performance of motor using PI controller with variation in switching angle are shown in Table.2 ,Table.3 respectively.
In varaiable speed drive applications ,due to change in load disturbance ,the system respond quickly and maintain a constant speed.The load torque is changed from no load to TL=10Nm,there is no significant change in speed Figure.8-9. The speed response of motor with variation in load T_L=10Nm is shown in figure.8. Speed response of SRM under no load with current 100A is shown in figure.9. Speed response of SRM under no load and T_L=10Nm of motor are shown in Table 4, Table.5 respectively. The PI controller tracks the speed closely to set speed when variation in switching angle and load satisfactorily.

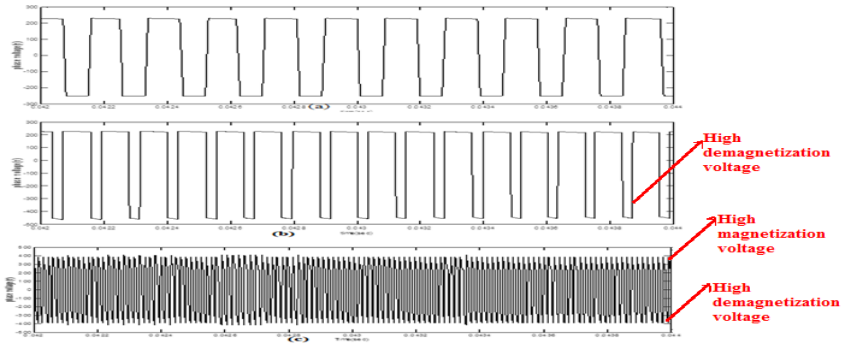

Fig.2 voltage response of SRM a)conventional Asymmetric converter b) passive converter c)Proposed converter

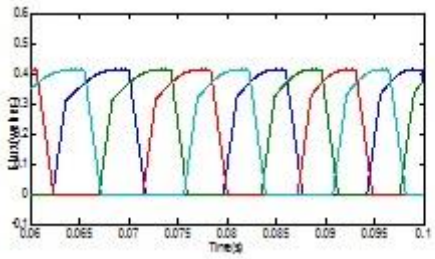

Fig. 3 Flux waveform of proposed converter

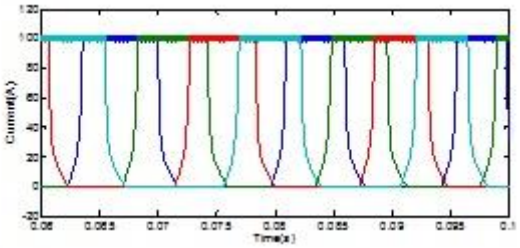

Fig. 4 Current waveform of proposed converter

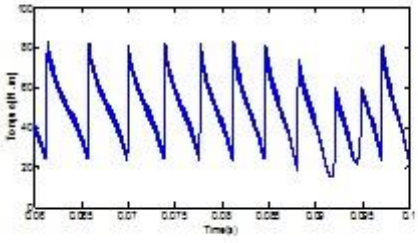

Fig. 5 Torque waveform of proposed converter

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A.Effect of Switching Angle:

Table.2 (Θ_{ON}=35°,Θ_{OFF}=70°) 200A TL=0Nm

Set Speed	Actual speed	Ts(sec)
1000	1001	0.07
1500	1500	0.14
2000	2000	0.17
2500	2500	0.23
3000	3000	0.26
4000	4000	0.35

Table.3 (Θ_{ON}=45°,Θ_{OFF}=75°) 200A TL=0Nm

Set Speed	Actual speed	Ts(sec)
1000	1002	0.05
1500	1501	0.07
2000	2000	0.13
2500	2504	0.15
3000	3001	0.2
4000	4008	0.5

B.Effect of load variation

Table.4(Θ_{ON}=45°,Θ_{OFF}=75°) 100A Tl=0Nm

Set Speed	Actual speed	Ts(sec)
1000	1000	0.13
1500	1500	0.18
2000	2001	0.23
2500	2506	0.33
3000	3009	0.4
4000	4010	0.62

Table.5 (Θ_{ON}=45°,Θ_{OFF}=75°) 100A Tl=10Nm

Set Speed	Actual speed	Ts(sec)
1000	997	0.16
1500	1504	0.23
2000	2004	0.27
2500	2506	0.42
3000	3009	0.58
4000	4009	1.5

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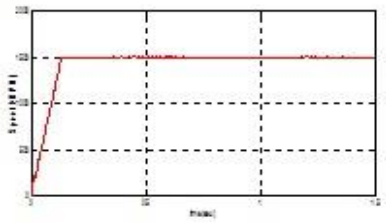

Fig 6.Speed response when (Θ_{ON}=35°,Θ_{OFF}=70°) , , I=200A T_L=0Nm

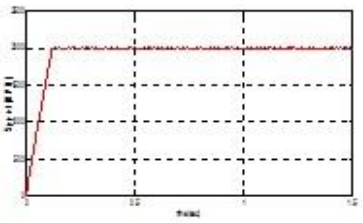

Fig 7.Speed response when (Θ_{ON}=45°,Θ_{OFF}=75°) I=200A T_L=0Nm

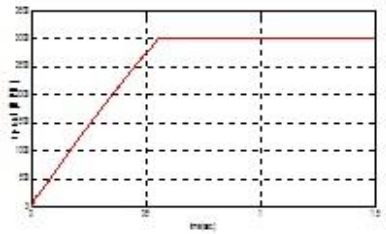

Fig 8.Speed response when (Θ_{ON}=45°,Θ_{OFF}=75°) , I=100A T_L=10Nm

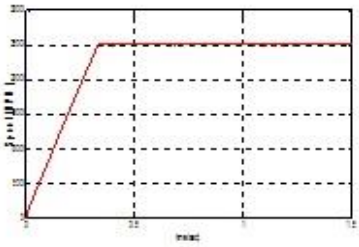

Fig 9.Speed response when (Θ_{ON}=45°,Θ_{OFF}=75°) I=100A T_L=0Nm

6 Conclusions

This paper has developed a closed loop speed control of proposed converter fed three phases SRM drive using PI Controller. Because of faster excitation and demagnetization the proposed converter circuit highly reduces the torque ripple of SRM drive compared with conventional converter circuit. By varying the set speed and the corresponding speed output is taken to evaluate the performance of the controller. From the simulation results it can be concluded that the proposed converter using PI Controller has fast response, perfect tracking of reference speed with no peak overshoot. From the results obtained it is found that the proposed converter using PI controller works satisfactorily, and are well suited for industrial applications.

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Hash based Secure Multicast Routing in Mobile Ad Hoc Network

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Abstract: *Mobile Ad Hoc Network (MANET) consists of number of mobile nodes which follows a dynamic topology. In Nodes in MANET moves in an undefined manner and each node is acted as a mobile router. In this dynamic architecture, a malicious node is capable of disrupting the routing messages by refusing to forward routing messages, or it can inject the wrong routing packets and also modifies routing information. Hence security is a major concern in MANET. In this paper, we have proposed a secure multicast routing protocol based on secret sharing with double hash functions to overcome insider and outside attack. Keys are generated and it is transmitted via the secured medium using secret sharing (SS) method. Based on the shares generated by the source using the SS, hash values are calculated and it is appended to the share. The receivers of the intended data transmission retrieve all the shares and apply the hash function to recover each share. The proposed scheme is compared with the ODMRP and other existing approaches using NS2. Based on the simulation, we have obtained the better results in terms of high packet delivery ratio with reduced network load and control overhead.*

Keywords: Confidentiality, Authentication, ODMRP, secret sharing, MANET, hash function

I. INTRODUCTION

A Mobile Ad-hoc NETwork or MANET is defined as a wireless network of mobile nodes communicating with each other in a multi-hop fashion without the support of any fixed infrastructure. The term Ad hoc implies that this network is a special network that is established to provide a special, often extemporaneous service customized to specific applications. In MANET, routing and resource managements are done in a distributed manner: that is, all nodes coordinate with other nodes to enable communications among themselves. This requires each node to be more knowledge so that it can operate both transmitting and receiving data. Establishing communication among a group of soldiers in a battle field is a good example. Another area in which MANET can be deployed is collaborative and distributed computing. The requirement for a temporary communication network among a group of people in a conference, meeting or classrooms necessitates the formation of mobile ad-hoc network. For example, consider a group of researchers who want to share their research presentations during a conference. In such case, the formation of a mobile ad-hoc network with the necessary support for multicast routing can serve the purpose. These distributed file sharing applications will not require the level of

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security expected in a military environment. Security aspects such as data integrity and data protection against unauthorized access are still compromised. Security in ad-hoc wireless networks is very important. The lack of any central administration makes MANET more vulnerable to attacks than wired networks.

Multicast means being able to deliver a packet to a group of receivers. The typical applications of multicast are multi-party video or audio conferencing, resource discovery, news feeds, online games, television, video transmission etc., Several multicast routing algorithms have been proposed for MANET to achieve the goal. Security in multicast is considered as more complicated than in the unicast operation. Mobile ad-hoc networks, due to their unique characteristics, are generally more vulnerable to information and physical security threats than wired networks or infrastructure based wireless networks. The ultimate goal of the security solutions for MANET is to provide security services such as authentication, confidentiality, integrity, availability and nonrepudiation to mobile users. In order to achieve this goal, the security solution should provide complete protection spanning over the entire protocol stack. There is no single mechanism that will provide all the security services in MANET.

II. RELATED WORKS

MANETs have certain challenges in security due to its characteristics. The main requirement to is ensure the security in MANET to have a secure routing protocol which should have properties to detect the behavior of the mobile nodes, guarantee of exact route discovery process, maintaining confidential network topological information and to be self-stable against attacks. Hu et al proposed [1] a secure ad hoc routing protocol based on the design of the DSDV routing protocol. It used a efficient one-way hash function that support use with nodes of limited CPU processing capability and to guard against DOS attack. SEAD is efficient and can be used in networks of computation- and bandwidth-constrained nodes. SEAD actually outperforms DSDV-SQ in terms of packet delivery ratio, although it does create more overhead in the network, both due to an increased number of routing advertisements it sends, and due to the increase in size of each advertisement due to the addition of the hash value on each entry for authentication. Gonzalez et al [2] proposed mechanism that enables the detection of nodes that exhibit packet forwarding misbehavior. The proposed algorithm does not require high density networks in which many nodes can overhear each other's received and transmitted packets. The simulation shown that it can detect the nodes that misbehave by dropping a significant percentage of packets. Yang et al [3] proposed a SCAN, a unified network-layer security solution for such networks that protects both routing and data forwarding operations through the same reactive approach. SCAN does not apply any cryptographic primitives on the routing messages. Instead, it protects the network by detecting and reacting to the malicious nodes. In SCAN, local neighboring nodes collaboratively monitor each other and sustain each other, while no single node is superior to the others. SCAN also adopts a novel credit strategy to decrease its overhead as time evolves. In essence, SCAN exploits localized collaboration and information cross-validation to protect the network in a self-organized manner. The proposed design is self-organized, distributed, and fully localized. Both analysis and simulations results have confirmed the effectiveness and efficiency of SCAN in protecting the network layer in mobile ad hoc networks.

Khurana et al [4] proposed a simple and efficient algorithm to solve the routing problems in misbehaving nodes. It does not address the problem of handling attack directly but tries to minimize the impact of the attack. Yu et al [5] proposed a novel algorithm that detects internal attacks during route discovery. The route-discovery messages are protected by pairwise secret keys between a source and destination and some intermediate nodes along a route established by using public key cryptographic mechanisms. They also proposed an optimal routing algorithm with routing metric combining both requirements on a node's trustworthiness and performance. A node builds up the trustworthiness on its neighboring nodes based on its observations on the behaviors of the neighbor nodes. Both of the proposed algorithms can be integrated into existing routing protocols for MANETs, such as ad hoc on-demand distance vector routing (AODV) and dynamic source routing (DSR). As an example, we present such an integrated protocol called secure routing against collusion (SRAC), in which a node makes a routing decision based on its trust of its neighboring nodes and the performance provided by them. The simulation results have demonstrated the significant advantages of the proposed attack detection and routing algorithm over some known protocols. ARIADNE is a well-known secure on-demand ad hoc network routing protocol, which proposes a mechanism to avoid routing attacks and DoS attacks [6]. Wadbude et al [7] proposed approach uses improved of security mechanisms to introduce in the proposed techniques so that it satisfies the main security requirement and guarantees the discovery of a correct and secure route. The security mechanisms that the protocol uses are the hash chain, digital signature and Protocol Enforcement Mechanism. Rajesh Babu et al. [8] have proposed to develop an energy efficient secure authenticated routing protocol (EESARP).

Poonam Yadav et al. [9] have introduced the on-demand routing protocols AODV, DSR and DYMO based on IEEE 802.11 and the characteristic summary of these routing protocols are presented. Feng He et al. [10] have proposed a novel secure routing protocol S-MAODV which is based on MAODV. Kalpana et al. [11] have addressed anonymity and trust issues for a wireless network containing selfish and malicious nodes. Mike Burmester et al. [12] have analyzed provable secure route discovery algorithm which is vulnerable to a hidden channel attack. Stefaan Seys et al. [13] have studied anonymous routing protocol for mobile ad hoc networks. K.Seshadri Ramana et al. [14] have proposed a routing protocol that is based on securing the routing information from unauthorized users. Sridhar Subramanian et al. [15] have examined a trust based reliable protocol TBRAODV.Vigneshwaran et al [16] proposed an anomaly detection scheme based on a dynamic leaning process that allows the training data to be updated at particular time intervals. The dynamic learning process involves calculating the projection distances based on multidimensional statics using weighted coefficients and a forgetting curve. It uses ant colony optimization for detecting misbehavior nodes to prevent the behavior in between the path during the data transmission. Vigneshwaran et al [17] proposed a secure multicast routing protocol based on the SS. Multicast sender generates the shares and it is encrypted with keys generated by the KGC. Upon receiving the shares the multicast receivers performs the same interpolating polynomial operation to get the original data. Vigneshwaran et al [18] proposed an intelligent anomaly

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detection method using neural network algorithms to classify the behavior of the node based on the certain security parameters. The back propagation based learning strategy was used for classifying the node depends upon its behavior. The routing with intelligence have made the data traffic hassle free.

III. PROPOSED SYSTEM

Based on the architecture of MANET, every node in the MANET is having the unique address. In a network, any node is acting as a source and destination remaining all other nodes in the region is to be considered as routers. ODMRP is source initiated routing; we assumed that any request made by the source node to join the group is assumed to be genuine node. And also assume that every node in the network is having a public key which is known to others. The main aim of the proposed system is to transfer the data in a secured way to the group of receivers. The proposed system uses an authentication to identify the intended nodes for the data transmission. During the process of route discovery source node initiates the JOIN_QUERY and that is flooded in the network. Once the JOIN_QUERY is received by the nearby node should generate the routing table and update its information to the JOIN_QUERY and flooded in the rest of the network. Upon receiving the JOIN_QUERY packet the receiver nodes initiates the JOIN_REPLY based on the reverse path mechanism. During the process of JOIN_QUERY every node in the dynamic network is maintained its own routing table. A routing table is created on demand and is maintained by each node. The node creates an entry in the routing table only when a non-duplicate Join Query is received. The node stores the destination and the next hop to the destination. The routing table provides the next hop information when transmitting Join Replies. If two or more JOIN_QUERY is received by the same node, then a node selects a JOIN_QUERY packet with latest or recent sequence number. When a JOIN_QUERY packet reaches the multicast receiver, it creates and broadcasts a JOIN_REPLY to its neighbors.
When a node receives a JOIN_REPLY, it checks if the next node address of one of the entries matches its own address. If it does, the node realizes that it is on the path to the source and thus is part of the forwarding group; it sets the FG_FLAG (Forwarding Group Flag). It then broadcasts its own JOIN_REPLY to the network. The next node address field is filled in by extracting the information from its routing table. This way, the JOIN_REPLY is propagated by each forward group member until it reaches the multicast source via the selected path. The JOIN_REPLY packet consists of group of nodes associated with the transmission. Now the source node generates a group key request to the KGC based on the nodes presented in the JOIN_REPLY. All the nodes intended for the data transmission are received the group key from the KGC. The group of receiver node generates random challenges to the multicast source and that is transmitted to the KGC for preparing the shares. Now the KGC prepared the shares based on the received random challenge values and it computes f(x) and calculates the hash values. Now the f(x) and hash values are transmitted to the multicast source. If any node from the outside of the network may not have the sufficient knowledge the polynomial function f(x). Upon receiving the f(x), the outside node in the network are not in the position to recover the original messages. In that way the outsider attack is eliminated. The figure 1 shows the proposed system architecture. In our protocol, KGC communicates with the source S and shares a secret, with each receiver R_i during registration. For distributing a secret group key involving the receivers, KGC needs to broadcast a message containing (t+1) elements to all receivers. At the same time, each receiver needs to compute an interpolating polynomial f(x) to decrypt the secret group key. Thus, our proposed protocol is only suitable for distributing secret group key to a minimum number of receivers. After decrypting the secret key, the receivers are calculated the hash function for the received shares using secure hash algorithm 3. Now the receiver is having two hash values such as 1) calculated hash value 2) received hash value. Insiders and outsiders attack are acknowledged by comparing two hash values by the receiver. If there is any alteration in the hash value the received share is altered or modified by the attacker. To identify the replay attack, every share is enclosed with the Timestamp (T).

Algorithm:

Step 1: After the route discovery process, the multicast Source sends a request to the KGC for generating group keys.
Step 2: KGC generates a group key response with the list of receivers and transferred it to the multicast sender.
Step 3: Multicast receivers associated with the respective communication generates a random challenges and transmits it to the sender for manipulating the shares.
Step 4: KGC generates a group key based on the random challenges and it generates a share based on the polynomial function f(x) for all shares. KGC also computes the hash function for all the shares.
Step 5: Multicast source computes another hash function using SHA3 based on the polynomial function and already calculated hash value.
Step 6: For each multicast receiver computes the hash function based on SHA3 and generates a f(x) and hash value. Multicast receiver applies the reverse side of the polynomial functions to recover the original messages.

To calculate the new hash value receiver uses the same hash algorithm. If any attacker or third party affected the share, hash values does not match it. In such a way insider and outsider attacks are prohibited.

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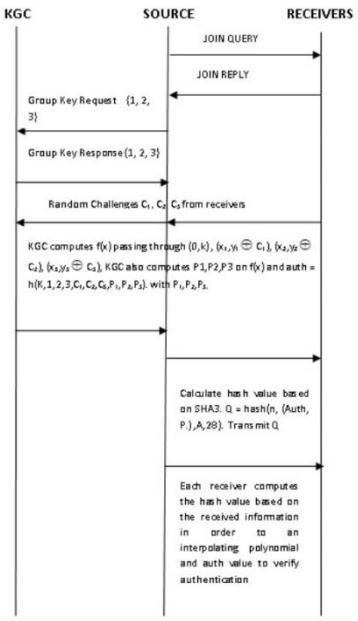

Figure 1. Architecture of proposed system

IV. RESULTS AND DISCUSSION

Our proposed approach is simulated in Network Simulator 2. The overall aim of the simulation study is to analyze the performance of the proposed system under the range of various parameters shown in Table 1. A pause time of 0 sec represents a network with very high mobility where all the nodes move continuously.

TABLE 1
SIMULATION ENVIRONMENT

Area	1000 m * 1000 m
MAC Protocol	IEEE 802.11 DCF
Wireless Channel	Free Space Propagation Model
Number of nodes	5,10,15,20,25,30,35,40,45,50
Traffic type	Constant Bit Rate
Mobility Model	Random way point
Mobility Speed	20 ms
Radio range	250 m
Simulation Time	50 ms
Initial energy of the node	1500 joules
Packet Size	Default size (512 Bytes)
Channel capacity	2 Mbps
Route refresh time	5 seconds

The proposed system is compared with other existing secure multicast routing protocol based on Network Load and Control Overhead. Based on the experimental results, we have obtained 5 to 10 % reduced control overhead and less network load compared with the existing approaches.

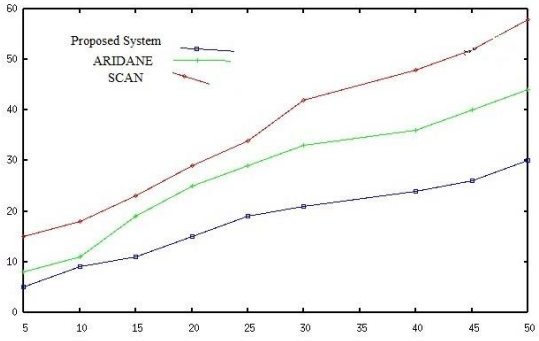

Figure 2. Control overhead

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It is observed from figure 2 & 3, our proposed system produced less control overhead and utilizes less bandwidth compared to the other secure routing schemes. Even though, our proposed model performs of both encryption and an authentication for the shares, it produces less control overheads due to the fast cryptographic hash function. SHA3 is fast and secure hash algorithm and the time taken to perform the computation is too low when compared to the other hash functions such as SHA – 1, SHA - 2. Any one of the node in the network or outside of the network could notable to modify the routing data and message due to the Timestamp and hash value. SHA-3 provides a new security tool for system and protocol designers, and that may create opportunities for security in networks that did not exist before.

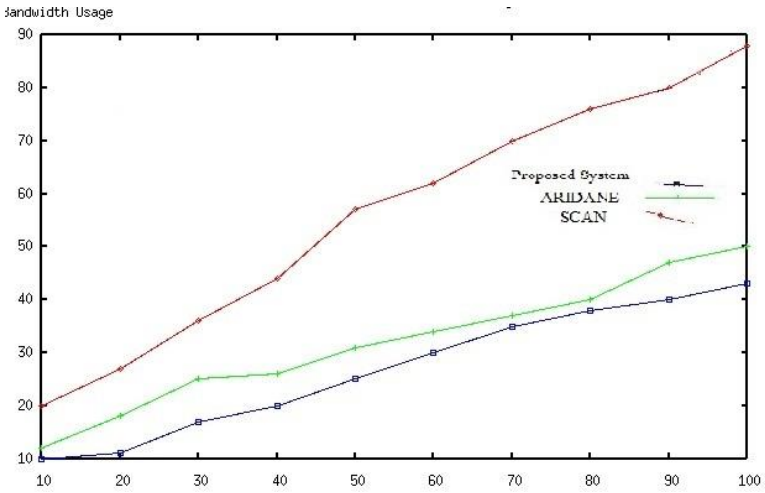

Figure 3. Bandwidth Utilization

V. CONCLUSION

We have proposed a secure multicast routing protocol based on double hashing. The source communicates with KGC to distribute the group key to all receivers. The confidentiality of our group key distribution is information theoretically secure. We provided a key authentication to identify whether the packets are transmitted and received by the authorized source and receivers. Key authentication is provided through the value of hash functions. Since the group key is known only to authorized receivers and KGC, unauthorized receivers cannot forge this value. In addition to that, another secure hash function is also applied to the calculated Auth value using the SHA3. Any insider node cannot forge a group key without being detected since the group key is a function of the secret shared between each receiver and KGC via source. In addition, any replay of the secret shares in step 4 can be detected since the group key is a function of each receiver random challenge. In our protocol, we only focus on protecting group key information broadcasted from KGC to all receivers. The insiders and outsiders attack have been identified and prevented. The simulation results have turned up effectively while considering the network load and control overhead and it produced less computation time compared to the existing systems.

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Energy Aware Node Deployment in Wireless Sensor Network with Straight Line Topology

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Abstract: *Wireless sensor networks are used to monitor a given field of interest for changes in the environment. Coverage and connectivity of the network are two of the most fundamental problem in WSNs. In WSN is usually defined as a with respect to how efficient in sensing an sensors are able to observe the physical ambience. Coverage in Wireless sensor network is essential are fast growing area for research. Connectivity can be defined as the ability of the sensor to reach the data sink. Finding an best deployment policy that offers high degree of coverage with network connectivity is quite difficult. In this paper we are discussing about energy efficient coverage with a straight line topology. The energy efficiency can be achieved with proper sleep wake up approach. Sensor nodes are mostly battery operated and are expected to work for a longer time without replacing the batteries. Therefore, the energy efficient coverage is achieved by new the sleep scheduling algorithm which expand lifetime of the system.*

Keywords: Coverage , Deployment, Energy Efficiency, WSN

1. INTRODUCTION

The WSNs generally is an intelligent, low power small in size and low cost solution that enables the efficiency and reliability improvement of many industrial applications such as safety and security surveillance, home and building automation, and smart grids. However, there are many challenges to bring the WSNs into real-life application [1a] Wireless sensor nodes are mainly battery powered, thus having constrained amounts of energy. Each sensor node is associated with a processor transceiver and a power source Instead of sending the raw data to the nodes or header nodes , with their processing capabilities they process the data locally. [4a]

In WSN the energy is a critical point and should be tackled sensibly. A WSN should be autonomous and self-sustainable, able to function for several years with low power. A node's lifetime is defined as the node's operating time without the need for any external intervention, like battery replacement.[3a]

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II. SENSOR DEPLOYMENT METHODS

There is extensive research in the development of new algorithms for sensor deployment, ad hoc routing, energy efficiency and distributed processing in the context of wireless sensor networks. As the algorithms for wireless sensor network are developed, they must be a low-power, highly efficient and adaptable to various hardware platform. Setting up a sensor network nodes in a real world environment is termed as Deployment[14]. Nodes may be deployed in predetermined locations or place them randomly Dropping sensors from a plane would be an example of random placement. The coverage schemes can be easly determined in deterministic placement rather in random placement . However in many deployments, it is either impractical or impossible to deploy sensor nodes in a deterministic way. Examples of deterministic and random placement are shown in Fig 1a and Fig 1b.
Other deployment approaches are dense deployment and sparse deployment. If the sensor nodes are deployed in an area in high density it is termed as dense deployment while a sparse deployment would have fewer nodes. The dense deployment model is used in situations where it is very important for every event to be detected or when it is important to have multiple sensors cover an area. The sparse deployment is cost effective and it should be properly managed and localized with maximum coverage with minimum nodes. In most of the work studying coverage it is assumed that the sensor nodes are static, they stay in the same place once they are deployed.

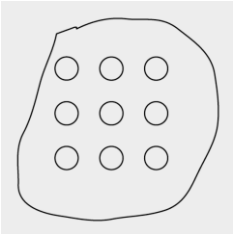

Fig.1 (a) Deterministic Deployment

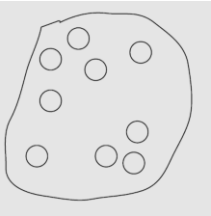

Fig 1(b) Random Deployment [2a]

A more sophisticated deterministic deployment method is given in [6]. The authors propose to arrange the sensors in a diamond pattern which would correspond with a Voronoi polygon.[5] The pattern achieves four way connectivity from each of the nodes with full coverage when the communication range divided by the sensing range is greater than the square root of two. However the pattern is too difficult to practical deployment. It assumes that the sensing and communication ranges of every node are a perfect circle.

III. CONSTRAINTS

Coverage problem is the basic problem of any type of WSN, and is the evaluation criteria of measuring sensor network quality of service (QoS). The core problem of sensor network coverage is "how strong that sensor network monitoring ability of observation in physical space?" [12]The most essential aspect to consider in the design of coverage scheme is the energy constraints. The primary challenge in WSN is energy management. Due to the limited energy the system has to limit its processing power, sensing ability, communication band width, node's form factor etc.[6]. It therefore becomes very essential to save energy and extend the battery life. Placing unwanted sensors into a low energy sleep mode is a popular method to conserve energy. Another method is to adjust the transmission range so that the sensor nodes only use enough energy to transmit to a neighbor node.[5] An hierarchical approach of network design using cluster heads reduce the amount of information sent up to the sink.
This will alleviate the load on the nodes so as to increase their lifetimes. Improving the efficiency of data manipulation and routing is also help to conserve energy. Eliminating the redundancy of data will allow the network to be more efficient by avoiding redundant data from nearby nodes. Optimizing the routing also help to find the shortest path to the sink using the least number of nodes. By using less energy for routing data, coverage is helped by having the nodes' lifetimes extended.[5]
Cardei and Wu present a summary of different approaches to energy efficient coverage problems in [7]. The authors state that most work done in this field was in the theoretical realm at the time of the survey. Chen, Kumar, and Lai extend a barrier coverage protocol to improve energy efficiency. When a node detects adequate k-coverage in the area it will put itself into sleep mode. It will enter wakeup mode after a random period of time and perform another check. If the node is not needed then it will find out from the other nodes when and factor that into its calculation as to when it should wakeup again. The authors in and [8] conserve energy by turning off groups of nodes at a time. The authors in [9] introduce a new protocol in which the nodes can be in any of five different states. When a node wakes from the sleep state it will enter the listen state and wait for a beacon. After receiving the beacon the node determines if it should go back to sleep mode or go to the join state. From this state it will wait for its timer to expire and move to the active state unless it receives a message telling it to return to the sleep state. When the node is in the active state it is providing coverage to the area, it will remain in this state until it becomes ineligible at which point it moves to the withdraw state. Once in the withdraw state the node sets a timer and returns to the sleep state unless it receives a message telling it to return to the active state.

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IV. IMPLEMENTATION OF ENERGY EFFICIENTCOVERAGE AWARE ROUTING PROTOCOL FORWIRELESS SENSOR NETWORK USING GENETIC ALGORITHM

The proposed algorithm is a new approach in wsn where nodes are assumed to be deployed in such a manner that there we could find a straight line localization of WSN nodes. The total sensor fields can be divided into number of circular cluster fields. Each circular fields have a central cluster head. The proposed topology of the nodes is in that circular fields is in straight line

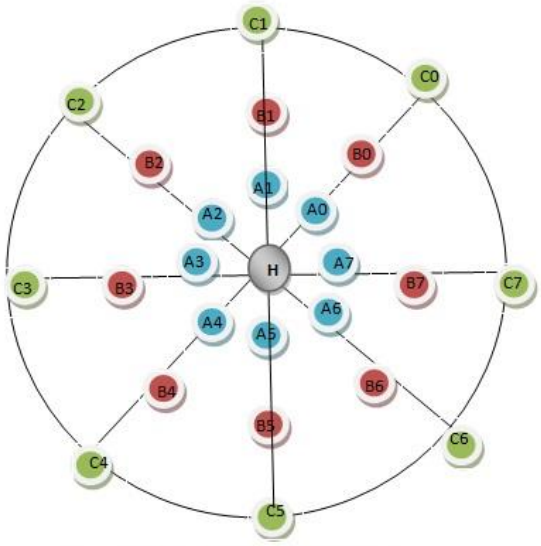

Fig 2: Node deployment in straight line

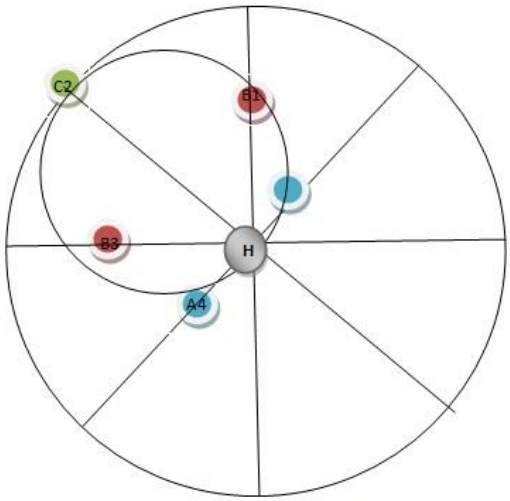

Fig 3: Active nodes in first circular sleep wake up nodes

localization. Each nodes are deployed in almost straight line and addressed in gray code sequence. The gray code sequence is one of the most effective way to address the adjacent nodes for reduced error in selecting the adjacent nodes. Here the nodes are conserve the energy by avoiding redundant data transmission using sleep wake up approach. In wireless sensor networks, sensor nodes generally switch between active and sleep modes in medium access control (MAC) layer to reduce energy consumption.[13] The most common technique for saving energy is the use of sleep mode where significant parts of the sensor's transceiver are switched off. In most cases, the radio transceiver on board sensor nodes is the main cause of energy consumption hence, it is necessary to keep the transceiver in switched off mode most of the time to reduce energy consumption.[15]

TABLE 1:

NODE DEPLOYMENT ADDRESSING

NODE NAME	GRAY CODE ADDRESS				
A0 B1 C2 B3 A4	00000	01100	11011	01110	00110
A1 B2 C3 B4 A5	00001	01101	11010	01010	00111
A2 B3 C4 B5 A6	00011	01110	11110	01011	00101
A3 B4 C5 B6 A7	00010	01010	11111	01001	00100
A4 B5 C6 B7A0	00110	01011	11101	01000	00000
A5 B6 C7 B0 A1	00111	11111	11100	01100	00001
A6 B7 C0 B1 A2	00101	11101	11000	01100	00011
A7 B0 C1 B2 A3	00100	01100	11001	01111	00010

TABLE 2:

PARAMETERS USED IN PERFORMANCE ANALYSIS

Symbol	Description	Value
Tmaxsleep	Maximum sleep Time	5 Seconds
Tsample	Sample Time	1 second
Psleep	Power dissipated during Sleep Mode	600µW

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PCS	Power dissipated when Processing	15mW
Et1	Power dissipated for sending 1 bit of data	1mW
Ed1	Power for transmission over a distance d	1mW
N	Number of nodes considered	30 and 500
A	Area of network	500X500 m2
Pinit	Initial power of each node	10W
Ttone	Time required to send the wakeup signal	Variable
PRX	Power when receiving	45mW
PTX	Power when transmitting	60mW
Pwu	Power when in wakeup mode	177W
Fwu	Frequency of the wakeup signal	862Hz
Fmsg	Frequency of sending message	Variable
Tmsg	Time needed for sending a msg+ACK	21 ms
Thdr	Time needed for sending just a header	7 ms

A sensor consumes Eelec = 50nJ/bit to run the transmitter or receiver circuitry and Eamp = 100pJ/bit/m2 [11] for the transmitter amplifier [10]. Thus, the energy consumed by a sensor i in receiving a k-bit data packet is given by, Eelec* k (1) While the energy consumed in transmitting a data packet to sensor j is given by the equation 1

Txij = Eelec*k + Eamp * d2ij * k ---------- (1)

Where dij is the distance between nodes i and j. [3] So main requirement is to minimize the transmission of data, for this it is thought that if redundant data is not transmitted then a lot of energy saving is possible. [10] The energy spent in transmission of a single bit is given by[9] etx(d)= et1+ed1*dn---------- (2)

The average power consumed by a node , is calculated using the equation 3, depends on the frequency at which messages are sent through the network, denoted by Tmsg. Each message transfer adds energy to the basic costs of the wakeup circuitry (Pwu). Receiving the message also takes Tmsg time. The Table 2 describes the parameters used for the sensor node for the implementation of the proposed algorithm

Pwu=Pwu+Fmsg x ((Ttone +Tmsg) x PTX +Tmsgx PRX+ (N-1) x Thdr x PRX ---------- (3)

The average power consumed for the sensor circle with a time interval of sec is given in graph fig. 4

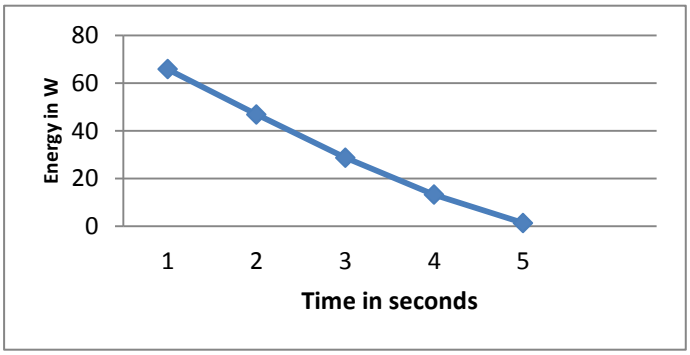

Fig 4: Total energy consumed for ideal one coverage of entire field

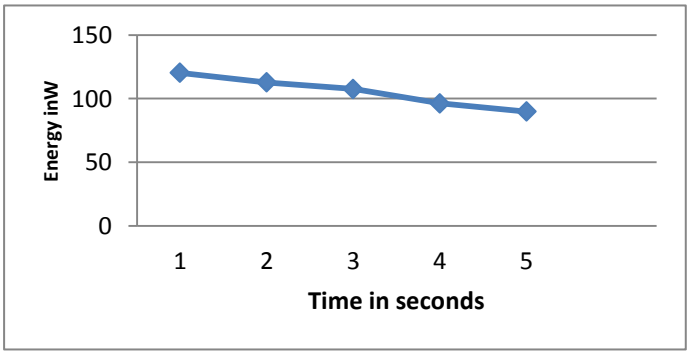

Fig 5: Energy consumed for coverage of a circular coverage approach

From the graph Fig 4 and Fig5 it is clear that the total energy consumed in the proposed algorithm is very less compared to normal sleep wake up mode. With the proposed algorithm circular coverage approach the energy of the nodes is conserved effectively

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V. CONCLUSION

WSN is exclusively used for monitoring the given environment with out any interference. But continuous coverage of a field is quiet challenging as it consumes large amount of energy. The energy aware coverage mechanism with a deterministic topology is quiet acceptable. Here we are proposing a new algorithm where the deployment of sensor node made the sensing effectively without affecting the coverage. Here the sensing field is considered as number of circular node deployment by taking the nodes in straight line and each circle has a central node act as the header node. Within the circle the nodes are made sleep and wakeup mode with another circular formation. From the results it is evident that the proposed algorithm is very efficient in power saving without the affecting of the coverage of the sensing field. For the error avoidance in the node addressing the nodes are addressed in gray code.

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Emerging Rails and Cashless Payments

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Abstract: *With the technological advancement, the scenario of transactions has changed all over the world. The "cash and carry" system has changed its face to the cashless system of today. The cashless exchange system has transcended all the boundaries of the currency exchange or the need of visiting brick and mortal banks. Journal publication is an effort which involves combined work of writers, editors and artists from different countries, each of them transacting in different currency. With people from so many diverse countries and economies participating together, the emerging payment rail and cashless world sounds more like the solution for the payment problems in journal publishing. This paper takes a look at various options of cashless payment available in the current scenario and if they can be used for overcoming the geographical and economic boundaries of the payment. The cashless system covered in the paper includes the current successful payment options of P2P FX, Crypto Currency, Mobile Money and even the Mobile Payment and Streamlined Payment. The paper also notes various ways the system can be altered to suit the needs of the journal publication market.*

I. INTRODUCTION

With all kind of technical miracles in the field of Internet, software, wireless communication, computers, and data analytics, the way the people transact financially has come a long distance. Every aspect of how consumers manage, spend, and borrow money is undergoing a transformational shift. Disruptive innovation is decentralizing money. Now you can buy a cup of coffee or pay bills with the click of a button on your smartphone. Our very perception of monetary value is changing. Currently the following major payment system have been fully utilized: Cash, cheque, ACH, Credit/debit/stored value cards and the electronic transfer transfers.

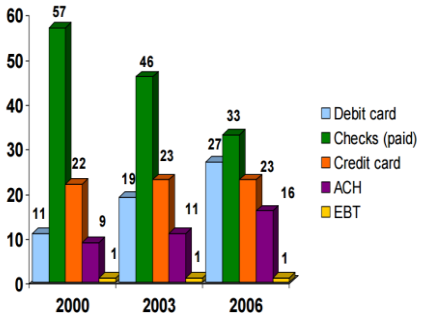

Figure 1: Current Scenario of Non-Cash Transactions

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This figure indicates the situation of cashless payment in the current scenario. As seen the cards and the cheques still win the race.While earlier the only means of payments available were cheques and cash, the scenario has changed considerably now. The first revolution in the world of payment came from the electronic fund transfer system. This Electronic Transfer System allowed one to transfer the money directly from one bank to another. There was no more need for the cumbersome cheque collection or physical meeting to make the payment.
Although this was a huge step in the field of payment, it still did not help the journal publications much. Because a journal is not limited to any particular geographical boundary; a journal includes the effort of number of people, some of which may be residing in the different countries and different economic system. The input from diverse writers and editors from all kind of states and countries can help in better dissemination of knowledge in journal industry. But payment to these writers and editors is still a problem.

Initially sending the cheque to the different country, in different currency was indeed difficult, and payment through cash was far more impossible, the writers have to satisfy themselves either with a copy of the journal, or the journal had to give up on the expertise of the foreign writers. Electronic fund transfer indeed made the things easier within one country; it did not ease the pain of international transfers as most of the banks did not allow international fund transfer electronically. The only option before the Journals was to make the payment via third party mediums like PayPal or Western Union which charges a big chunk of fees. They become infeasible option especially in case the transfer amount is too small.

Another problem that the journal contributors face through these transactions is that they have to contact bank, or have a bank account in order to be able to cash the amount. This becomes a hassle if the banks are not nearby or if the contributor is from the company where banking is still a developing feature. This leaves a journal with only two options—either to forgo the writers who do not have access to the banks or credit card, or just send them a contributor's copy as the compensation which is not a motivating practice for the authors.

But the emergence of cashless world and payment rails looks like the answer to all the problem of journal publishing. These systems are portrayed as an answer to all kinds of national and international payment issues. Although these systems sound too good, the paper takes a look at whether these cashless systems are truly the solution to the journal publication issues or are there some issues which can arise in the application of these systems.

There are many types of cashless rails which are emerging in current system like P2P FX, Crypto Currency, Mobile Money, Mobile Payments, Streamlined Payments, and Integrated Billing etc. These systems ensure the payment via mobile or bitcoins without the involvement of any brick and mortar banks. The future of the finance industry looks very bright with these systems. But then, the same has not been analyzed with respect to the payment options. The purpose of the paper is to analyze these cashless payment rails vis-à-vis difficulties in the payment in journal publishing. For the same, each option is individually analyzed with its pros and cons and its usability in the payments via journal publishing.

II. CASHLESS SYSTEMS AND EMERGING RAILS

For a long time, the attempts are being made to develop a financial system where people can actually go cashless. Debit Cards and Credit cards are innovation in these lines, but payment by these card isnot the right answer for all kinds of payment as the transaction charges are too high, especially if the payment amount is too less. That is why the industry is still searching for a way to overcome such problems.

To overcome this problem, the solution of using electronic fund transfer was introduced, which served some purpose of transferring the amount, but not all the way as most of the Electronic Fund Transfer is within the country itself. International transfers are difficult or almost nil with these fund transfers. Even if such transfers are allowed, the amount deducted in the process is quite high. These high charges are unjustified for the smaller amount which might need to be transferred.

Another problem faced by these transfers is the necessity to have the working bank accounts. In the developing continent like Africa, there are many countries which only have one to two banks and queue before these banks is so long that the person will take hours to turn the money into cash. Electronic transfer is also not very fruitful as there are remote places where availability of infrastructure for accessing the account is quite a bit sketchy.

To overcome the many weaknesses of the debit/credit card system and electronics system, the world is leaning more and more towards the cashless system. Bill Gates has been rightly said, "Banking is essential. Banks are not." The people are realizing this fact and with the help of technology have broken down the barriers of retail finance sector. While earlier the payments needed to be transferred physically, or through credit or debit card, these days it can be done directly. Two major technologies which have affected this change are the ubiquitous use of mobile and crypto currency.

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A. Cashless Mobile payment Options

With the widespread use of mobile devices, a new type of channel, called mobile commerce, is emerging. This involves transacting using mobile. This can be a P2PFx transaction of the transaction using the M-Pesa or similar such application.

A mobile payment or m-payment is the kind of payment which is done initiated, authorized and confirmed using a mobile in return for goods and services offered. It is an alternative to the electronic payment done with the help of telecommunication technology. Mobile devices include all electronic devices which can connect to the mobile networks like mobile phones, PDAs, wireless tablets etc.

To make these payments two different technologies are used—short messaging service (SMS) and Near Field Communication (NFC).The example of companies using SMS for providing m-payment service involves PayPal and TextPayMe. An example of company using NFC is VIVOtech, which partners with companies such as Phillips, American Express, MasterCard, Visa, Symbian, and Sprint, etc. Mobile serves a platform for bringing together the service provider and clients providing them with a place to serve their basic need of transaction.

The basic process of the mobile payment can be shown as follows where in the client and the product/service provider transact with each other using the Payment Service Provider. This payment service provider can be a bank or the card itself. It is the responsibility of this payment service provider to authenticate the payment from the end of the sender and then establish a link with the receiver. The amount is finally credited in the account of the receiver directly.

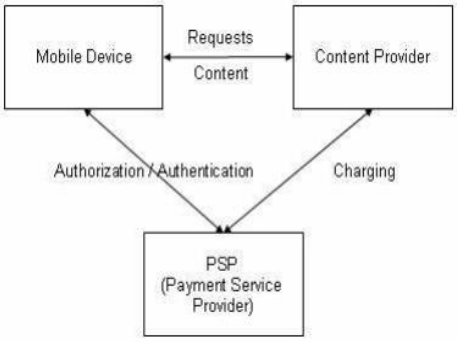

Figure 2: A Mobile Payment System

This figure shows the process of mobile payment system as the transaction happens between mobile device, content provider and the Payment Service Provider.

A user purchases the service or the product and then initiates the payment using Payment Service Provider. He may be called for entering a PIN or a password to authenticate the transaction and then the amount is transferred to the content provider's account.

Sometimes the mobile payments are done using a third party provider as well who then collaborates with the Payment Service Provider which can be the bank or the credit card to provide the ease of transaction to the customers.

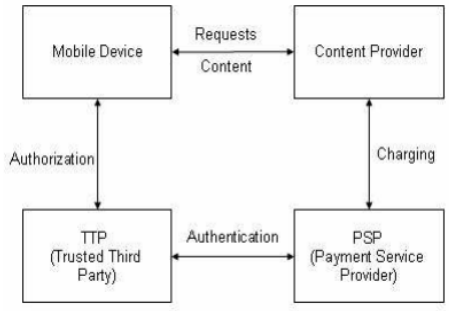

Figure 3: A Mobile Payment System With Participate fro TTP

This figure shows the process of mobile payment system as the transaction happens between mobile device, content provider and the Payment Service Provider

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Many of the European countries, and Korea, Singapore and Japan have already gone far down the path of technological innovation, systems design, implementation, adoption, use and refinements.
This system offers huge advantages in terms of its usage:

1) SocioEconomical Condition: Most people in developing economies do not hold any alternative to cash like bank account or the credit card. There are states in countries like Africa where the number of banks is too less for the population and the individuals have to stand in line for hours to encash their paychecks. Mobile Payment is a boon for such as that can be directly encashed for them while being used for the service.

2) Informal Social Security: In the countries, especially in developing countries, where there are no means to transfer the cash quickly, mobile payment plays a very important role as it allows the families and friend to provide instant cash in times of emergency.

3) Rapid Diffusion of Mobile Phones: The mobile phones have penetrated even the remotest areas of the countries. Even for the developing countries, mobile is an easy alternative to receive a payment.

4) Ease of Financial Transaction: Mobile phones offers an ease of transaction as one does not have to visit a brick and mortar bank physically to get the currency. Instead if once received in mobile, it can be directly used for further purchase of the products and services. Mobile platform also allows transferring the amount directly using the M-payment platform.

But not all is rosy in the world of mobile payment. Mobile payment is fraught with some different challenges, the biggest being the presence of multiple platforms. There are many options of mobile payment available right now and these platforms do not communicate with each other. This becomes a bigger problem when the payment is made via a medium which the other person does not prefer or vice versa. Similarly not all the vendors accept payments from all kinds of the mobile payment platforms. The mobile platforms are a perfect solution if both buyer and seller prefer the single platform of mobile payment solution. Another factor which comes into play is the development of an app for all kinds of mobile platforms, which in turn is quite an expensive process.

Last but not the least, mobile payments are still not secure because most of the sensitive data required for the payments is stored in the cache of mobile, mostly as something called saved cards. Anybody who has the access to the phone has the access to this information. Probably that is the reason many people are still not opting for the mobile payments. Moreover the security of the payment is differs between the different mobile payment options.

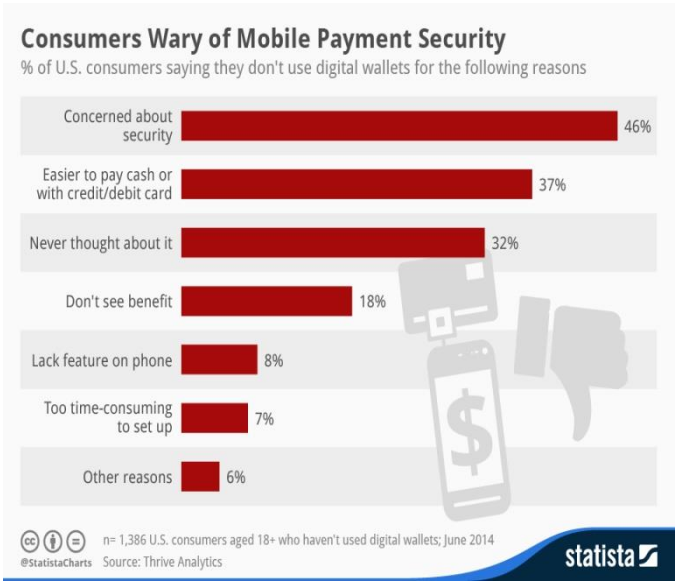

Figure 4: Reasons Why Consumers Do Not Prefer Mobile Payment

The above graph from the website of Statista clearly elaborates the various reasons why the mobile payment has not succeeded despite all its promises. Many of these problems are applicable for the Journal payment as well.

B. Peer to Peer FX System

Another cashless system which can be utilized using mobile is P2P Fx system or Peer to Peer Forex Transfer. The biggest problem people face while transacting across the world is how to send the money abroad. The banks and third parties currently charge huge amount of commission for this kind of transfer. This is the problem which is solved by peer to peer currency exchange. This platform provides an opportunity to send the currency across the geographical locations without denting the amount through commissions.

The concept of the Peer to Peer exchange is quite different. In these, the two people looking for the exchange are connected together.

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Fig 5: Representation of Peer Exchange

Peer Exchange has been represented using this figure which show how both the parties exchange their currencies with each other. For example, let us assume A wants to exchange Dollars to Euros, and there is B somewhere who wants to convert Euros to Dollars. The peer to peer exchange company will bring both A and B at a mutually agreeable rate so that they can exchange the money as per the agreed rate. There is no payment involved. No currency leaves the site. The currency only exchanges hand from one user to another. The currency fair, one major such site offering this service has elaborated this process in the following image.

Fig 6: Working Process of Peer Exchange

The Logo of the peer exchange currency website clearly indicates how the process functions.

The sites which allows this service are : CurrencyFair, Kantox (for businesses), and TransferWise. The users can either accept the predefined rate or bid for the lower rate. The P2P Fx platforms also provides the liquidity even when no match is there through their own funds. In such cases some amount of money is charged for the service. The major advantages of the system can be listed as follows:

1) Ease of Exchange: As evident from the whole process, there is an ease of exchanging the currency. One does not need to search for a reliable vendor for currency exchange and one can get the amount exchanged from the comfort of home itself.

2) Economical Currency Exchange: Most of time of the time, if the right rate of exchange is found the currency exchange becomes quite cheaper on these platforms rather than while dealing with the direct vendors.

3) Easy Liquidity: Even if the right match is not found, the above mentioned communities still provide the exchange for a nominal charge which is still lesser than that offered by the vendors in the market.

As explained above, the biggest advantage of this platform is the cost saving options it provides. A person has the capacity to save on the huge commissions that they would have otherwise paid with these platforms. But the platform suffers from a disadvantage as well. There are chances that the customer might not be able to get the corresponding match if the amount is too small or too big. In such cases, the customer is forced to go for the higher exchange rate than expected or bidded by them. Also, this is a perfect way to exchange the currency, but this does not serve as a payment medium exactly. The companies do not provide an option of transferring the exchanged currency to somebody else's account and hence the system is not very successful as the payment medium. There have

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been attempts for integration of payment system wuth P2P Fx, the success of the platform as a future payment platform is still in doubt.

C. Crypto Currency

This is the third and currently most sought after cashless payment system. Crypto currency is a different kind of cashless transactions in a manner that it does not involve any kind of currency or the fat currency published by the government.

While the above two transactions involve the currency, the only currency crypto currency involves is the electronic currency. These currencies are not printed, like dollars or euros – instead they're produced by people, and increasingly businesses, running computers all around the world, using software that solves mathematical problems.

These are generated or mined electronically, transacted electronically and spend electronically as well. The most famous of crypto currency available is the Bitcoins. The biggest difference between the cryptocurrency and the cash is that the crypto currency is decentralized. No bank holds the right of printing the crypto currency; no single institution controls the crypto currency.

The system relies on public-private key technology and the decentralized clearing of payments to enable quasi-anonymous transactions.

The system of bitcoin can be explained with the following example scenario. Suppose there are two parties—A and B both parties in a transaction have a public and a private key. The payer A uses its private key to verify that it is the rightful owner of the cryptocurrency. The payer, A, then identifies the payee, B by the latter's public key. To make a transaction, payer A submits this information to the bit coin software that so and so transaction is taking place. Submitting this information via the bitcoin software effectively amounts to requesting that all other peers on the network acknowledge the transaction is valid.

Once the transaction is authenticated (discussed below), all other peers are notified that the payee now holds the balance transferred from the payer. To spend these coins, the new owner repeats the process— becoming the payer to a payee identified only by its public key. The following flow chart clearly depicts the working of the crypto currency like bitcoin. As evident from the drawing below, the bitcoins are generated by a pool of the user who then circulates these among the peers. The peer can further purchase the product and services using these bitcoins. At some places, these bitcoins are also being used for making the payment for the product, while there are some facilities which allow the use of bitcoins for withdrawal of the actual currencies.

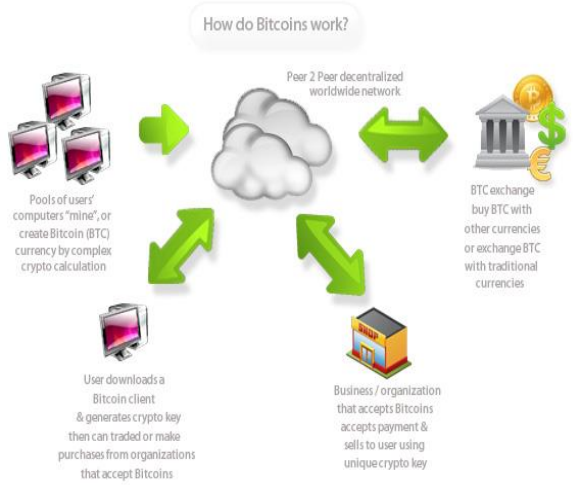

Fig 7: Working Process of the BitCoin

BitCoins, the most famous of Crypto currency, can be used to understand the process of working of the crypto currency. The above figure indicates the steps from minting of the BitCoins to the exchange of BitCoins.

The major advantages of the process are:

1) Decentralized Process: The process is decentralized and is not controlled by any particular authority, which means there cannot be a meltdown because of one institution. This gives a huge amount of confidence to the users who can utilize this system without the fear of collapse.

2) Easy to set up: Doing transaction is quite easy via this system as this does not involves going anywhere or contacting any third party.

3) Anonymity is possible: While it is not possible to transfer the amount anonymously in any other media, this medium allows transferring the money quasi-anonymously to anyone. Even the receiver can be anonymous with this medium.

4) International Payments: Because the crypto currency work as a single currency throughout the world, sending the currency via this crypto currency to different country is also possible. Moreover one does not have to pay for the hefty conversion charges if such the payment mode is selected.

5) Economical: Currently there are very little to zero charges in the bitcoin transaction. Hence sending the money in terms of bitcoins cost less than the actual transfer of the money.

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6) Bitcoins have already established themselves in quite a few market. The following graph indicates the number of bitcoins traded from the year 2010-2013.

7) Record: Every transaction is well recorded in the Bitcoin leger. So even if there is anonymity, it is actually possible to trace back the history of each transaction.

8) Protection from identity theft: One of the biggest fears while sharing the account number and other details is that one's identity might get misused. The use of crypto currency keeps the identity hidden behind the veil of address and hence it is a much safer option.

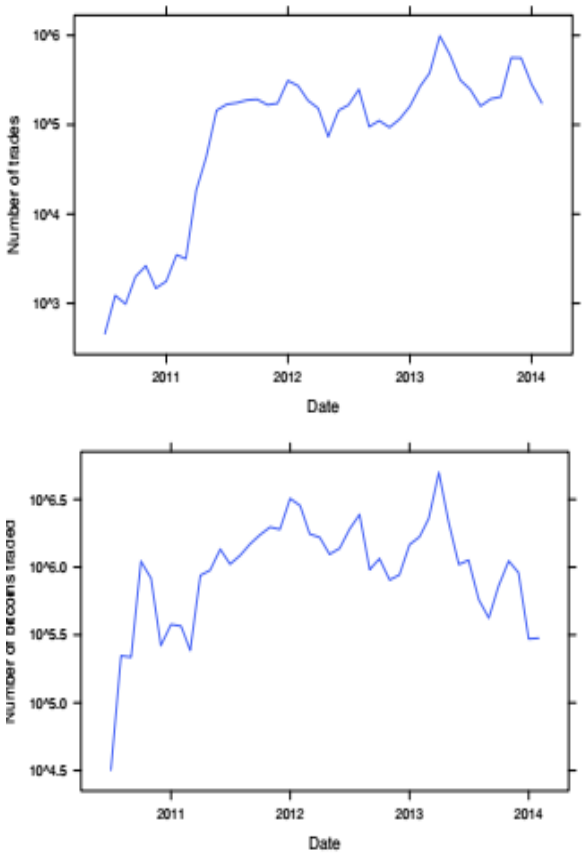

Fig 8: Increasing Popularity of the Bit Coins

The above graph shows how the bitcoins have become more famous and have gained popularity. The top graph indicates the rise in the number of traders for the bit coins, while the bottom graph indicate the number of bitcoins traded from 2010 to 2013.

The above list of advantages show that the crypto currency is indeed the future of the payment system, but it is not without its disadvantages. The biggest setback for the currency is the people are not aware about the process of cryptocurrency. People do not know what the benefits of these crypto currencies are, and those who know consider that as the means to purchase illegal stuff. For crypto currency to succeed, awareness about it needs to be generated.

Another disadvantage the crypto currency suffers from is its acceptance partners. There are few partners which offer the accept bitcoins but their number is quite less as compared to that of the other platforms. Hence it is not usually the preferred means of the payment.

Another disadvantage is the government's non-support in many countries. The countries on the brink of bankruptcy believe that bitcoins impact the economy negatively and that because of this negative economy it is not possible to control the inflow and outflow of cash Due to this, the transactions through bitcoins were considered illegal for a long time.

With all these roadblocks, it does not look feasible for the crypto currency to become the most favorable means of the payment in the near future.

III. EVALUATION OF THE CASHLESS SYSTEM

We have already identified the various advantages of the cashless options available. This section compares those advantages vis-à-vis journal publishing. To understand whether the system can be used or adopted for payment for journal publication we first need to understand the difficulties in payment in the field of journal publishing.

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1) The first and the biggest difficulty that arise in the journal publishing is of the geographical and economic boundaries. For a journal to present the multifaceted view, the authors, contributors and editors from different area should contribute. This contribution from authors of different countries will be a big help in dissemination of knowledge and keeping abreast of latest trends. But these widespread contributors and audience becomes difficult to handle financially. Most of the time, one has to either forgo the payment option while publishing with the international journals, or either the journals have to avail a service of the third part for making the payment. Cashless payment option like Peer to PeerForex, M-Payment and the crypto currency payment can be the answer to the problem of journals and magazines. They will allow the transfer of amount without any delay and can either be encashed in different countries.

2) Each journal involves multiple authors. Sending separate payment to them is a cumbersome job. Scheduling the payment and transferring the amount directly through the cashless medium can be a big help in such cases as this will allow scheduling the transfer beforehand through a single click or using the handy option like mobile phone for making the payments.

3) Another disadvantage the journal payment suffer from is the region of development. This problem is not faced in the developed countries, but in developing countries, where the problem is more pronounced because of non-availability of the cash in hand to the journals. These journals find it difficult to survive because of the problems associated with the payment. In such cases, payment through these mediums can go a long way in helping these journals to thrive.

4) The fourth disadvantage is for the authors who live in remote areas and who find it difficult to go to the bank because of their age or physical health or because of the absence of banks in their region. For such people, cashless payment is a boon as it will allow the authors to directly use the money for the purchase of the goods and services online. Be it M-Payments or the use of crypto currency, the currency in their phone and crypto-account is much more useful and liquid than the currency in the account.

The analysis of each system can give us an idea whether the method can be adopted for payment for the purpose of payment for journal publishing.

Mobile System is the most developed of cashless system. It has already been adopted in many countries and continents. M-Pesa is the preferred mode of payment for the countries of Africa. This Mobile Payment can indeed be used to make the payments for the journal. But for that, one will need to adapt to the needs of the contributors. There will be needed a common platform where all the details of smooth payment can be checked upon. A payment mode should be such that it should be convenient for both the payee and the payer.

On individual scale, mobile payment has been experimented in many of the developing countries. For the payment of taxi fares, for the payments of food, for grocery payment—many companies have their introduced their own wallets. Beyond this as a common platform, many of the telecommunication companies have tied up with the wallet of M-Pesa. With the widespread advent of M-Pesa as the preferred mode of the mobile payment, this indeed looks like a feasible option in the very near future.

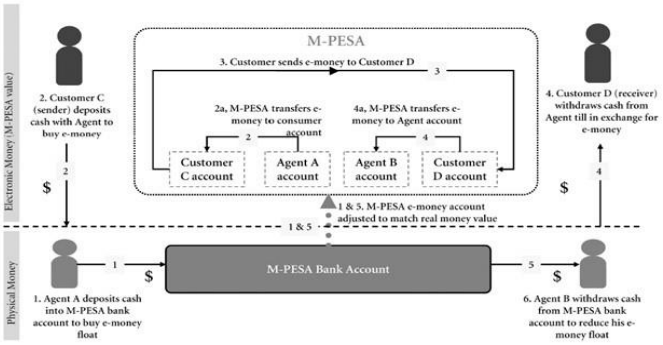

Fig 9: How M-Pesa Works

M-Pesa is the most well-known among the mobile payment platforms and is being utilized widely. This is the only platform which has the capability to be used as a single platform for the payment throughout the world.

The international transaction through mobile payment has not yet been explored, but if explored mobile payments will be a perfect solution to all the problems faced in the journal publishing.

Peer to Peer Foreign Exchange looks like an answer to half the solution of the foreign payment problems as it will allow the easy transfer of the payments beyond the geographical boundaries without any excessive conversion charges. But till date the peer to peer exchange has only be used as the method of funds exchange rather than payment in itself. It means that although peer to peer foreign exchange allows the currency to be exchanged through its platform, it does not allow deposition of the exchanged amount in a different account.

Hence even though peer to peer foreign exchange sounds like a promising solution, it has a long way to go in terms of development. Integrated means of payment along with the peer to peer exchange needs to be established. Furthermore, the current scenario means that the exchanged amount once received is again deposited in the bank. This means that in any condition the receiver will have to go to the bank to cash the amount. Thus peer to peer foreign exchange in itself is an incomplete answer to the problems of payment of the journal payment.

Crypto Currency is the most famous option among the financial gurus. It is an option, which many people are looking at for the future of investment and payments. Crypto currency overcomes all the problems of the payment in journal publishing. It does not

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involve going to bank either for deposition of the amount or for the withdrawal of the funds. It can easily solve the problem of the international payments, and it is also liquid enough and can be used directly for making the purchases. This looks like the perfect solution for the problem of payments in journal publishing.

The crypto currency has already established its place in the hospitality industry as well as the gaming industry. Gaming industries have been using the system like bitcoins for the purchase of the various resources while playing the game. This might not be the widespread use of crypto currency, but within a system, it is a perfect solution for the transactions between gamers from different parts of the world.

Similarly hospitality industry introduced the crypto currency in the loyalty points where in point collected through the different hotels of the network are used to pay for the stay and food.
So cryptocurrency in itself is not a new phenomenon. But despite all the factors this system also is still a far off dream. First of all, the problem is that the people are mostly unaware about how this system works. The general consensus among the people is that the system is used for the payment of illegal goods. So, in order to implement the crypto currency as the payment mode for journal publishing, a widespread awareness program will be needed which will ensure that people are aware about the system firsthand. Also, it is required that the system should be adopted by many sellers as well so that the contributors who receive the money can utilize it.

So, implementing the crypto currency as the means of the payment is indeed a difficult goal.

But there can be an option of using the crypto currency within the journaling arena till that time. That is like in the gaming system, a journal environment can be created throughout the world for the different journals. The payment of the contributors can be in standard form of crypto currency and the purchase of the journal can be in a similar way. This will ensure that if nothing else, the contributors can at least purchase a copy of the journal they need.
But this system can be successful only if the journals worldwide or interestwide accept the same norms of payments. Else, the crypto currency will be on hold till the time when more partners adopt the payment through these currencies.

IV. ROAD MAP TO FUTURE

Despite various advantages, the financial payment rails suffer from many disadvantages as well. In order to adopt these financial payment rails as the part of the daily transactions, there is an inherent need to reduce these disadvantages, so that the people can utilize the advantages offered by these payment rails. The road to future seem fraught with lot more roadblocks. In order to switch to these cashless payments instead of the regular payment, following roadmap may be utilized in general.

1) Awareness Programs: This is indeed the first step in adopting this kind of payment system. While developing countries are well-aware about the options of mobile payment system, they are still unaware about other cashless options available to them. Similarly, the developed countries are sitting on the sidelines to see how the cashless payment options will change the face of the financial landscapes. The first step in introduction of cashless payment as the means of the payment in journal publishing is to start an awareness drive. This awareness drive can be taken by either a few or all the journals together. This will ensure that the contributors as well as customers are aware about this system as an option for receiving and advancing payment.

2) Development of Legal Framework: Currently the system of cashless payment is not fully developed because there are no central guidelines or regulatory framework in place to secure these payments. Each platform runs on its own set of rules which also varies from region to region. There is a need to establish a proper legal framework in association with these emerging payment rails. Right now, there is no option of getting redressal in case the payment go awry. Most of the legal and judiciary systems do not even recognize these emerging rails.

3) Setting up of Regulations: As explained in the above point as well, the need of the hour is to develop a central framework. Crypto Currency does have some inherent code like specifying the maximum number of bitcoins that can be mined at a given time, but all such rules and regulations need to centralized and integrated in the similar manner so that the users do not feel lost and insecure.

4) Development of Common Platforms or Integrated Platforms: With so many platforms coming up in different regions and different countries, for seamless cash transfer, the need is that these platforms should communicate with each other. For example if take two mobile payment platforms, it is important that the mobile platform talk to each other and allow transfer to each other's platform. This will increase the usage of the payment sent using these methods. Similarly cryptocurrency also need to be integrated with other methods including mobile payments and bank transfers so that the customer can realize the true value of the funds transferred as the crypto currency.

5) Seal of Acceptance from the banks: This might seem like an anti-cashless system argument, but the fact is that despite all the modern means of payment and options, customer's trust on bank system is more as compared to any other system. In order to truly integrate the cashless payment system, seal of approval from bank and government authorities is needed. This will ensure that people feel confident in transacting over the platform and the fear of security is taken care of.

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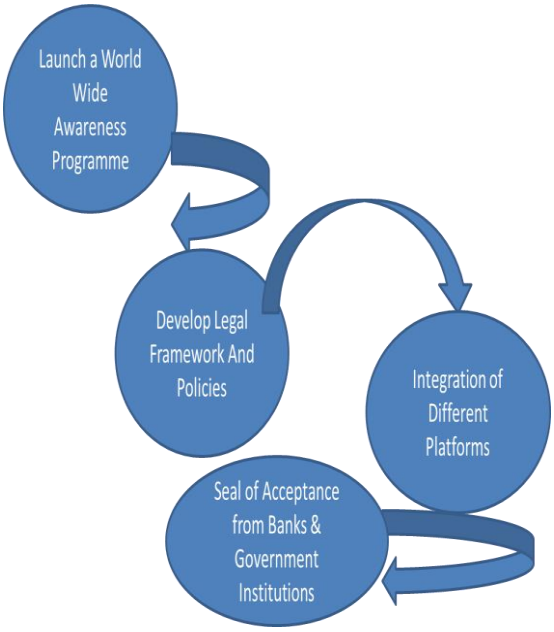

Fig 10: Roadmap for Future

Future of the Cashless Payment and Emerging Rail is quite bright if the system can take care about allaying the fears of the people.

In order to establish the system of cashless payment in the field of journal publishing the steps needed will be almost the same. First is the awareness programme which should be slowly used to spread the idea about different kind of payment modes available to the contributors. The next step will be to integrating the world of journal in a single platform. This single platform of payment, be it the crypto currency or the mobile payment network can then be used as a single platform by all the journals. The platform can be customized to suit the need of the journals. Such customization has already been seen in the gaming industry as well as in the industry of hospitality. In a similar manner, the cashless payment option can be simplified and adjusted to suit the need of the payment options in journal publishing. Last but not the least step is to develop a seamless system which will instill the confidence in the mind of the contributors.

V. CONCLUSION

As the details above indicate, the cashless payment indeed offers and interesting choice for the payment in journal publishing. It has already taken world by storm, and by the virtue of its ease of transaction, lower commission, and wider reach, it is a perfect solution for journal payment options. Also evident is the fact that the emerging rails and cashless modes of payment indeed offer the great advantage. But despite this, these are not yet accepted means of payment for the following reasons:

1) Many of these cashless modes of payment are not considered secure. Despite the various security measures being taken to control the transaction, there have been many instances of misuse of the currency.

2) These cashless payments do not enjoy full blessings of the government and associated authorities and hence are not considered quite safe. There are even the places where crypto currency is considered illegal. This kind of uncertainty creates a doubt both in the mind of the authors and those of the publishers and hence the payment is not really preferred through the cashless payments.

3) Cashless payment has not gained momentum yet. Although many companies are accepting these cashless modes, the people in remote countries are still unaware about the various options of cashless payment.

Not only the publishing world, but the whole industry is sitting and waiting on the sidelines to see how the security and the infrastructure issues will be resolved by the system. The same is the case with the journal industry. There definitely are the advantages of going for the cashless system of payment and there is no doubt that this system will solve the constant battle of the payment journal industry face. This kind of payment system will also help in attracting the talent from the different geographical locations. For the developing countries, this can be a perfect answer to the lack of knowledge in a particular area. This will also attract more buyers from the different areas, thereby increasing the circulation of the journals in the market. But for it to be adopted, the system for the cashless payments is not fully in picture yet. The required infrastructure, security means, and regulations are still under the process of development. The government authorities throughout the world have not yet given their nod to these payment systems. Moreover, there is not common platform to integrate these systems throughout all the locations. Owing to all this, the cashless payment seems lika a far-fetched dream. But then with the kind of development the technology has seen in past decade, it is entirely possible that the security measures and infrastructure for the cashless payment will undergo a drastic change in the near future.

The most probable option for now looks like the mobile payment, which can at least be currently also adopted in the particular geographic region if not worldwide. The countries in Africa and Asia, where mobile payment has already established its roots, can go

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forward with the payments through the mobile payment. Crypto currency is still quite far away because of the prejudice and the government's disapproval hanging like a cloud over its growth. But once implemented, crypto currency is by far the best solution one can visualize for the payments using the cashless system. Peer to Peer Foreign Exchange, although a feasible and very helpful method, is very far off in the race of payments. It will take a lot of integration and development of infrastructure for the idea through this platform to fly off.

All in all, we can say that although journal payments cannot use the cashless system directly, the day is not far off when both the contributors and publishers will find their answer to the payment woes in the cashless system.

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Forestalling the Distraction Accidents by Using Cellular System

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Abstract: *Talking on cell phones while driving is as fatal as driving our car after drinking which can lead to various disastrous major miss happenings. Do you know that using a mobile phone while driving can affect the cognitive functions of persons, distract his or her visual concentration and also the speed of processing information. It has been also proved that use of cell phones while driving puts a driver at a significantly higher risk of collision by distracting their mind. It matters whether the person makes use of hands free or hand-held phones, which has no escape to it. This deadly combo has significantly increased the risk of accidents in range numbers. The theme of this project is to make the driver to attend only the emergency calls. Initially driver should enable call forward to system number. When a call is made to driver, the caller will receive a message intimating that he is in driving. If once again he calls the driver then it is understood that it is emergency. So the driver will get an intimation regarding the emergency call through LCD display. If he wants to make a call, he must stop the car. Unless the system will recognize in such a way that the driver is speaking in mobile phone while driving. It automatically reduce the car fuel supply by variable Solenoid so that the driver will have time to park the car. Thus the system prevents accidents due to phone calls.*

Keywords: GSM Module, Mobile Phone Sniffer ,DC Motor, Solenoid valve, Flow sensor, RPM Sensor

I. INTRODUCTION

Every year nearly 1.4 million people have been killed because of they are wireless customers and their over-bearing cell phones. While in India, an estimated 1.35 lakes person died due to road accident in 2010, which is approximately 10% of road accidentfatalities worldwide as shown in fig.1and these figures are the highest in the world. Still no research has been carried out to find the number of drivers using cell phone involved in road accident and very limited efforts has been carried out to prevent accident due to cell phone usage.

In existing systems as vehicle manufacturers continue to increase their emphasis on safety with advanced driver-assistance systems (ADASs), we propose a device that is not only already in abundance but portable enough as well to be one of the most effective multipurpose devices that are able to analyze and advise on safety conditions.

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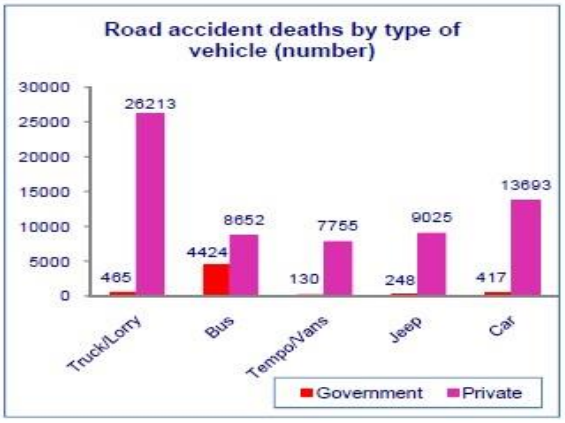

Today Mobile smart phones are equipped with numerous sensors that can help to aid in safety enhancements for drivers on the road. We use the three-axis accelerometer of an Android-based smart phone to record and analyze various driver behaviors and external road conditions that could potentially be hazardous to the health of the driver, and the automobile. The use of these data can educate a potentially dangerous driver on how to safely and efficiently operate a vehicle and With real-time analysis and auditory alerts of these factors it can increase a driver's overall awareness to maximize safety.

II.PROPOSED APPROACH

With the aim of preventing these accidents, we proposed to develop a highly efficient automatic system for early detection of incoming and outgoing call, with the help of an antenna along with mobile detection unit above the driver seat.

This unit shown in fig:3 is capable of distinguishing whether the cell phone used either by the driver or by the passenger; if the driver uses of cell phone is detected, a safety application named Cell phone Accident Preventer will be automatically load on the driver's cell phone which helps in eliminating the risk of accidents from being occurred and at the same time ensuring that the user does not miss any emergency call.

It shows how the sniffer system shown in fig:4 will help in preventing accidents and to what extent this system will help in reducing the Indian economic loss incurred unnecessarily due to road accident fatalities.

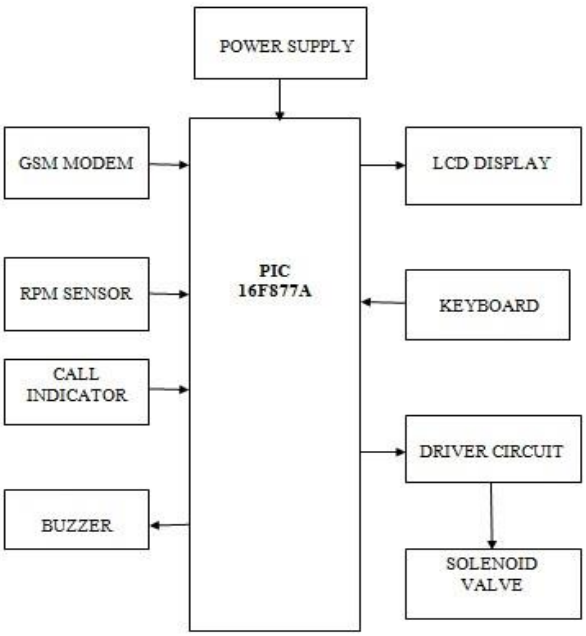

Fig: 2 Block Diagram

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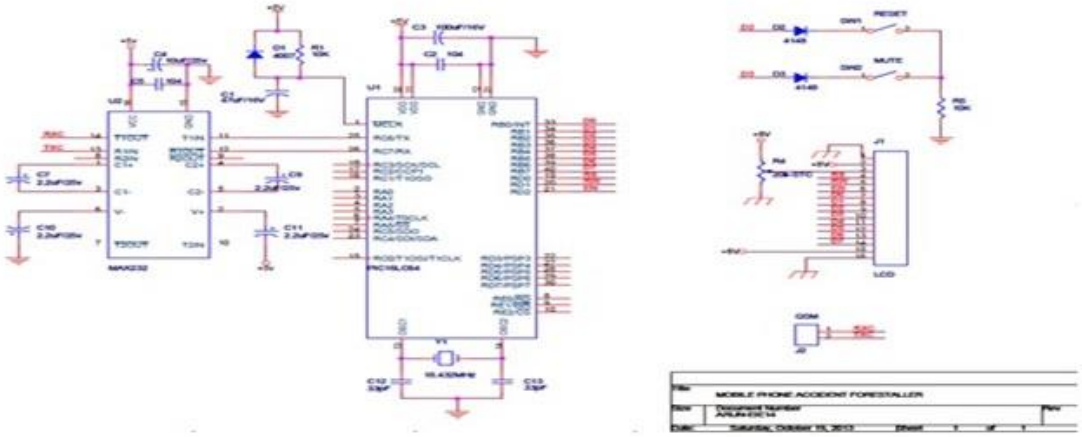

Fig: 3 Master Board Circuit

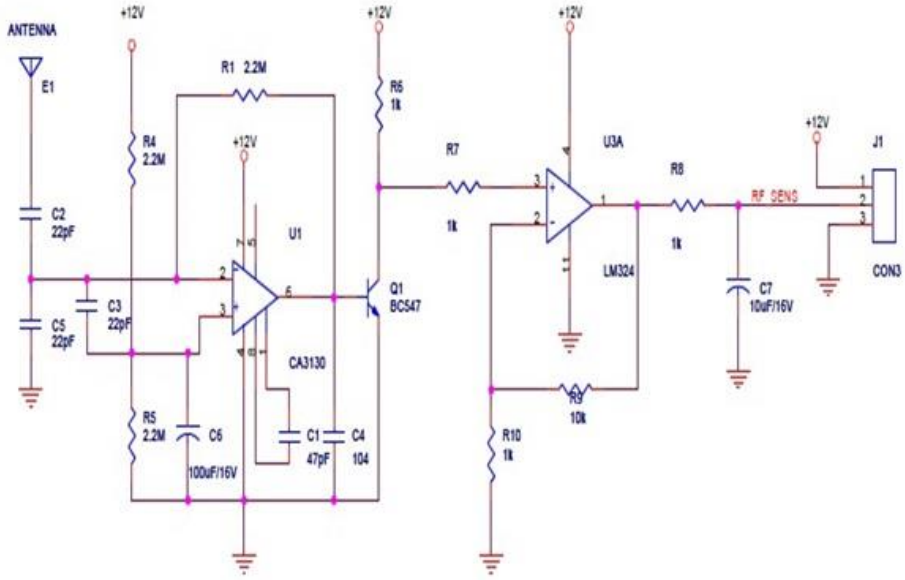

Fig: 4 Mobile Phone Sniffer Circuit Diagram

III. COMMUNICATION DEVICES

a)MAX232

The MAX232 is an integrated circuit that converts signals from an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits and it is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals. This drivers provide RS-232 voltage level outputs (approx. ± 7.5 V) from a single + 5 V supply via on-chip charge pumps and external capacitors which makes it useful for implementing RS-232 in devices that otherwise do not need any voltages outside the 0 V to + 5 V range, as power supply design does not need to be made more complicated just for driving the RS-232 in this case.The receivers reduce RS-232 inputs (which may be as high as ± 25 V), to standard 5 V TTL levels. These receivers have a typical threshold of 1.3 V with a typical hysteresis of 0.5 V. The MAX232A is backwards compatible with the original MAX232 but may operate at higher baud rates and can use smaller external capacitors – 0.1 µF in place of the 1.0 µFcapacitors used with the original device.

b) GSM MODULE:

A GSM modem is a specialized type of modem which accepts a SIM card and operates over a subscription to a mobile operator like a mobile phone. A GSM modem exposes an interface that allows applications such as message to send and receive messages over the modem interfacing part.

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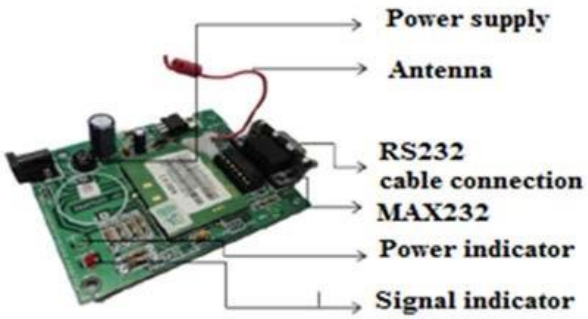
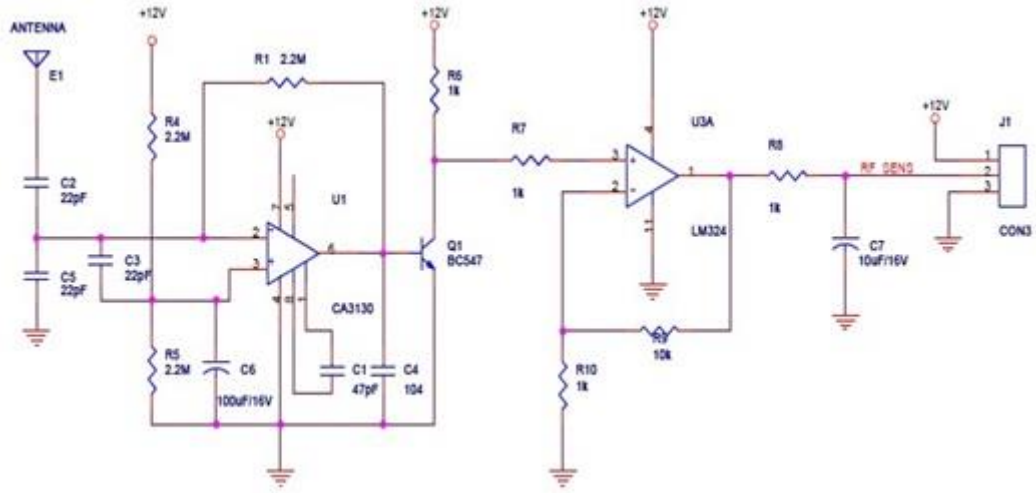
Fig : 5 GSM module





The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a
GSM modem must support an "extended AT command set" for sending/receiving SMS, as defined in the ETSI GSM 07.05 version and 3GPP TS 27.005 specifications. The interfacing between the GSM and the Microcontroller and the developed module is shown in the fig: 5..

IV.SOFTWARE ANALYSIS
A) ABOUT SOFTWARE

The main purpose of using the microcontroller in our project is because highperformance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. By combining a versatile 8-bit CPU a with in-system programmable Flash on a monolithic chip, the Microchip16F877A is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications.

The programs of the microcontroller have been written in Embedded C language and were compiled using MPLAB, a compiler used for microcontroller programming. The communication between PC and the microcontroller was established MAX 232 standard and those programs were also done in C language. The following programs are used at various stages for the mentioned functions Serial communication. The various special function registers of the microcontroller are set such that they can send and receive data from the PC which uses the serial library to communicate with the ports.

b) SUPPORT FOR ALL 16F VARIANTS

The PIC Family is one of the fastest growing Microcontroller Architectures. More than 400 device variants from various silicon vendors are today available. New extended PIC Devices, like the Philips 80C51MX architecture are dedicated for large application with several Mbytes code and data space. For optimum support of these different PIC variants, MPLAB provides the several

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development tools that are listed in the table below. A new output file format (OMF2) allows direct support of up to 16MB code and data space. The CX51 compiler is a variant of the PIC compiler that is design for the new PIC 18F architecture.

c) PROTEUS

Proteus VSM is used to bridge the gap between schematic and PCB for embedded design, offering system level simulation of microcontroller based designs inside the schematic package itself.

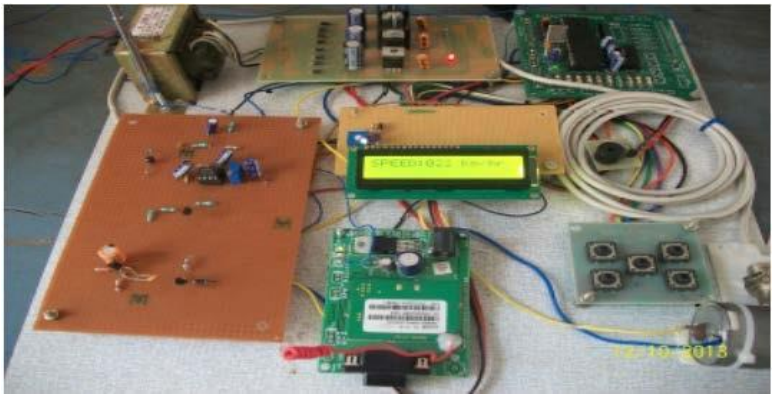
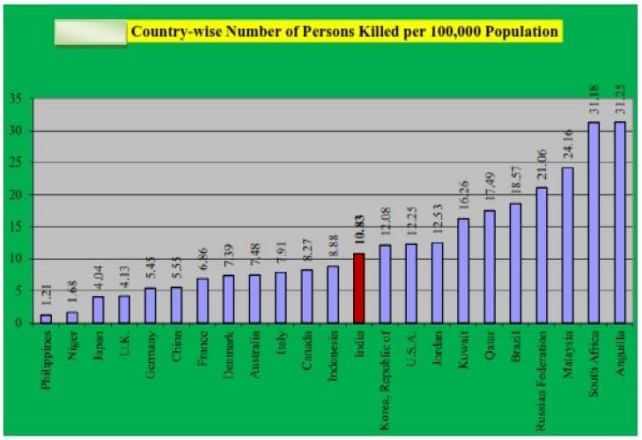
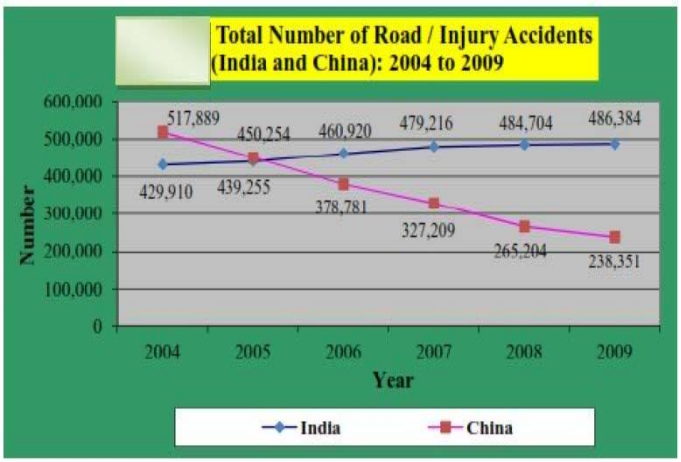


Fig : 6 Prototype V.EXPERIMENTAL RESULTS a) Accidental Injury Rate (per lakh of population) in India



b)Comparitive status of road accidents in India and China



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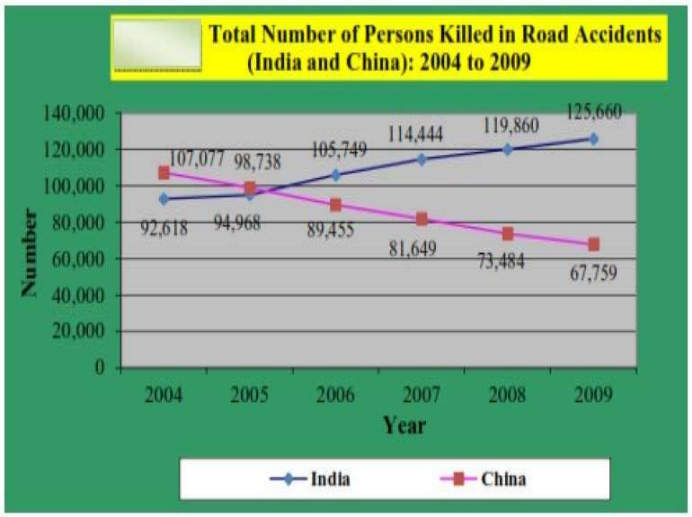
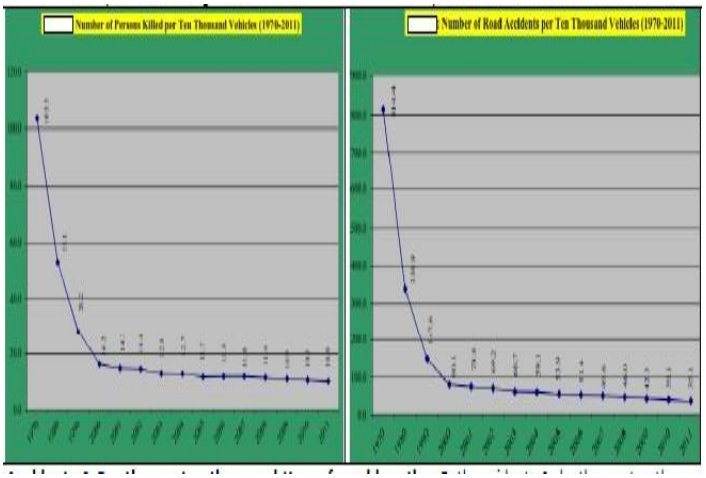
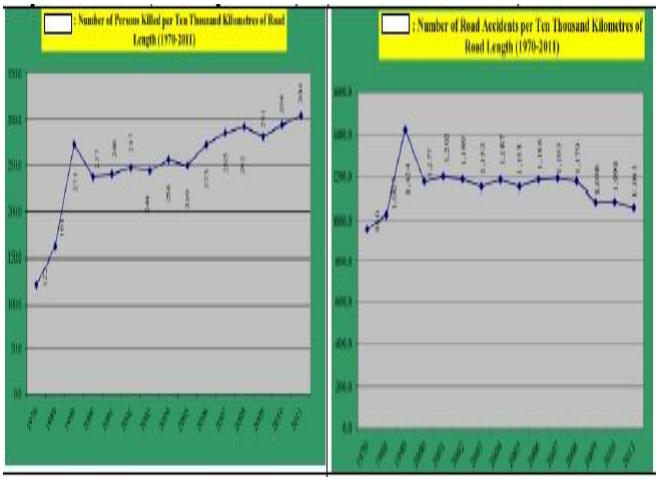


c)Accidents and Deaths per 10000 vehicle



d)Accidents and Deaths per 10000 Kms or Road Length



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VI.CONCLUSION

To prevent the occurrence of accident due to mobile phone use by drivers an attempt has been made to provide a low-cost, non-invasive; small-size system. Sensing circuit is used to detect the driver's use of mobile phone, possessing the ability to block the mobile communication only in the driver seating area while providing an option for the driver to attend an emergency call if he stops a vehicle at a safe.

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Classification of Hierarchical Routing Protocols in Wireless Sensor Network

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ABSTRACT: *Wireless Sensor Network (WSN) stands forefront in the scientific research community recently. WSNs are highly scattered self-organizing system and are deployed in various fields. Routing schemes have the common objective of trying to get better throughput with minimum delay and to prolong the lifespan of the sensor network. This paper mainly focused on brief technical introduction to WSN stack architecture, classification for hierarchical routing protocols and its comparisons based on their characteristics. With respect to the recent advances in the development of hierarchical routing protocols for WSN, there is need to investigate the significance, performance issue of each routing technique as well as the detailed operation of LEACH, PEGASIS, H-PEGASIS, TEEN, APTEEN and HEED. To solve these issue, to close the gap between technology and application.*

Keywords: Wireless Sensor Networks, Hierarchal Routing Protocol, LEACH, PEGASIS, H-PEGASIS, TEEN, APTEEN, HEED

I INTRODUCTION

Wireless networking technology has seen a thriving development in recent years. Wireless sensor networks integrated into the environment, machinery and human, coupled with the efficient delivery of sensed information, could deliver tremendous benefits to society. Some of the potential benefits are reinforced emergency response, preservation of natural resources, improved homeland security and enhanced manufacturing productivity. The significance of sensor networks have low energy consumption, sufficient intelligence for signal processing, low cost, self-organizing capability, data gathering and querying ability[1].

A. The Architecture of the Protocol Stack for Wireless Sensor Networks

The sensors are usually scattered in a sensor field. Each of these sensors has the capabilities to collect data related to application specific parameters (like temperature, vibration) and route data back to the sink by a multihop infrastructureless architecture. The sink may communicate with the task manager via Internet or Satellite. A three-dimensional sensor network generalized protocol stack for WSNs is presented by Akyildiz et al. [1], which comprises five layers with three planes as shown in Fig. 1.

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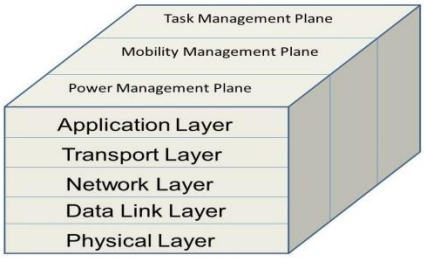

Fig. 1. Protocol Stack Architecture of WSN

The upper layer is the *application layer*, which is quite specific to the usage and distribution environment of the WSN. It provides various specific value-added services as well as the functions of time synchronization, positioning of sensor/sink, traffic management and send queries to obtain certain information. The *transport layer* is needed to establish an end-to-end connection and to provide reliable transmission service with reasonable overhead and congestion avoidance. The *network layer* takes care of routing the reliable data across the network from the source to the destination. To discover reliable, efficient path according to predetermined metric (minimum delay, maximum throughput, etc.,) and is quite unique from protocol to protocol. The main purpose of the *data link layer* is to guarantee the exactness of data transferred by the physical layer, for efficiently utilize the frequency. It is responsible for multiplexing data streams, data frame detection and error control. The MAC protocol in the Data Link Layer deals with issues such as channel access policies, time scheduling, synchronization among the sensors and able to minimize collision with neighbors' broadcast. The *physical layer* is the lowest layer in a communication system and is responsible for the conversion of a stream of bits into signals vice-versa over physical medium, which deals with radio-related tasks such as carrier frequency generation, frequency selection, signal detection, robust modulation and data encryption for transmission purposes. In addition, the power, mobility and task management planes monitor the power, movement and task distribution among the sensors respectively. These management planes are needed, so that sensors can work together in a power efficient way, route data in a sensor network and share resources between sensors [2, 3].

II RELATED WORKS

B. Routing Protocols in Wireless Sensor Networks

Advances in WSNs have led to many new protocols which are particularly designed for specific application**.** Routing protocol has to monitor the change of network's topological structure, know the routing information, find the destination, select the route and transfer the information through route. Initially, Ad Hoc routing protocols had been used in WSNs, but due to the characteristics of WSN, these protocols often perform with unsatisfactory because of their structure complexity. So, a careful approach is needed while designing a routing protocol for WSNs based on their metrics such as lowest delay, maximum throughput, least energy consumption, or the best link quality whose primary aim is to establish a best path between sources and sink [4].

C. Classification of Hierarchical Routing Protocols for WSN

Last few years many researchers have explored hierarchical cluster-based routing protocols in WSN from different perspective depends on their application [5, 6]. The main goal of hierarchical routing is to efficiently maintain the energy consumption of sensors by involving them in multi-hop communication as well as minimize the number of transmission to the sink and to cover a large geographical area without degrading the service. The cluster head with a high energy sensor, can be used to data aggregate, fusion and send the information, the rest of sensors in their cluster can perform tasks of sensing. To provide a comprehensive analysis of the most recently proposed some of the hierarchical routing protocols for WSNs are discussed below in this section.

D. Low-Energy Adaptive Clustering Hierarchy (LEACH)

W. Heinzelman, A. Chandrakasan and H. Balakrishnan have proposed a hierarchical cluster-based routing protocol for sensor networks, called LEACH [7]. It is the first and most popular self-organizing, energy-efficient protocol that was focused on extend the lifespan of sensor networks and also perform data fusion. LEACH splits a network into several clusters of sensors, which are constructed by using localized coordination and control based on the received signal strength. In each cluster, a dedicated sensor with extra privileges called Cluster Head (CH) acts as the *local base station* is responsible for routing data to the sink which is represent in Fig. 2. To give a chance to all sensors to act as CHs by using randomized rotation of a high-energy sensor as CH in order to evenly distribute the energy load among the sensors in the network and avoid draining the battery of any one sensor in the network.

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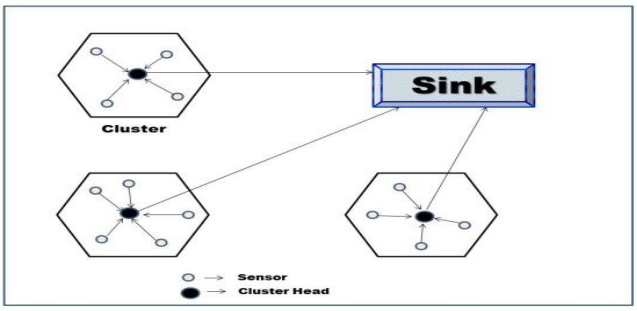

Fig. 2. Cluster-based LEACH Protocol

The operation of LEACH is divided into rounds having two phases are

i) Setup Phase: To organize the sensor network into clusters, a sensor generates a random number between 0 and 1. If this number is less than the threshold T(n), it becomes a CH for the current round and it is determined as follows

$$T(n) = \begin{cases} p/1-p*(r \bmod p^{-1}) & \text{if } n \in G \\ 0 & \text{Otherwise} \end{cases}$$

where r is the current round, p is the desired percentage for becoming CH and G is the set of sensors that have not been elected as a CH in the last 1/ p rounds. After the sensors has elected themselves to be CHs. In advertisement phase, the CHs inform their neighborhood with an advertisement packet that they become CHs. In the cluster setup phase, the member sensors inform the CH that they become a member to that cluster with *join packet* contains their IDs using CSMA. After this phase, the CH knows the number of member sensors and their IDs. Then, the CH creates and broadcast a TDMA schedule to cluster members for data transfer prevents intra-cluster collisions.

ii) Steady-state Phase: Data transmission begins, sensors send their data during their allocated TDMA slot to the CH and the radio of each sensor can be turned off until its allocated TDMA slot, thus minimizing energy dissipation by the individual. When all the data has been received, the CH performs data aggregation, compression and transmission to the sink.

Compared to direct communication, LEACH achieves over a factor of 7 decreases in energy consumption. Optimal number of CHs is estimated to be 5% of the total number of sensors. But it is not applicable to deployed in large regions and the idea of dynamic clustering brings extra overhead for changing CHs, advertisements and etc., which may reduce energy consumption.

E. Power-Efficient GAthering in Sensor Information Systems (PEGASIS)

S. Lindsey and C.S. Raghavendra introduced a chain-based hierarchal routing protocol is PEGASIS [8], which is also proposed for prolong the lifespan of network by communicate with closest neighbor which is near optimal for data gathering applications in sensor networks. It is an enhancement over LEACH. PEGASIS assumes that sensors are homogeneous, stationary and have a global knowledge of the network. The operation is performed in two steps i) Chain Construction: Rather than forming clusters, chain of sensors can be constructed using greedy algorithms and each sensor can take turn of being a leader of the chain. ii) Data Gathering: Leader of sensor is responsible for routing the aggregated data to the sink. Each sensor aggregates the collected data with its own data and then passes the aggregated data to the next sensor in the chain. This process is continued until all the sensors are included in the chain as shown in Fig. 3.

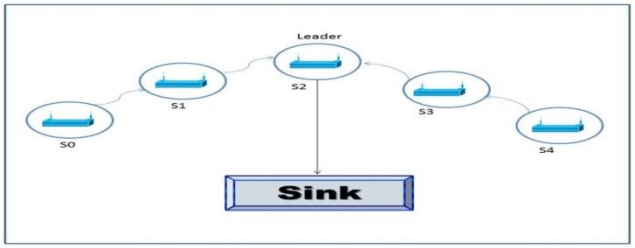

Fig. 3. Chain-based PEGASIS Protocol

Simulation results showed that PEGASIS is able to increase the lifetime of the sensor networks twice when compared to LEACH. The difference from LEACH is to employ multi-hop routing by forming chains and selecting only one sensor to transmit to the sink instead of using multiple sensors and required low bandwidth to transmit data. PEGASIS outperforms LEACH by about 100 to 300% for

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different topologies and network sizes. Such performance gain is achieved through the elimination of the overhead of dynamic cluster formation in LEACH and through minimizing the number of transmissions and receives by using data aggregation. However, for large networks introduces excessive delay and a single leader can become a bottleneck.

F. Hierarchical-PEGASIS (H-PEGASIS)

It is an upgrading to PEGASIS, which aims to minimize the delay by using simultaneous transmissions of data and proposes a solution to the data gathering problem by considering metric such as energy and delay [9]. In order to avoid collision of simultaneous transmission and possible signal interference among the sensors, two approaches are proposed. The first is incorporates signal coding namely CDMA. In the second approach only spatially separated sensors are allowed to transmit at the same time. The chain-based protocol with CDMA capable sensors, constructs a chain of sensors, that forms a tree like hierarchy and each selected sensor in a particular level transmits data to the sensor in the upper level of the hierarchy. Since the tree is balanced, the delay will be in O(log N) where N is the number of sensors. Here, to ensures data transmitting in parallel and minimize the delay significantly.

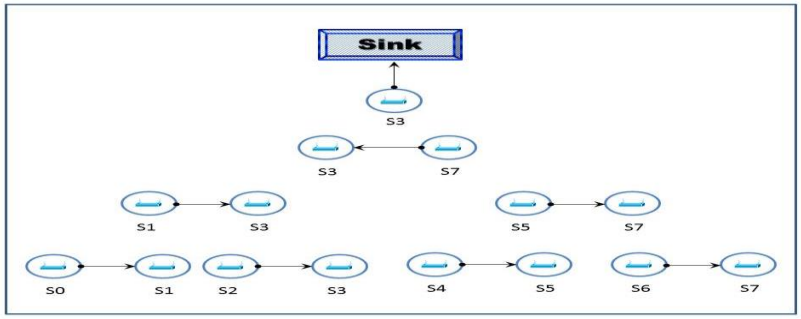

Fig. 4. Hierarchical- PEGASIS Protocol

In Fig. 4, sensor s3 is the designated leader for round 3. Since, s3 is in odd position 3 on the chain, all sensors in an even position will send to their right neighbor. Sensors that are receiving at each level rise to next level in the hierarchy. Now at the next level, s3 is still in an odd position. Again all sensors in an even position will aggregate its data with its received data and send to their right. At the third level, s3 is not in an odd position, so s7 will aggregate its data and transmit to s3. Finally, s3 will combine its current data with that received from s7 and transmit the message to the sink. Such chain-based protocol has been shown to perform better than the regular PEGASIS scheme by a factor of about 60. Although the H-PEGASIS approaches avoid the clustering overhead of LEACH, it still requires dynamic topology adjustment since every sensor needs to know about energy status of its neighbors in order to know where to route its data. Such topology adjustment can introduce significant overhead especially for maintaining sensor networks lifetime.

G. Threshold Sensitive Energy Efficient Sensor Network Protocol (TEEN)

A.Manjeshwar and D.P Agrawal have proposed a hierarchical cluster-based routing protocol along with data centric approach with responsive to sudden changes in the sensed attributes (eg. temperature) and network operated in reactive mode [10]. Using TEEN in sensor network, the closer sensors form clusters, with each led by a CH as routers to the sink. The sensors sense environment continuously and send sensed data to their first level CH. It transmits aggregated data to next level CH until the data reaches the sink as shown in Fig. 5. After the clusters are formed, the cluster-head broadcasts two threshold values to its members as followings: Hard Threshold: This is the minimum possible threshold value of the sensed attribute to trigger a sensor to turn on its transmitter when the attribute is in the range of interest and report to its cluster head, thus reduce the number of transmissions significantly. Soft Threshold: Once a sensor senses a value at or beyond the hard threshold, it sends data only when the value of that attributes changes by an amount equal to or greater than the soft threshold. As a consequence, soft threshold will further minimize the number of transmissions if there is little or no change in the sensed attribute value.

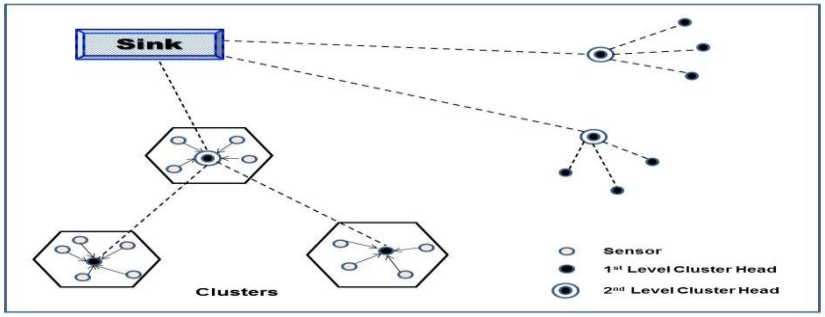

Fig. 5 Hierarchal Clustering in TEEN

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Important features of TEEN include its suitability for time critical sensing applications where the users can control a trade-off between energy efficiency, data accuracy and response time dynamically. To control the number of transmission by adjust both hard and soft threshold values and ensure that there are no collisions in the cluster. The main drawback of this scheme is that, if the thresholds are not reached, the sensors will never communicate the user and not get any data from the network. Thus, this protocol is not suitable for applications where the user needs to get data on a regular basis.

H. Adaptive Periodic Threshold-sensitive Energy Efficient Sensor Network (APTEEN)

A. Manjeshwar and D. P. Agrawal introduced an enhanced version of TEEN and the architecture of APTEEN is same as in TEEN. It aims at both capturing periodic collection of data (LEACH) and reacting to time-critical events (TEEN). Thus, APTEEN is a hybrid cluster based hierarchical protocol that allows the sensor to send their sensed data periodically (Proactive) and react to any sudden change (Reactive) in the value of the sensed attribute by reporting the corresponding values to their CHs [11]. In APTEEN, the sink is to form clusters, each CH broadcast the following parameters: i) Attributes: This is a set of physical parameters which the user is interested in obtaining data about. ii) Thresholds: It consists of a hard threshold and a soft threshold. iii) Schedule: This is a TDMA schedule assigning a time slot to each sensor. iv) Count Time: It is the maximum time period between two successive reports sent by a sensor.

APTEEN supports three different types of query namely: Historical query (to analyze past data values), One-time query (to take a snapshot view of the network) and Persistent queries (to monitor an event for a period of time). The simulation result shows that APTEEN's performance is between LEACH and TEEN in terms of energy dissipation and network lifetime. The main limitation of APTEEN is that additional overhead and complexity required to forming multilevel clusters, implementing the threshold functions and dealing with attribute based naming of queries. However, this is a reasonable trade-off and provides additional flexibility and versatility.

I. Hybrid, Energy-Efficient Distributed Clustering protocol (HEED)

HEED extends the basic scheme of LEACH by using residual energy and node degree (number of neighbors) or density as a metric for cluster selection to achieve power balancing. It operates in multi-hop networks, using an adaptive transmission power in the inter-clustering communication. HEED was proposed with four primary goals namely: (i) Prolonging network lifetime by distributing energy consumption, (ii) Terminating the clustering process within a constant number of iterations (iii) Minimizing control overhead (iv) Producing well-distributed CHs and compact clusters.

In HEED, the proposed algorithm periodically selects CHs according to a combination of two clustering parameters. The primary parameter is used to probabilistically select an initial set of CHs based on their residual energy of each sensor and the secondary parameter is the intra-cluster communication cost as a function of cluster density or node degree. The HEED clustering improves network lifetime over LEACH. The final CHs selected in HEED are well distributed across the network and the communication cost is minimized. However, the cluster selection deals with only a subset of parameters, which can possibly impose constraints on the system. These methods are suitable for prolonging the network lifetime rather than for the entire needs of WSN [12].

III COMPARATIVE ANALYSIS OF HIERARCHICAL ROUTING PROTOCOLS OF WSN

The routing protocols mentioned in the above sections are developed for different applications. Table – I demonstrate detailed operational characteristic of the hierarchical routing protocols related to different categories [13,14].

TABLE – I Comparison among different hierarchical routing protocols

Routing Protocols	LEACH	PEGASSIS	H-PEGASIS	TEEN	APTEEN	HEED
Category	Hierarchical	Hierarchical	Hierarchical	Hierarchical	Hierarchical	Hierarchical
N/w Life Time	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good
Resource Awareness	Yes	Yes	Yes	Yes	Yes	Yes
Data Delivery Model	Cluster based	Chain based	Chain based	Active Threshold	Active Threshold	Cluster based
Data Aggregation	Yes	Yes	Yes	Yes	Yes	Yes
Over head	High	Low	Low	High	High	High
Power Usage	High	Max	Max	High	High	High
Query Based	No	No	No	Yes	Yes	No
QOS	Low	Low	Low	Low	Low	Low
Mobility	Sink Fixed	Sink Fixed	Sink Fixed	Sink Fixed	Sink Fixed	Sink Fixed
Scalability	Good	Good	Good	Good	Good	Good

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IV CONCLUSIONS AND FUTURE DIRECTION

The routing protocols designed for WSN should consider the goal, technology associated with architecture and application area of the network. The design of routing protocols is influenced by many challenging factors caused by the nature of the WSNs. These factors must be overcome before efficient communication can be achieved in WSNs. In this paper, we presented the stack architecture for WSN, hierarchical routing protocols for WSNs. Finally, all the presented hierarchical routing protocols are summarized in Table 1 to provide a fast overview of the main motivations behind their design and the methods used to achieve the desired goals. In this paper, to introduce some recommendation and directions as guidelines and hints that would assist and give enhancements to the future design of protocols for WSN are suggested and put forward. To this aim, different hierarchical routing approaches should be integrated efficiently.

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Wireless sensor node threshold algorithm for Fire detection

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Abstract: *The environmental events measured by sensor nodes are detected by the Wireless Sensor Networks (WSNs). In this proposed work WSN is used to detect the fires and threshold algorithm for fire detection are analyzed. In this the sensor nodes are equipped with SHT75 temperature humidity sensor and OPT101 light sensors. The idea in this detection method is detecting fire using only these two sensors even it cannot afford other sensor units such as photo electric sensors, cameras and smoke detectors. The result shows that this algorithm along with the sensor node detects fire at their initial stage. This is efficient method to detect the environment conditions. In addition the use of light is to differentiate the sunbeam and fire is also discussed.*

Keywords: Security Systems – wireless sensor networks – fire detection – threshold algorithm to detect fire.

I. INTRODUCTION

Wireless sensor network is a network consists of sensor nodes to perceive the environment condition and to act on the environment through actuators. These networks are specially designed to monitor the environmental parameters, detecting or tracking them for different field such as industry, medical, military environmental and automotive. These nodes consists of low power devices equipped with one or more sensors, a processor, memory, power supply, wireless transceivers XBeePro and actuators. In this project SHT75 and OPT101 are used to detect environmental parameters such as temperature humidity and light respectively.
The satellite images are also used to detect fire in some cases with limitations as follows:

a) Low frequency image capture leads to large response time.
b) Depends on image resolution, they detect fire when the area is large.
c) Cost of launching and maintaining satellites are huge.

Due to these limitations, some areas use video cameras to monitor environment, but the coverage of these systems are very limited. Hence the efficiency of wireless sensor network depends on the sensors and suitable algorithms used for detecting the task. In some case, the sensors may not available to detect. They are available with high cost and consume high power. In these cases, a suitable algorithm leads to get acceptable and best results. This threshold algorithm processes different input data to provide an output. But this output is better than the input data individually. WSN is equipped with XBeePro wireless IC transfers the important and processed data to PC central monitoring station. This PC receives information from the sensor nodes, process them and take appropriate actions. For example, inform user about the event, communicate it worldwide and display the information. Fire detection will be very helpful in avoiding human and material loss.

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In this paper, threshold algorithm for fire detection is proposed and evaluated. This node is equipped with temperature, humidity SHT75 sensor and OPT101 light sensors. The performance of the threshold algorithm is evaluated with the comparison algorithm with the metrics such as delay time in detecting fire, precision in finding, un-detecting fire and detecting un-fire. The final results show that the threshold algorithm method is able to detect fires at their initial stages efficiently.
The rest of this document is organized as follows. The related work is presented in Section 2. In Section 3, the proposed threshold algorithm for fire detection is discussed. In section 4, the experiment results are analyzed. Finally, in Section 5 the conclusions are presented.

II. RELATED WORK

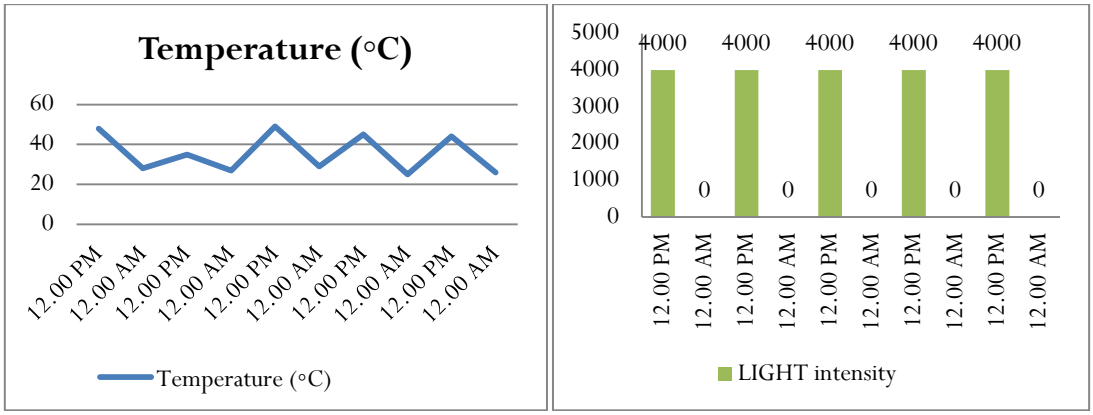
The Cetin Elmas and Yusuf Sonmez [1] are analyzed the data fusion framework with novel hybrid algorithm for multi-agent decision support system for forest fire. The Andrey Somov et al. [2] are discussed about the deployment and evaluation of a wireless sensor network for methane leak detection. The Gui Yang et al. [3] are analyzed about the study on remote monitoring system for landslide hazard based on Wireless Sensor Network and its application. The Daniela Ballari et al. [4] were discussed a mobility constraint model to infer sensor behaviour in forest fire risk monitoring. Wei Tan et al. [5] is discussed the Mine Fire Detection System Based on Wireless Sensor Network. Yeon-sup Lim et al. are analyzed [6] Fire Detection and Rescue Support Framework with Wireless Sensor Networks.

III. THRESHOLD ALGORITHM TO DETECT FIRE

Environmental properties are identified to differentiate between fire event conditions and normal condition. To achieve this, temperature humidity and light are measured for few days without fire event occurrence. Based on this, the environmental physical properties behaviour under normal conditions could be understand. The data in the presence of fire is also collected. The behaviour difference is compared between normal and abnormal environmental conditions. The threshold algorithm is applied on collected data. The sensor node is designed with the sensors such as temperature/ humidity SHT75 and light sensor OPT101 to collect environmental data. Sensor nodes continuously collect temperature and light measurements that are used for fire detection. Initially, the data is collected in the period between April and May 2015 at campus and analyze them to identify properties that allow differentiate normal condition from fire condition. The following points are observed. Based on these observations, threshold algorithm is proposed for fire detection.

1. Environmental measurements are following a cyclic behaviour every day.
2. At night, light measurements remain in an extreme low level of intensity. So that fire presence can be detected by comparing the light with a simple threshold light level.
3. The fire and sunbeam are differentiated upon temperature measurements.
4. When the sensor node is exposed to the sun, light measurements by sensor assume greater values and remain constant, whereas light measurements affected by fire occurrence do not achieve the same level. So, light measurements are used to differentiate between the fire and sunbeam.
5. Since sunbeam is a cyclic event, the fire from sunbeam is also differentiated by comparing current measurements with past measurements.
6. The temperature and relative humidity values maintain an inversely proportional relationship among them. When the temperature increases, the relative humidity decreases.
7. The light intensity shows a stable and high level during the day and a stable and very low level during the night. The light values show a sudden change during transition period of day to night, and vice versa.

The temperature, relative humidity values (SHT75) and light (OPT101) show a cyclic behaviour as shown in Figure 1. When a fire occurs, the temperature shows a rapid increment, whereas the relative humidity decreases fast. The light intensity does not show a significant change in the presence of a fire.



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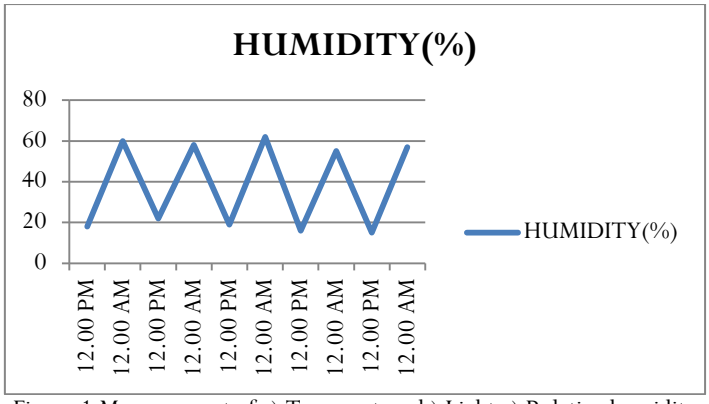

Figure 1 Measurement of a) Temperature b) Light c) Relative humidity

The threshold algorithm is based on the state machine shown in Figure 2. The transition from one state to another is generated when a relevant change in the values of temperature, light or relative humidity is detected, indicating the probable existence of a fire. To develop the application to collect the sensed data and send them to a central monitoring station, the embedded C programming language is used.

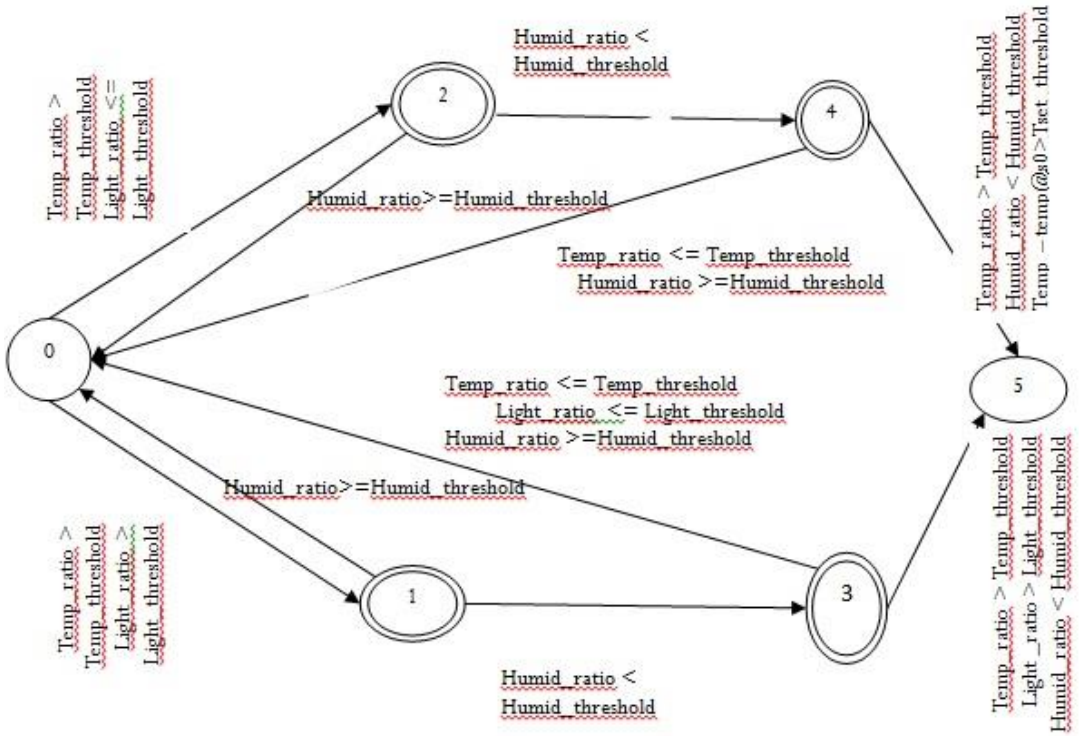

Figure 2 State change diagrams to detect day/night fire

State 0 represents initial, normal no fire environmental conditions. The State 1 and State 2 are transition state for night fire and day fire respectively. State 3 and state 4 represents sunrise and direct sunshine conditions respectively. State 5 represents the occurrence of fire. At state 0 temperature measured (Tm) by sensor SHT75 is evaluated. The memory window (M_T) contains average of most recent temperature value recorded by sensor. The ratio (Temp_ratio) between Tm (temp@s0) and M_T is calculated. If this is greater than Temp_threshold, means a large change in temperature value and a fire may be detected.

To determine if it is night or day fire, the rate of change of the light is evaluated. The memory window (M_L) contains average of most recent light value recorded by OPT101 sensor. The ratio between Lm (light measured) and M_L is found and called as Light_ratio. If this is greater than Light_threshold, the machine changes to the State1. Otherwise, it changes to the State2 day fire.

In state 1, the memory window M_H contains the average of recent relative humidity values. The ratio (Humid_ratio) is determined between humidity measured (Hm) and M_H. If this is less than Humid_threshold, the machine moves to State3; otherwise, it return back to State0.

While the machine is in State3, the ratios are still computed, and if they are greater (or smaller, in the case of humidity) than their respective thresholds the machine moves to State5 and an alarm is triggered and information is wirelessly communicated, indicating the probable occurrence of a night fire.

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To identify the day fire event at state 2 the following are done. If the ratio (Humid_ratio) is less than Humid_threshold, the machine moves to State 4 from state 2; otherwise, it return back to State 0. In State 4, if the temperature and humidity ratios maintain their relationships, the difference of the current temperature value and temp@s0 are calculated. If the difference is greater than Tset_threshold, the machine changes to State5, which means that perhaps a day fire has occurred.

IV. EXPERIMENTAL RESULTS

The following parameters are determined using the algorithm.

1) Memory window size between every 5 second and 5 different average values are calculated initially.
2) After experiments, Memory window size (M) and threshold (T) are varied to evaluate the metrics.
    - Undetected fire: it occurs when the methods do not detect a fire event (event is not detected).
    - Detect unfired: it occurs when the methods indicate a false fire presence (event is wrongly detected).
    - Delay time: The difference between the time of a fire event starts and the time it is actually detected.
    - Precision in finding: Precision indicates how the methods agreed to classify the condition of the environment as normal.

In this paper, undetected fire and detect unfired are the major metrics. Since in practice it has to be avoided both cases.

3) The results indicate that, for every memory window size and the threshold value increases, the algorithms converge to undetected fire, but detecting unfire increases accordingly.
4) To select the best threshold for a given memory window size, the threshold of minimum value is chosen for no detection with the smallest undetected fire.
5) It is noted that larger window size cause stable and less detected unfired condition in Threshold algorithm.
6) The delay of event detection in algorithms was less than 3 milliseconds, which is an acceptable value to make reactive actions depending on the location of application.
7) To save energy, the sensed data were sent to the PC center monitoring station every 5 seconds.
8) The performances of the algorithm using the following values are evaluated. The best performance was obtained using a memory window size greater than or equal to 25, and the following threshold values:
    temp_threshold = 1.15, light_threshold = 1.2, humid_threshold = 1.01, and tset_threshold=3.5◦C.

V. CONCLUSION

In this paper proposes the threshold algorithm for fire detection in wireless sensor network that use only light OPT101 and temperature/humidity sensors SHT75. The data is analyzed and shows few parameters allow automatic fire event detection based on measures collected. Finally, conclude that this threshold algorithm is more reliable because of the stability to represent the environmental conditions in the form of state diagrams. It is simpler to implement and showed a good performance. The use of more sensors will add reliability to the detection process, but will increase the energy consumption and the deployment costs. Thus, this node with this simple algorithm was to make a compromise between efficiency and cost. This work will be extended for best algorithm and more sensing parameters.

ACKNOWLEDGMENT

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Fabrication Of Piezoelectric Polyvinylidene Fluoride (Pvdf) Polymer- Based Tactile Sensor Using Electrospinning Method

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Abstract: *The polyvinylidene fluoride (PVDF) nano fiber has been widely investigated as a sensor and transducer material, because of its high piezo-electric and ferroelectric properties. The novel nano structure of PVDF has attracted considerable interest in the bio-sensing and biomedical application. This paper deals with electrospun PVDF nanofibers as pressure sensor. Basically this material (PVDF) acts as a transducer which convert load into electrical signals. The piezo-resistive type PVDF base tactile sensor has been fabricated using MEMS. The PVDF based nanofiber coated over the copper electrodes by electrospinning method. Under normal conditions, the PVDF has α-phase while applying an electric field the PVDF polymer would be changed from α-phase into β-phase. This β-phase of PVDF exhibits piezo-electric property and measure the piezoelectricity simultaneously measure pressure and temperature in real time. The pressure was monitored from the change in the electrical resistance via the piezoresistance of the material. The enhancement of PVDF properties has been carried by using SEM. The SEM image result showed that the size of nano fiber, the size of nano fiber is varied in the range of (180 nm-400 nm) with smooth surface. The X-Ray diffraction has shows that the PVDF was aggregated with the β-phase crystalline nature. Due to β-phase it was act as a piezo electric property's and its results are very high sensitivity*

I. INTRODUCTION

The tactile sensor is one, which plays a major role in industry, robotic, biomedical, communication and automotive industry. It has vital role in all packaging and quality sector. MEMS technique has been used in its fabrication to increase the efficiency, size, weight. The microelectronics mechanical systems have the potential to provide the sufficient signal for its processing too. In the current industry of robotics excellent manipulation results in the structured environment build around the robot.

The tactile sensor is the preponderance part in robot's hand response due to sense. the unstructured prosthetic hand, while making the robotic hand its all touching condition has been feed back to the human hand and check they were response to the corresponding action of human hand. The numerous field of research would benefit from such advantage in prosthetics [1], a thropomorphic robotics[2], and Tele surgery robotic[4,5].

At present the tactile sensor technology has been applied to solve the problem in robotics and also in medical field[7]. The deformation mechanism such as capacitive, piezo resistive, ultrasound, conductive polymer etc., has a tactile sensor. Recently flexible sensor have

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been developed to allow the mounting of the sensor on around surface[8,9]. Hebel descripted an impedance based sensor sing planar grib of gold chromium electrodes such as ethylene glycol based conductive fluid and latex skin[10]. Similar type of sensor works on the variation of impedance between electrode and inner surface of the elastomer[11,12] a tactile sensor work based on the variation of piezo resistive [13] due to variation of resistance of act as force sensor[14] however the tactile sensor has work based on piezoresistive. The area of nano structure sensor's has fabricated by using nanofiber luana et al says that nanofiber has multifunction capability and flexible design[15]. An emerging technology in electronics is focused in portable and flexible devices for application those involved in human real time [16-18]. So it has major source in robotic, in skin care at muscle engineering and sensor network.
It has fabricated for robotics sensing purpose, the robust technology has used in sensor network for daily environments.
A more and amore sensing purpose king has fabricated by tactile type .the tactile sensor has functional similar to tip of finger as same sensitivity, T.Shimi et al said that the tactile sensor can detected contact of object and hardness of an object [19]. As same robotic part. while it touch or handle any soft fragile object it produce tremendous result in a treatment process[20,21,22,23]. In the polymers were crucial role in nanofibers it used in bio medical field naturally polymer has contain maximum flexible and they can form produce better aligned nanofiber. The variation of fiber length and size of porous of film the sensor has respond. Dosh[24] and Zhao[25] said the processed PVDF thin film produce high β phase film, compare to other polymeric material the PVDF having better piezoelectric property. Lee [26] obtained composites with a high content of crystalline β phase by doping palladium nanoparticles into PVDF. These results may be attributed to local-dipole effects which force the C-F dipoles on PVDF chains to oriented and form the crystalline β phase on the surfaces of the dopants. However, in their work they did not measure the piezoelectricity of the obtained composites. It Is low cost and good dispersion properties make Ag NWs a more attractive candidate as dopant in PVDF
This research work has describe a biomimetic tactile sensor that is sensitive to the wide range of normal and shear forces encountered in robotic and prosthetic applications. It is intrinsically simple, robust, and easy to manufacture and repair. This report focuses on a novel approach to extending the dynamic range by texturing the inner surface of the elastomeric skin. Preliminary results indicate promising spatial and temporal resolution.

II. EXPRIMENTAL DETAIL

A.EXPRIMENTAL DETAILS

Materials

Polyvinilide fluoride were purchased from himedia, N,N-dimethyl form amide were purchased from LOBA chemical (AR grade 99.0%) and copper were purchased from LOBA chemical

Solution Preparation

The 1 gm pf poly(vinyl indene fluoride) (PVDF)is mixed with 20 ml of DMF,PVDF has been dissolved in DMF after 6hr stirrer chemical at a 600c using magnetic stirrer until a homogeneous polymer solution was formed. The prepared solution were kept 600 c for 5 days, after that the solution was cooled at ambient room temperature for electrospinning. In this work 18 wt % of PVDF solution was used for electrospinning

Sample Preparation
The sensor has been fabricated as a comb structure. a copper material is used for the base electrode. Each saw has 0.3mm distance, the sensor has 7 saw on a conduction board, and each saw has 0.2mm distance and the end of the each saw side connection lead taken

Sensor Material And Circuit Design
This paper deals with biological signal conducting and wearable (PVDF) sensor has been fabricated

Sensor material
The PVDF material has a semi crystal polymer, which has a α, γ, δ and β phase .Among this phase β phase is highlight role in that because among the four β phase have more number of dipoles[30].
In normally PVDF polymer arranged in α phase, when changed its phase α in to β then only it act as a piezoelectric property, generally α phase the dipoles are arranged in randomly due to orientation of dipole[31] as it could not charge or produce any electric pulse over surface of the film. While the PVDF act as the piezoelectric property it could be convert its phase and here the film has coated uniformly and to improve it sensitivity, has its produce maximum output voltage from the piezoelectric sensor given by[32].

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$$V=F.\ d/a \quad (1)$$

Weather the output voltage of the sensor has determined by V,F is force occur in the material, d is diameter and A is area of the sensor. Hence the thickness of the film increased the output voltage has increased in a β phase and crystalline nature, as its structure and crystallinity character of the film has been by SEM, FTIR, XRD.

III.ELECTROSPINNING PROCESS

The electro spinning method is used in these experiments for the formation of nanofiber structure. This is major component for this study [33]. A syringe pump to maintain constant flow rate of polymer solution, the dispense needle has connected with high power supply. The nanofiber was collected over ground metal plate. It has 5kv to 40kv of electrical range. The pvdf nanofibers fabricated by the conventional electrospinning process are under a high voltage [34].. The electric pules have applied on needle, which has 0.3 dm. A structure of nanofiber is depend on flow rate of polymer, size of the needle, distance of the collector and applied electrical voltage[35]Due to high electric voltage, positive charge has been grounded viva the polymer a it could be form nano fiber, depends on distance of collector and electrical voltage a structure of nano fiber has been varied. The inherent high electric field with in-situ mechanical stretching for possible alignment of dipoles along the longitudinal direction of the nanofiber [36]. The coated electrode has been placed inside electrospinning chamber, the box was carried out in a closed box, the temperature in the box roughly remained at 250c and the humidity level between 60 to 75%.The demonstration, a single PVDF nanofiber was electro spun across two adjacent electrodes placed 200-300μm a parts and fixed to the contact electrode on either size. The single tailor cone nano fiber has been coated over electrode in a closed environment, which act as working sensor

IV.CHARACTERIZATION

The fabrication of nano fiber has been characterized by a scanning electron microscope was used to observe the morphology of the PVDF fiber before that the sample were coated over the collector. The collected fiber has been taken for FTIR (FTIR-TS)equipped by spectroscope, the X-Ray diffraction spectrometer (XRD) were described 2θ variation with respected to intensity and coated nano fibers surface rough ness also taken by softron (rough ness meter).

Result and Discussion

The major experiment was carried out to optimize the condition for electrospinning the PVDF nanofibers. The PVDF solution was consistently at the concentrating of 18 wt%, the collector has placed from the needle at 15cm.the applied electric voltage in the range of 10 to 35kv.

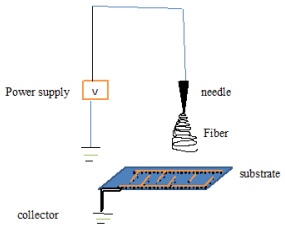

Fig 1.Electro spinning process

The nano fiber has been collected in the nearest field of collector due to electrospinning (37).when the distance increase electric field was increase which is produce and control the nano fiber. The continuous flow of the polymer was necessary to replenish the system. the continuous electric field developed in the syringe system. Due to flow of polymer and electrical voltage a nano fiber has been coated over the electrode continuously. The formation of fiber in the β phase, while applying of high electric pulse the α phase was converted into β phase[(38,39,40,41)]. the formed nano fiber has porous nature even though It was act as a tactile sensor because of its porous nature weather the porosity has increased piezoelectric level also increase.

Fig 2: Fabricate sensor

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STRUCTURE MORPHOLOGY

The polymer nano fiber has been coated over the copper substrate in the area of 1 cm x 4cm.the coated nano fiber has been characterized, the structural morphology by SEM, FTIR, crystalline of material has been study by using XRD

FTIR

Fourier transform infrared spectroscopy (FTIR) can be used to characterize both the dipole orientation and crystallography of the nano fibers, the fiber sensitivity of is due to orientation changes in CF2 [42]. Bashir Ahmed et al has said The FTIR has examined by due to orientation of dipole of molecules [43], and the mendal et al said that FTIR of PVDF nano fiber examined by orientation of dipole[44]. Fig.3 describes FTIR spectra have mentioned that the dipoles were aligned in direction of electric field during the electrospinning process.

A strong absorption band is observed corresponding to the vibration of the CH2 groups located at 500 cm-1 and 4000 cm-1 in the PVDF virgin sample [45-49]. The increase in absorption and broadening of new band indicates the possibility of evolution of HF bond. Conjugated double bonds are responsible for its broadening at higher dose towards the lower frequency side. The increase in overall absorption and the broadening of new band are enhanced with the increase of irradiation lose [50] The transmittance values of this peak were taken as the reference for calculation of relative changes in the intensities of the other peaks as the ratio of transmittance is not dependent on the sample thickness [50]. This methodology has been used to monitor the relative amount of β- and α-crystalline phases and amorphous phase [51].

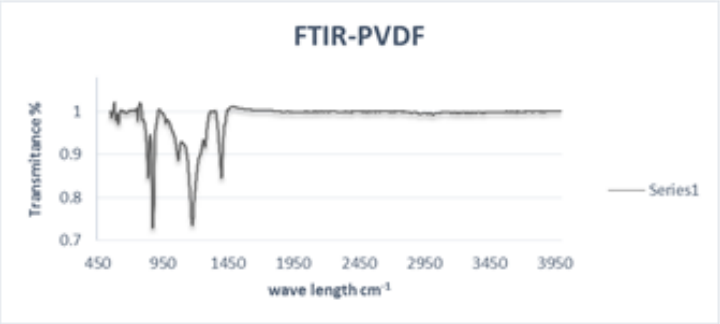
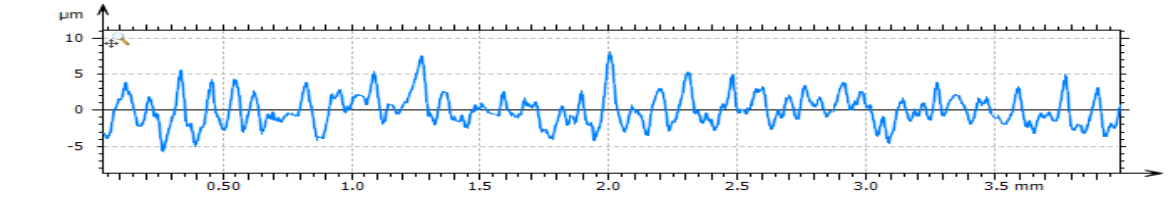


Fig.3 FTIR of the PVDF

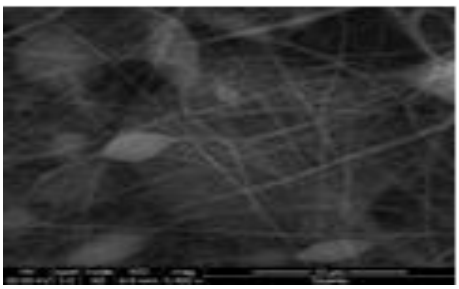
SURFACE ANALYSIS

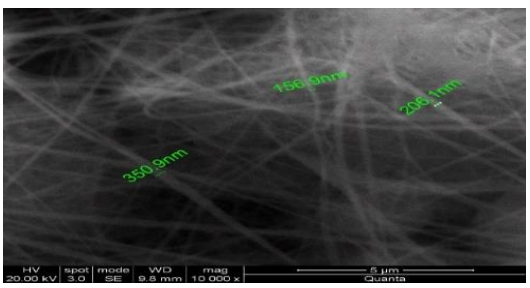
The coated nano fiber surface has been taken for its roughness of the fibers using softtronics, it could be descried that the roughness of a material. the PT has shows that roughness of a coated material.



Parameters	Value	Unit
Length	4.00	mm
Pt	13.8	µm
Scale	20.0	µm

SEM





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The SEM micrographs and diameter distributions of electrospun nanofiber for PVDF is shown above. the coated nano fiber has been cut small size which was stick over the sticker and it could be placed into holder section in SEM after the samples was placed in that the vacuum has been produced in side chamber and maintained temperature in constant manner. The PVDF SEM image has been taken in 20kv. The diameter of PVDF nanofiber in the range (150 nm-350 nm).the morphology of electospun nanofiber and the fiber diameter are significantly influenced by the composition of electrospinning [52]. The image shows that coated fiber has good porous nature and the beats has to be formed between the fiber line. As it concluded that the image of PVDF act as good sensor sue to its high porous nature.

XRD

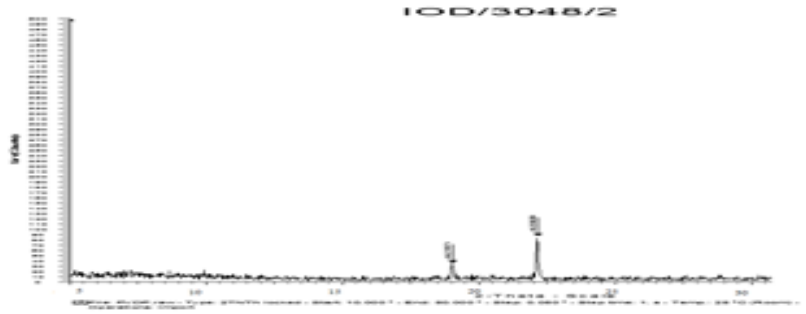

Fig.5 XRD analysis of PVDF

The XRD was used for analyzed the form of crystallite of electrospun nano fiber. Among the five different crystalline structure of PVDF, the β phase crystalline is the one with the most effective phase, normally it act as a semi crystalline nature and alpha phase when the electric field was applied to PVDF it would be convert into β phase[38 ,39].In the spatial arrangement of CH2 and CF2 groups of PVDF in the electro spun nano fiber show crystalline structure in $2\theta = 18.4\,0$ and $2\theta = 23.90$ in XRD diffraction [53,54].Both FTIR and XRD spectra has conformed crystallinity of electro spun nano the fiber. Due to high electrical voltage was applied to the polymer solution which is convert a Raw Phase of PVDF into β Phase

V.CONCLUSION

This paper is deals with the pressure pulse sensor. The PVDF polymer act as a wonderful vibration sensor, which has the fabricated for this major property of piezoelectric property . This is a novel type of sensor which is fabricated by electrospinning method, generally PVDF polymer always an α phase crystalline nature, when the electric field applied to the polymer it would convert into Beta phase. During the electrospinning process the polymer nanofiber has been coated over the copper materials, which acted as a pressure sensor. And the fabricated sensor has been characterized by SEM and FTIR . Whereas the SEM image represent that structure of nano fiber and size of the Nanofiber. The X-Ray diffraction has described crystallinity of the sensor, as per characteristics and output of sensor it act as a very good sensor and its life duration is also high compare to other sensor.

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