International Conference

On

Futuristic Trends in Engineering, Science, Humanities, and Technology

FTESHT-16

January 23 – 24, 2016

VOLUME-3

Editors

Dr. P.S. Chauhan

Convener, FTESHT-2016

Dr. Ravi K. Dwivedi

Conference Secretary, FTESHT-2016

Organised by

IPS College of Technology & Management

Gwalior, Madhya Pradesh (India)

in

Association with

TRO INDIA

Preface

It gives us immense pleasure to present the proceeding of the International Conference on Futuristic Trends in Engineering, Science, Humanities, and Technology (FTESHT-2016) to be held during January 23-24, 2016 in the IPS College of Technology & Management.

One of the major objectives of the present International Conference is to provide a platform for Scientists, Technocrats and Researchers to share and exchange views on the opportunity and challenges offered by the ever increasing technological advancement taking place in the world.

There has been excellent response from various sections which is evident from the contributions received through valuable articles. We sincerely acknowledge and express our gratitude to the reviewers for their great contribution in selecting the worthy articles and facilitating the process of publication.

We take this opportunity to thank International and National Advisory Committee members and reviewers for their guidance and timely help. We also appreciate the efforts of my colleagues, members of the staff and students to make this event successful. We hope that the proceedings gets your appreciation.

Place: Gwalior, M.P., India
Date: January 23, 2016

Dr. P. S. Chauhan
Convener

Dr. Ravi K. Dwivedi
Conference Secretary

Shivraj Singh Chouhan
Chief Minister

Government of Madhya Pradesh
BHOPAL - 462 004
S.No. - 20, January 14, 2016

Message

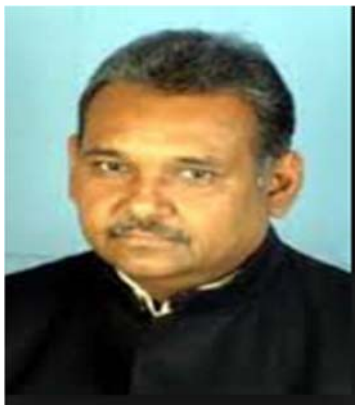
I am delighted to know that IPS College of Technology and Management, Gwalior is organizing an international conference on Futuristic Trends in Engineering, Science, Humanities and Technology (FTESHT-2016).

Innovations in science and technology aiming at human welfare need encouragement. The State Government is promoting scientific temperament among the masses so that optimum benefits of scientific advancement could be harnessed in an enthusiastic fashion.

I hope the conference will be a grand success with the renowned professionals sharing their insights on the subject.

Regards.

(Shivraj Singh Chouhan)



Shri Anoop Mishra
Hon'ble Member of Parliament (Morena)
Government of India

January 12, 2016

Message

With the advent of new technologies, new avenues are opening up. Emergence of new Technology is also throwing up new challenges. In the context of the new challenges educational Institutions need to constantly review, update knowledge and adopt technology driven skills. This is possible through mutual exchange of thoughts and sharing of knowledge and skills.

I am quite sure that this International Conference on "Futuristic Trends in Engineering, Science, Humanities & Technology" will provide a unique opportunity of sharing and equipping trends and latest research works.

It is my heart-felt wish that this event becomes a successful forum of exchange of ideas and knowledge for one and all.

Regards.

Anoop Mishra

Prof. Piyush Trivedi
Vice Chancellor

राजीव गांधी प्रौद्योगिकी विश्वविद्यालय, म.प्र.
(मध्यप्रदेश का तकनीकी विश्वविद्यालय)
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(State Technological University of Madhya Pradesh)

DO Letter No. : VC/PS/2016/693

दिनांक / Date : 12/01/2016

MESSAGE

I am happy to learn that the **IPS College of Technology & Management, Gwalior** is organizing the International Conference on **"Futuristic Trends in Engienering, Science, Humanities & Technology (FTESHT-2016"** on January 23-24, 2016.

I hope this Internationl Conference will provide an excellent platform for developmental and research activities in the field of Science, Humanities and Engineering.

I am sure that deliberations made by the experts will be beneficial for advancement of science and technology.

It is a laudable effort of the organizers for choosing a very relevant and active field of research. Conducting the Conference as above, are vital part of quality improvement activities for all the stake holders viz a viz researchers, faculty, academecia and Students community.

I extend my warm greetings to the organizers and hope that the Conference will attain its desired goals.

14/01/16

Prof. Piyush Trivedi

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Smt. Shobha Mishra
Chairperson
IPS Group of Colleges

January 11, 2016

Message

"Vision looks inward & becomes duty

Vision looks outward & becomes aspiration

Vision looks upward & becomes faith"

When the vision of duty, aspiration and faith become a reality, it becomes a proud moment for me and my team to see professionals, students and researchers come together to work collectively towards a better society.

The International Conference on "Futuristic Trends in Engineering, Science, Humanities & Technology" is being organized with a view to provide a platform to the professionals, scientists and students to work together for a just and better society.

I extend warm greetings to all those associated with the conference and wish the conference a grand success.

Shobha Mishra

Dr. Arun K. Tyagi
Director
IPS Group of Colleges

January 11, 2016

Message

Education is simply the soul of the society as it passes from one to another.

G.K. Chesterton

The world is moving very fast & new technologies are coming every week. We need to be proactive & enthusiastic in learning about these cutting edge tools and research.

New technology is bringing opportunities along with new set of skills and new challenges. Interaction in person is the best mode of communication to know the development taking place in Science, Technology & Engineering.

IPS constantly strives to meet challenges of future by fostering education and technical advancement. This conference is an effort in the similar direction. It aims at keeping pace with technological development taking place globally and bridging the technology gaps.

I am quite optimistic about the success of the conference and wish it gives a qualitative outcome for global educational growth and development.

Best wishes….!!!

Dr. Arun K. Tyagi

Mr. Ashwini Mishra
Deputy Director
IPS Group of Colleges

January 11, 2016

Message

I am delighted to know that the IPS is organizing an International Conference on "Futuristic Trends in Engineering, Science, Humanities & Technology."

Knowledge is a liberating force which helps in removing the barriers of prejudices and ignorance and facilitates eliminating the various disparities between human beings. Knowledge has also come a long way, from being power to becoming powerful vision.

I am sure this conference will prove a step-ahead in the same direction and achieve the ultimate target of global academic success.

I offer my best wishes and greetings to all the participants and wish good luck and grand success.

Ashwini Mishra

Mr. P. K. Ghosh
CAO
IPS Group of Colleges

January 11, 2016

Message

It is a matter of great happiness for me to know about the initiative being taken by the teaching community and students of IPS College of Technology & Management for having conceived and organize an International Conference.

The theme of the International Conference is appropriate in the present context. I am sure the conference will bring Engineers, Technocrats and Professional on a common platform, for exchange of views and sharing updated knowledge which will go a long way as a value addition to the education system.

I wish the organizers and participants the very best in their endeavor and am confident that the event will be a great success.

I extend my sincere greetings.

P. K. Ghosh

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January 23, 2016

KEYNOTE SPEECH

Green Manufacturing

Abstract

Green Manufacturing is a challenge for today but as business opportunities for tomorrow. This work presents the importance of Green manufacturing. This concept focuses on both how the product is made as well as the product's attributes. Nowadays customers are environment conscious and also the environmental protection is a top agenda for them. They are thinking about the global issues such as global warming, depletion of the Ozone layer, running out of fossile fuel supply and loss of trees and forest.

The detailed discussion of the intersection of the environment and manufacturing been discussed related to Green manufacturing, clean technologies and Green products, this work also covers things such as making products with less energy and materials, producing less waste, and fewer hazardous materials as well as products that have greener attributes.

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January 23, 2016

KEYNOTE SPEECH

Fundamentals of Mathematical Model Development for Basic Sciences

Abstract

The problems that modelers wish to solve exist in the real world. First step is to simplify the real world to create a model world, i.e., the model world leaves out much of the complexity of the real world problem. The original question gets translated into a question involving the model world. Next, we construct a model of the problem in the model world using known mathematical tolls and techniques. The final step is to interpret the answer found for the model world problem back in the real world. “Every study must begin with a clear statement of the study’s overall objectives and specific issues to be addressed; without such a statement there is little hope for success”. Modeling is a way of thinking and reasoning about systems. The goal of modeling is to come up with a representation that is easy to use in describing systems in a mathematically consistent manner. Models based on good theory can compensate for lack of data, and models based on broad evidence can compensate for lack of theory, but models alone can hardly compensate for the lack of both. We often fail to realize how little we know about a thing until we attempt to simulate it on a computer.

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January 23, 2016

KEYNOTE SPEECH

Restoration from Noisy and Motion Blurred Images

Abstract

Generally the images captured in uncontrolled environment have degraded quality as compared to the original images due to imperfections in the imaging and capturing process. The degraded images are classified into two major categories: (i) blurred imaged and (ii) noisy images. The factors responsible for blurring of images in general are: atmospheric turbulence, defocusing of the lens, aberration in the optical systems, relative motion between the camera and scene. The restoration of such blurred images sometimes becomes mandatory particularly in surveillance applications. The effectiveness of the restoration process mainly depends on the blurring system model. The motion blur system is characterized by two parameters, namely, blur direction and blur length. Various methods for the identification of blur parameters have been proposed in literature. The popular methods used for determination of point spread function (PSF) parameters in the spectral domain will be discussed. The talk will focus on the algorithms to determine motion blur PSF parameters, i.e., blur direction and blur length, in frequency domain. The blur direction is identified using Hough transform to detect the orientation of line in the log magnitude spectrum of the blurred image. The blur length is found by rotating the binarized spectrum of the blurred image in the estimated direction. These parameters are the used to restore the images. A modified Weiner filter is then employed for restoration of images.

WIRELESS SENSOR NETWORKS: A SURVEY

Kapil Keswani[1], Anand Bhaskar[2]
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Abstract
Variety of fields which includes military, healthcare, environmental, biological, home and other commercial applications are using Wireless Sensor .Wireless Sensor Networks (WSN), which are made of several of sensor nodes that can sense, actuate, and relaying the collected information, have made remarkable impact everywhere due to vast advancement in the field of embedded computer and sensor technology. It is a group of small sensor nodes which communicate through radio interface. The four basic units viz: sensing, computation, communication and power are the essential part of any sensor nodes. The main characteristics of any sensor nodes are limited energy, communication capability, storage and bandwidth, which is also important for study point of view. Survey done in this research paper is on the basis of various aspects of wireless sensor networks. In this paper we also discussed various types of WSNs, their applications and try to through light on various categories of routing protocols.

Keywords: WSN, Sensor nodes, Applications, Sensor Networks types, Routing Protocols.

I. INTRODUCTION

A wireless sensor network [1][2] is defined as a collection of a large number of tiny low power, low cost and multi-functional sensor nodes which are randomly and highly distributed either within the system or extremely close to it. Sensor nodes which are very small in size consist of a sensing unit, data processing unit, and geographic positioning system, power supply unit such as battery or solar cell and communicating components such as radio systems. We can get position of the node using GPS, this not only gives random placement but also means that protocols of sensor networks and its algorithms should be able to acquire self organizing abilities in inaccessible areas.

Figure 1 is a basic block diagram of sensor node comprises five main components-

Controller A controller to process all the relevant data, capable of executing arbitrary code.

Memory Usually, different types of memory are used for programs and data. Some memory are used to store programs and intermediate data

Sensors and actuators The actual interface to the physical world: devices that can observe or control physical parameters of the environment.

Communication Turning nodes into a network requires a device for sending and receiving information over a wireless channel.

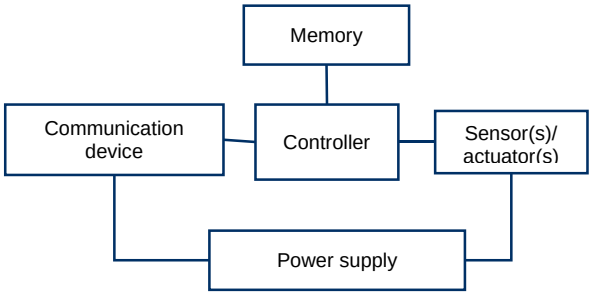

fig.1: Overview of main sensor node hardware components

II. TYPES OF WIRELESS SENSOR NETWORKS

With reference to research done in the past by various researcher, five types of wireless sensor networks are possible depending upon how these sensors are installed to monitor data. According

to these properties of sensor deployment we can categorize WSNs viz; ground (terrestrial) WSN, underground WSN, aquatic (underwater) WSN, multi-media WSN, and mobile WSNs.

A. Ground (Terrestrial) WSNs [11] It consist of hundreds to thousands of inexpensive wireless sensor nodes deployed arbitrarily in a given sensing area. In ad hoc deployment, sensor nodes can be dropped from a surface area and arbitrarily placed into the target area. In a ground (terrestrial) WSN [11], reliable communication in a dense environment is very significant. Ground (Terrestrial) sensor nodes must be able to effectively communicate data back to the base station. Though battery power is limited energy resource and it is main constrain on network performance and due to which it may not be replaceable or rechargeable again, ground(terrestrial) sensor nodes however can be equipped with a secondary power source such as battery or solar cell. It is always important for sensor nodes to conserve energy. For a ground (terrestrial) WSN, energy can be preserved with short transmission range, multi-hop routing, eliminating data purity, in-network data aggregation, minimizing delays, and using low duty-cyclic operations.

B. Underground WSNs [11] are compilation of a number of sensor nodes positioned inside crust of earth or in a cave or in a mine and they are used to observe underground events such as volcanic conditions etc. Extra sink or base station nodes are located above crust of earth to transmit information from the sensor nodes to the sink(base station). These type of WSN are much more costly than a ground (terrestrial) WSN in terms of deployment, equipment, and maintenance. Underground sensor nodes are more expensive because it is important to select the necessary equipment in order to ensure reliable communication through rocks, soil, water, and other contents residing inside crust. The internal conditions environment makes wireless communication a challenge due to high levels of attenuation and signal losses.

Unlike ground WSNs [11], the deployment of an underground WSN needs precise planning and energy and cost considerations. Energy is an important constraint in underground WSNs. Like ground (terrestrial) WSN, underground sensor nodes are prepared with a limited battery power source and once deployed into the crust or ground, it is difficult to recharge or replace a sensor node's battery.

C. Aquatic (Underwater) WSNs [11] is a set of a number of sensor nodes and vehicles deployed inside water. As opposite to ground (terrestrial) WSNs, aquatic (underwater) sensor nodes are more costly and due to which a few sensor nodes are deployed in sensing region. Autonomous aquatic (underwater) vehicles are used for investigation or collecting of data from sensor nodes. As compared to a dense deployment of sensor nodes in a ground WSN, a sparse deployment of sensor nodes is placed at sea level (underwater). Typical aquatic (underwater) wireless communications are implemented through transmission of acoustic waves.

D. Multi-media WSNs [11] are set of various low cost sensor nodes guided with microphones and cameras. These sensor nodes interconnected with each other using a wireless connection for data sensing, data processing, data correlation, and data compression. Multi-media WSNs are used to allow observing and tracking of events in the form of multimedia applications.

E. Mobile WSNs [11] are of a set of moving sensor with their interaction with sensing environment. Moving sensor nodes are capable enough to sense, compute, and communicate like non-moving nodes. Mobile WSNs are used in military and other industrial applications.

III.SENSOR NETWORK ARCHITECTURE DESIGN

A Wireless sensor network [1][2] is defined as a network of various tiny cheap, disposable, low power devices, called sensor nodes, which are randomly distributed in order to perform their selected tasks such as fire sensing, weather monitoring etc. These sensor nodes form a

network by interacting with each other either directly or via other nodes.

A sink also known as base station which is situated far away from sensing field. This sink or base station is competent of communicating with the user either directly or through the existing wired networks. The main parts of the network are the sensor nodes which are required for monitoring physical conditions such as weather conditions like temperature, humidity, intensity, vibration, pressure, motion, pollutants etc. These small sensor nodes, which consist of sensing unit, a processor for data processing, and communicating components, local data storage such as memory unit, Figure 2 shows the structural view of a Wireless sensor network in which sensor nodes are represented as small circles. A sensor node mainly contains four components: sensing unit, local memory storage, central processing unit (CPU), power supply unit, and communication unit. These components are assigned with various tasks and each individual unit is responsible for their own task.

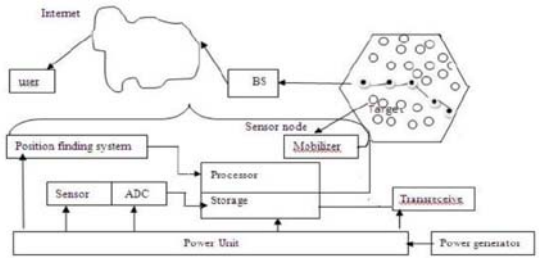

fig 2 .Sensor nodes scattered in a sensor field and components of a sensor Node

The sensor units consist of sensor and ADC (Analog to Digital Converter). The sensing unit is accountable for sensing data as per ADC commands, and then returning the analog data it senses. ADC is a converter that communicate the CPU what the sensor unit has sensed, and also commands the sensor unit what to do. Communication unit is responsible to receive command or query from and transmit the data from CPU to the base station or sink. CPU is accountable for performing data operations such as data removal, data aggregation etc. Power unit supplies power to entire nodes system

Each node may also contain two optional components such as location finding system and mobilizer to understand the knowledge of location with high accuracy.

IV. WIRELESS SENSOR NETWORKS APPLICATIONS

According to literature survey the applications [11] of WSNs can be categorized into defense applications, forest applications, medical science applications, Domestic applications, and industrial applications:

A. Defence applications: WSNs can be an essential part of defense command, security control, data communications, computation, intelligence, targeting systems such as (C4ISRT), surveillance, investigation etc.

B. Forest applications: Some environmental applications[11] of sensor networks include tracking and recording the movements of small animals ,birds and insects, monitoring environmental conditions, earth monitoring and exploration,

C. Medical Science applications: Few of the health applications [11] for sensor networks are diagnosing the patients, tracking location and movement of patients and doctors inside hospital etc.

***D.* Industrial applications:** Some industrial applications [2][11] of WSNs are building virtual keyboards, monitoring product quality, environmental control in office buildings, robot control ,interactive toys etc.

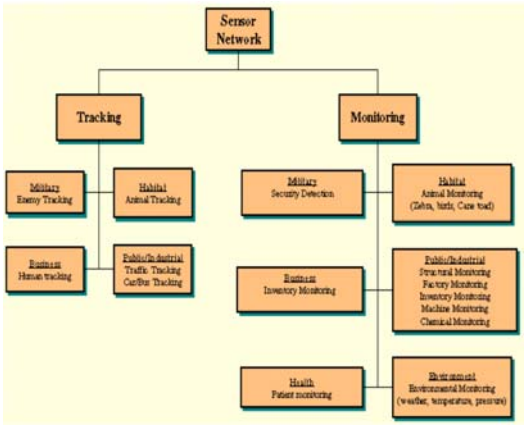

fig.3 Wireless Sensor Networks applications

V.ROUTING SCHEMES IN WIRELESS SENSOR NETWORKS

Routing can be defined as a procedure [9] of finding a path between the source node and the sink or destination node to perform data transmission. In WSNs the network layer is

frequently used to implement the routing of the incoming data. As we know that in multi-hop networks the source node cannot reach the sink node directly. That is why intermediate sensor nodes have to send their packets to the destination nodes. The formation of routing tables gives the solution. These consist of lists of node option for any given packet destination. Routing table is the task of the routing algorithm along with the help of the routing protocol for their construction and maintenance [2] software that requires lots of processing power.

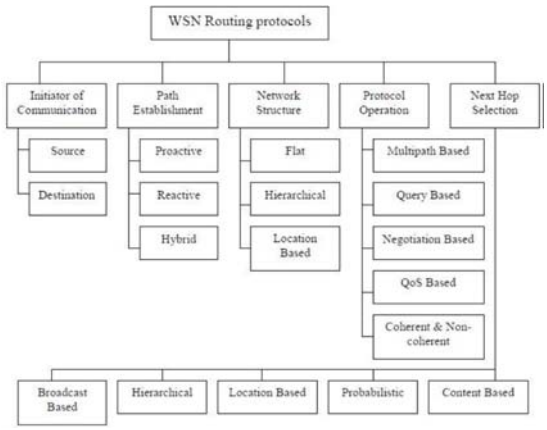

fig.4 *WSN Routing Protocols Classification*

A. Path establishment *Based Routing Protocols*

According to path establishment based routing protocols routing paths are established according to three types; proactive protocol, reactive and hybrid protocol. Proactive protocols are those kinds of protocols that compute all the routes before they are actually required and then store these routes in a routing table present at each node. On the other part, reactive protocols are such kinds of protocols which compute routes only when they are required. Hybrid protocols use a combination of both proactive and reactive routing protocols [6].

1) Proactive Protocols: Proactive routing protocols are such routing protocols which maintain consistent [5] and correct routing tables of all network nodes by using periodic broadcasting of routing information throughout the network. Here in this category of routing protocols all routes are computed before their actual requirement. These routing protocols can be used both in flat and hierarchal structured networks. The advantages of flat proactive routing are their ability to compute optimal path which needed overhead for this computation which is not acceptable in many situations.

2) Reactive Protocols: A reactive routing protocol [5] comes under on demand routing protocol category. So they do not maintain the global information of all the nodes in a network. Here the route establishment between source and destination is based on demand according to the requirement of the network. In order to find out the route from source to destination a route discovery query and route reply strategy is followed. Hence, in reactive routing methodology, route selection is on demand by using route query packets before route establishment.

3) Hybrid Protocols: Hybrid Protocols are combination of both proactive and reactive routing protocols. This routing methodology is applied to large networks. These protocols use clustering approach which makes the network more stable and scalable. The network structure is divided into several clusters and these clusters are maintained dynamically and if a node is added or left a particular cluster then this type of methodology uses proactive technique when routing is required within clusters and reactive technique when routing is required across the clusters.

B. Network Based Routing Protocols

Protocols which are divided based on the structure of network which is very vital for the required operation are comes under the category of network based routing protocols. The protocols comes under this category are further subdivided into three subcategories according to their operations. These protocols are [6]

1) Flat-Based Routing: Flat based routing is required where a large amount of sensor nodes are required and each and every node plays same role. Since here the number of sensor nodes is very large therefore it is not possible to assign a particular identification (Id) number to each and every node. It leads to data-centric routing strategy in which sink node sends query to a group of particular nodes in a sensing field and waits for their responses. Few Examples of Flat-based routing protocols are[5][8][9][10]:

- Energy Aware Routing (EAR).
- Sequential Assignment Routing (SAR).
- Directed Diffusion (DD).

- (MCFA).
- Sensor Protocols for Information via Negotiation (SPIN).
- Minimum Cost Forwarding Algorithm
- Active Query forwarding In sensor network (ACQUIRE).

2) Hierarchical-Based Routings: Hierarchical based routing strategy [10] is best match in those situations when network scalability and efficient communication is required. It is also known as cluster based routing protocols. Hierarchical-based routing is energy efficient methodology in which higher energy nodes are randomly selected as cluster heads for processing and transmitting data towards base station where as low energy nodes are used for sensing and send information to their cluster heads. In this way hierarchical-based routing helps largely to the network scalability, lifetime enhancement and minimum energy consumption. Some available hierarchical-based routing protocols are; [5][10]

- Hierarchical Power-Active Routing (HPAR).
- Threshold sensitive energy efficient sensor network protocol (TEEN).
- PEGASIS
- Minimum energy communication network (MECN).

3*) Location-Based Routing*: In these kinds of network topography, sensor nodes are randomly scattered in an area of interest and mostly known by their geographic position where they are installed. They are mostly situated by means of GPS technique. The distance between sensor nodes is calculated by the strength of signal received from those nodes and coordinates are calculated by exchanging information between neighboring sensor nodes. Few location-based routing protocols are; [5][8][9][10]

- Sequential assignment routing (SAR).
- Ad-hoc positioning system (APS).
- Geographic adaptive fidelity (GAP).
- Greedy other adaptive face routing (GOAFR).
- Geographic and energy aware routing (GEAR).
- Geographic distance routing (GEDIR).

C. Operation Based Routing Protocols

WSNs applications are categorized as per their functionalities. Hence routing protocols are classified according to their functions to meet these functionalities.

1) *Multipath Routing Protocols*: Multipath routing protocols are those routing protocols those provide multiple path selection for a message to reach its destination thus increasing network performance and decreasing delay in network. Due to increased overheads better network reliability is achieved through sending periodic messages network paths are kept alive and hence greater energy is consumed. Multipath routing protocols are [8][10] :

- Multi path and Multi SPEED (MMSPEED).
- Sensor Protocols for Information via
- Negotiation (SPIN)

2) *Query Based Routing Protocols*: Query based routing protocols works by sending and receiving queries for data. In this category the destination node sends query of interest from a node through network and node with this interest matches the query and send back to the node which initiated the query. The query is normally written in high level languages. Query based routing protocols are [8][10] :

- Sensor Protocols for Information via Negotiation (SPIN).
- Directed Diffusion (DD).
- COUGAR.

3) Negotiation Based Routing Protocols: Negotiation based routing protocols uses high level data descriptors for the removal of redundant data transmissions through negotiation process. Generally these protocols make smart decisions either for communication or other actions based on facts such that how much resources are present. Negotiation based routing protocols are [8][10]:

- Sensor Protocols for Information via Negotiation (SPAN).
- Sequential assignment routing (SAR).
- Directed Diffusion (DD).

4) *QoS Based Routing Protocols*: QoS based routing protocols, network required to have a balance approach for the QoS of applications of system. Here the application can be delay sensitive so to achieve this QoS metric. Here network have to look also for its energy consumption which is another metric when communicating to the sink. So in order to achieve QoS, the cost function for the desired

QoS also needs to be mentioned. Examples of such routing are: [8][10]

- Sequential assignment routing (SAR).
- SPEED.
- Multi path and Multi SPEED (MMSPEED).

5) Coherent and non-coherent processing: In the operation of wireless sensor networks data processing is a major component. Hence, routing techniques follow different data processing techniques. There are two types of data processing based routing [6][7].

6) Non-coherent data processing: In this category of data processing, sensor nodes will locally process the raw data before being transmitted to other nodes for further processing of data. The sensor nodes that perform further processing of data are known as the aggregators.

7) Coherent data processing: In coherent data processing based routing, after minimum processing the data is forwarded to aggregators. The minimum processing basically includes tasks like duplicate suppression, time stamping etc. When all sensor nodes are sources and send their data to the central aggregator node, a huge amount of energy will be consumed and hence this process has a higher cost.

D. Initiator of Communication Based Routing Protocol

Communication Based Routing Protocol relies upon the communication between network components, where generally they remain in sleep mode temporary. In order to get any services required from other network, the sink (destination, base station) node or the source node will initiate the routing with other part to send or receive the control or data packets[6][7].

- Source Initiator Routing Protocol
- Destination Initiator Routing Protocol.

E. Next-Hop Selection Based Routing Protocols

1) Content-based routing protocols: Content-based routing protocols determine the next-hop on the route purely based on the query content. Such type of routing protocols fits the most to the architecture of sensor networks, as the base station do not query specific nodes rather it requests only for data regardless of its origin[5][9][10].

- Directed Diffusion.
- GBR.
- Energy Aware Routing.

2) *Probabilistic routing protocols:* These protocols based on assumption that all sensor nodes are randomly deployed and homogeneous. By using this routing protocol, next-hop neighbour for each message to be forwarded are randomly selected by nodes and probability of selecting a certain neighbour is inversely proportional to its cost [5].

- Energy Aware Routing Protocol.

3) *Location-based routing protocols:* These protocols select the next-hop towards the destination based on the known position of the neighbours and the destination. The position of the destination may indicate the centroid of a region or the exact position of a specific node. The communication overhead caused by flooding can be avoided by Location-based routing protocols, but the calculation of the positions of neighbours may result extra overhead. The local minimum problem is common for all decentralized location-based routing protocols: it might happen that all neighbours of an intermediate node are farther from the destination than the node itself. In order to circumvent this problem, every protocol uses different routing techniques[5][10].

- GEAR (Geographical and Energy Aware Routing).

4) *Hierarchical-based routing protocols*: In case of hierarchical protocols, a message for a node (also called aggregator) will be forwarded by all nodes that are in a higher hierarchy level than the sender. Each node aggregates the incoming data by which they reduce the communication overload and conserve more energy. Therefore, these protocols enlarge the network lifetime and they are also well-scalable. The set of nodes which forward to the same aggregator is called cluster, while the aggregator is also referred as cluster head. Cluster heads are more resourced nodes, where resource is generally means that their residual energy level is higher than the average. The reason is that they are traversed by high track and they perform more computation (aggregation) than other nodes in the cluster.

Hierarchical routing is mainly two-layer routing where one layer is used to select cluster heads and the other layer is used for routing. [5][9][10]

- LEACH (Low Energy Adaptive Clustering Hierarchy) protocol.

5) *Broadcast-based routing protocols:* In broadcasting based routing protocols each sensor node in the network decides individually whether to forward a message or not. So the functioning of these protocols is very straightforward. So if a node decides to forward massage, it simply re-broadcasts the message and if it declines to forward message, the message will be dropped [5][10].

- MCFA (Minimal Cost Forwarding Algorithm).

VI. CONCLUSIONS

Wireless Sensor Networks are one of the promising fields in research area. Wireless sensor networks has a significant feature to observe environmental and physical phenomenon such as temperature, pressure, humidity etc.. In this paper we tried to find out and discussed various aspects of wireless sensor networks and also discussed various types of WSNs and their applications and classify various categories of routing protocols. The routing protocols in WSN has become one of the most significant research areas in WSN is routing protocol and introduced unique challenges compared to traditional data routing in wired networks. The main aim behind the routing protocol design is to keep the sensors operating for a long time, thus extending the network life time. Although many routing protocols have been proposed for sensor networks, many issues still remain to be addressed.

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ANALYTICAL STUDY OF PHOSPHORS FOR RADIATION DOSIMETRY

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Abstract

The main aim of the study is to analyse the different luminescence properties of phosphors synthesised by Combustion Synthesis (CS) Technique for Radiation Dosimetric Applications. Different electrical, optical and structural properties are seen in inorganic and organic materials in nano-crystallized form as compared to those in the bulk form. Out of these, the ones suited as phosphor host material show considerable size dependent luminescence properties when an impurity is doped in a quantum-confined structure. Pioneering studies of Thermo luminescence (TL) properties of nanostructure materials have produced encouraging results. With an objective of finding a new dosimetric material with higher sensitivity, good reproducibility, low hygroscopicity, and good response at high doses in radiotherapy and in mixed radiation fields and thereby advancing the dosimeters hence developing highly efficient materials, with high TL yield present investigation is undertaken. Activated Nano/Micro phosphor in regulated condition can be obtained by employing different Synthesis methods. Luminescent Properties exhibited by so prepared Phosphors can be tailored by impurities present, type of dopands used, molar composition of dopands and methods employed for their Synthesis, and temperature of synthesis. The materials of required properties can be synthesized by employing, hydrothermal reaction, sol-gel synthesis, micro-emulsion synthesis and mechanochemical synthesis.

Key-words: Phosphors, Luminescence, Radiation Dosimetry

Introduction:

Thermally stimulated luminescence also termed as thermoluminescence (TL) is a powerful technique extensively used for dosimetry of ionizing radiations. TL dosimeter (TLD) materials presently in use are inorganic crystalline materials. They are in the form of chips, single crystals or microcrystalline size powder. The most popular of them are LiF: Mg, Ti, LiF: Mg, Cu, P, CaF_2, $Li_2B_4O_7$, $CaSO_4$: Dy, CaF_2:Dy.The TL results of the recently reported nanomaterials have revealed very imperative characteristics such as high sensitivity and saturation at very high doses .However, recent TL studies of different luminescent ceramic micro or nanomaterials showed that they have a potential application in radiation dosimetry .These materials spread over various applications such as medical imaging, high energy physics, and nondestructive testing. During the last two decades, numerous ceramic materials have been proposed to be used as radiation detectors.

In order to provide efficient dosimeters for X or γ rays, the choice of the oxide matrix is crucial.The possibility to prepare nanocrystalline powder could allow the preparation of ceramics that could replace traditional thermoluminescent material. Another very attractive solution is the direct preparation of radiation detecting thin films. Thin detecting films are particularly valuable in fundamental spectroscopic studies when the absorption coefficient of the material is high or when the excitation energy is close to the absorption edge.

The commercially available Phosphors and their radiative efficiencies are tabulated in Table 1 & Table 2 [1-5]:

Table 1: Different TLD dosimeter- based personnel monitoring (PM) systems being used for individual monitoring of radiation workers.

System	Dosimeter type/Country where the PM system is being used
Harshaw TLD Badge (Thermo Electron Corp., USA + many other commercial systems in Europe)	LiF:Mg,Cu,P or LiF:Mg,Ti
Teledyne Isotopes, USA	CaSO4:Dy Teflon Tape Card: a) Korea, b) some labs in USA.
TLD badge system based on CaSO4:Dy teflon discs	a)India, b) Australia, c) Brazil
Panasonic TLD badge (Japan)	Li2B4O7:Cu & CaSO4:Tm
Rados, Finland	Li2B4O7:Mn,Si
Vinca, Serbia and Montenegro	Li2B4O7:Cu,Ag,P MgB4O7:Dy,Na
Landauer Inc., USA	Al2O3:C OSL badge
Chiyoda Technol Corporation, Japan	Silver-activated phosphate glass dosimetry system: Japan and France

Table 2: General characteristics of some commercially available thermoluminescent dosimeters relevant for personnel dosimetry.

TLD type	Effective atomic number Zeff	Main peak (oC)	Emission maximum (nm)	Relative sensitivity	Fading (at 25°C) for storage in dark	Useful dose Range
LiF:Mg,Ti	8.2	200	400	1	5%/year	20 μGy-10 Gy
LiF:Mg,Cu,P	8.2	210	400	25	5%/year	0.2 μGy-10 Gy
Li2B4O7:Cu	7.4	205	368	2	10%/2 months	10 μGy-103 Gy
MgB4O7:Dy	8.4	190	490	10	4%/month	5 μGy-50 Gy
Mg2SiO4:Tb	11	200	380-400	40	negligible	10 μGy-1 Gy
CaSO4:Dy	15.3	220	480, 570	30	1%/2 months	2 μGy-10 Gy
CaSO4:Tm	15.3	220	452	30	1-2%/2 months	2 μGy-10 Gy
Al2O3:C	10.2	190	420	60	5%/year	1 μGy-10 Gy

Aanalysis:

Transitions of electrons between the valence band and the conduction band are allowed and they produce free electrons in the conduction band and free holes in the valence band[6] . The energy difference between the two bands is denoted by the band-gap energy Eg (as shown in Figure 1). The transition of electrons directly from a metastable state to ground state is forbidden. The metastable state represents a

shallow electron trap and electrons returning from it to the excited state require energy. This energy can be supplied in the form of optical radiation (photo stimulation) or as heat (thermal stimulation). The probability (p) per unit time that a trapped electron will escape from a metastable state to an excited state is governed by the Boltzmann equation.

$$p = s.\exp(-E/kT) \quad (1)$$

Where s is the frequency factor (s^{-1}), depending on the frequency of the number of hits of an electron in the trap which can be considered as a potential well, E is the thermal activation energy required to liberate a trapped charge carrier called trap depth (eV), k is Boltzmann's constant and T is the absolute temperature (K).

First, the intensity of thermo luminescent emission does not remain constant at constant temperature, but decreases with time and eventually ceases altogether. Second, the spectrum of the Thermo luminescence is highly dependent on the composition of the material and is only slightly affected by the temperature of heating. The Thermo luminescence emission mainly is used in solid state dosimetry for measurement of ionizing radiation dose. Initially radiation dose was given by simple mechanism of thermo luminescence.

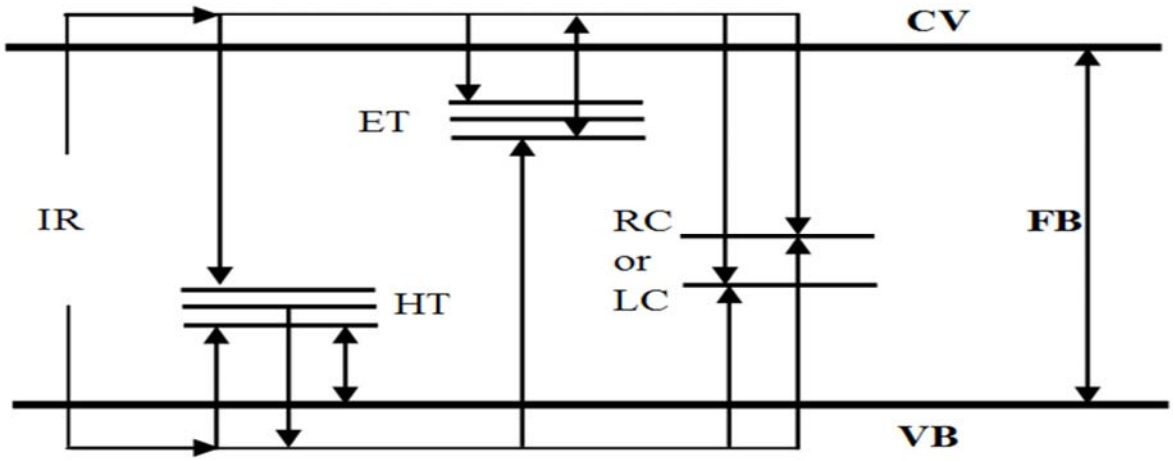

Figure 1

An optical storage phosphor or material is defined as to be a system which undergoes electronic or structural change that allows an optical readout of radiation exposure. luminescent phosphors where the radiation induced centres are metastable or stable and can be repetitively read out by photoexciation[7].The impurity incorporation transfers the dominant recombination route from the surface states to impurity states. If the impurity-induced transition can be localized as in the case of the transition metals or the rare earth elements, the radiative efficiency of the impurity- induced emission increases significantly[8].Dosimetric characteristics of the phosphor like Thermo luminescence glow curve, TL emission spectra, dose–response, fading studies, reproducibility and reusability studies are the factors which measures the efficiency and application potential of synthesized phosphors[9].

GLOW CURVES:

Thermo luminescence properties to be considered in choosing a suitable dosimetric system for radiation therapy dosimetry are linearity between radiation dose and response, sensitive to the signal, TL glow curve, acceptable accuracy and precision, and a good characterized relationship between the dosimeter response in the medium in which dose is to be measured and the calibration radiation field. Further its radiation application was measured and analysed by reading the following parameters:

TL glow curve:

Shallow traps, those nearest to the conduction band, are easily emptied at room temperature (RT), leading to measurable fading of the TL signal. The dosimetric traps require somewhat more energy to release trapped electrons, normally forming the peak within which maximum TL yield is obtained and hence are

used as the principal peak in dosimetric evaluation. The deep seated traps require appreciable energy in order to be emptied, obtained by high temperature annealing. The maximum peak of TL intensity increase with increasing the irradiation dose.

TL response

One of the important characteristic to be a good Thermo luminescence dosimeter is linear relationship between TL emission and the absorbed dose. The particular Thermo luminescence material gives the great effect to the linearity range. Generally, the response of TL phosphors is linear at low absorbed dose value than becomes supralinear and finally saturates at high values.

Energy dependence

The energy response should be flat, i.e., the system calibration should be independent of energy over a certain range of radiation qualities. In reality, the energy correction has to be included in the determination of the quantity Q for most measurement situations.

Sensitivity

TL sensitivity can be define as the amount of light released by phosphor per unit of radiation exposure. There are many factors that affect to TL sensitivity dosimeter such as kind and concentration of activators, system of the readout, heating rate, etc. The Figure 2 shows thcharacteristic of TL-glow curve with the function of temperature & relative Intensities of Phosphors.

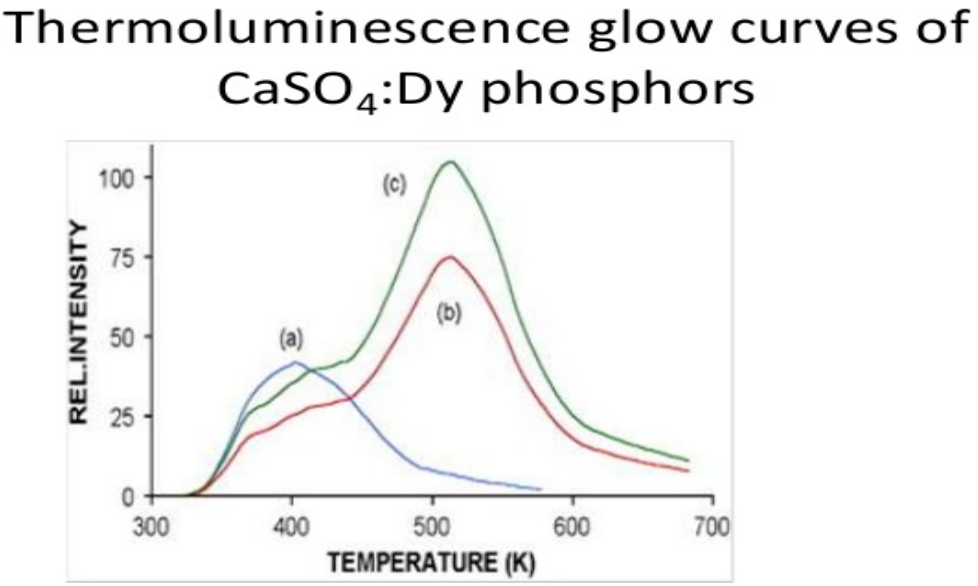

Figure 2

Results and Discussion:

After the synthesis and characterization of formed phosphor exhibits thermo luminescence when heated after exposure to radiation [eg.gamma rays (Co-60 teletherapy machine), X-rays and particulate radiation (Linear accelerator with 4, 6,15MV photon energies & 4-18Mev electron energies)], the intensity of the thermo luminescence being in proportion to the dosage of radiation of the phosphor, i.e., the dosage of radiation to which the phosphor is exposed. The TLD reader heats the TL element, measures the thermoluminescence emanating from the element by means of a light measuring circuit including a photoelectric converter such as a photomultiplier tube, and displays a reading of the dosage of radiation corresponding to the measured intensity of the thermo luminescence in an analog or digital value. TL glow curves will be recorded for all the samples with various treatments. Characteristic of natural, natural plus irradiation induced TL and together with annealed sample The characteristics of formed phosphors will give the following properties when analyzed with TLD-Reader (a)Trap Depth (b)Value of frequency facto:(c)Order of

Kinetics(d) The trap density of Dopants & Co-Dopants changes will be analysed:(e)TL peak temperature (Tm):

APPLICATIONS:

One of the important applications of TL Phosphors has been in the field of medical physics for their application in radiodiagnosis, nuclear medicine and radiotherapy. The rmoluminescent dosimeters (TLDs) have become popular in these fields due to their high sensitivity, miniature size, tissue equivalence, high stability to environmental conditions, low TL fading, reusability, linear dose response and sufficient precision and accuracy.

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ROLL OF SOME NANO STRUCTURED BUILDING MATERIALS: A REVIEW

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Abstract

Cement is most commonly used material in construction. Some time it is said its consumption is next to water .main function of cement in concrete is as a binder. in concrete to bind the coarse and fine aggregate.But in terms of green houses gases, the production of cement also affects our environment too much(one ton of cement also produces one ton green house gases CO_2) and the energy required for its production is approximately next to steel and aluminium production . therefore researcher are trying to find alternative of cement continuouslyso that its adverse affect on environment can be reduced.

Low calcium Fly Ash, silica fume,based Geopolymer Concrete, Acrylic polymer fiber reinforced concrete epoxy resin concrete, glass fiber, and carbon nanotubes .are new names in construction industry. new materials can make concrete more durable, more flexible, light , strong. Some nano materials are playing key role in enhancing the properties of concrete. Such as nano silica, nano ZnO, nano Cao, etc.

Key words: geopolymer concrete, carbon nano tube ,epoxy resin concrete,nano materials in concrete.

Introduction

Building construction is the biggest industry and it requires huge amount ofbuilding materials including aggregates, bricks, cement, sand, water and some of the other materials such as Aluminium, Glass, paints, timber etc. Today the materials required should not only posses the good strength , durability, and workability. It should affect the environment least. Normal strength is not sufficient, higher and higher strength is required because of sky scrapers. Nano materials and composites are providing new opportunity in invention of new materials. The researchers are trying the consumption of cement so as to reduce the green house impact of it. Some new materials with nano particles are discussed here.

Description

Geopolymer concrete

Approximately half of the electricity is generated by thermal power stations, which is produced by burning coal.and flyash is generated as bi-product in tremendous quantity at these stations.its disposal in storage lagoon require too much land and cost. sometime this waste land fill causes environmental hazard problems also. [1] And this can become substitute of cement. Geopolymer concrete is emerging cementitious composit and a kind of replacement of cement in cement concrete.Metakaolin and Flyash are natural materials of geological origin contains silica and alumina.And in presence of highly alkaline solutions polymers of alumina silicates are generated, and hardened like cement . This special kind of cementitious material is highly corrosion resistant.acid resistant and sulphate resistant.and the mechanical properties are also

improved i.e.compressive and flexural strength.shrinkage is reduced.because of geopolymers of alkaline silicate this material is inert for alkali aggregate reaction. Geopolymers are polysialates of alumina-silicates. Chemically can be written as (-Si-O-Al-O-)n where n is the degree of polymerization. [2][3]

Polymer concrete (or Epoxy resin concrete). The air voids present in the concrete reduces the strength of concrete, if the.voids can be filled by some suitable materials then the strength of concrete can be increased. In polymer concrete the slight percentage of low viscosity polyster resin is introduced which fills the micro level voids and concrete is tightly packed and so that the strength of concrete get increased.[7] The percentage of resin vary from 5%to 15 %. This concrete is specially suitable. for using as high grade dielectric materials in electrical appliances for high voltage. Till now porcelain is used which is costlier than polymer concrete. In making polymer concrete knowledge of nano technology have been applied;[4] Epoxy resin concrete is new experimentation in concrete to improve the properties of cement concretet. We know that cement concrete has good compressive strength but poor in flexural strength so it gets cracked due to any tensile stress. By using epoxy resin the flexural strength can be increase also called high performance epoxy resin concrete.[5] In china the experiment has been done with it,where steel manhole covers were replaced by epoxy resin concrete. This was not only cost effective but flexural strength wise also improved also. And the problem of theft of steel cover was stopped. The chemical resistance of this concrete is also better than opc concrete.[6]

Carbon-notubes:

The new material which have got too much attentation is Carbon nano tube. At present this is not used in structural elements but very soon it will be involved into structural elements.at present two type of CNT are discussed SWCNT and MWCNT.The singled walled carbon nanotube(SWCNT) tensile strength is about 13-53 GPa while multiwalled carbon nanotube (MWCNT) is upto 150 GPa, SWCNT Youngs Modulus is about 1-5 TPa while MWCNT is about 0.2 to 095 TPa.it all depends upon the internal arrangement of MWCNT.we can see that for steel the tensile strength is about 0.38 to 1.55 GPa and youngs modulus is about 0.06 to 0.18 TPa.this all discussion is when axial properties of CNT are considered. It is too much stronger than steel and lighter than aluminium[9-12].

Nano materials in Modification of the strength of steel bars .

Steel is important part of construction industry. With use of some nano materials in steel, the properties of steel can be improved .its resistance to corrosion, strength is improved by nano materials,carbon nano tubes and nano copper. Steel cables are used in various civil structures, in prestressed concret and bridges can be strengthened using carbon nanotubes. Fracture resistance is increased in Steel fixers like bolts can be reduced by use of molybdeneum and vanadium.steel structures such as bridges are subjected to dnamic loading and cyclic loading and so subjected to fatigues stresses. nano particlels addition of magnesium and calcium helps in solving the problem of heat affected zone in weldings etc.[1][14]

Nanoclays:

Clay nano-composites have improved physical and engineering properties, this is One of the most focus area in construction. Research on clay has received great attention in the area of nanocomposites. It offers tremendous improvement in a wide range of physical and engineering properties for clay polymers with lower percentage of filler.these nano fillers increase in density, compressive strength , young's modulus ,along with the filling in of air gaps. nanoclays like metallic nano-kaolin is used with cement.[9]

Surface treatment of hardened concret and glass by Nano-Coatings :nano coatings

Protect the structures/components from various weathering agents i.e. abrasion, chemical attack and hydro-thermal attack., to improve aesthetics, various chemical coatings are generally and routinely used. Now the thickness of coatings reduced from micro coating to nano coatings. Many reports are there which shows that various nanoparticles used in binders improves the effectiveness on key properties related to deterioration and it is reported that a paints and solvent with low molecular weight

epoxy resin and nano-clay particles are showing promising results. [12]

Titanium dioxide (TiO2) in glasss coatings. Titanium dioxide (TiO2) posses very good sterilizing property and antifouling properties.By photo-catalytic process number of air pollutants present in air (organic and inorganic) captures and breaks down because of TiO2 coating[11] .glass is now important component of every building.. now a days nanoTitanium dioxide (TiO2) is being used to coat the glasses**.** This coating of TiO2 make the glass surface self cleaning,because Tio2 is hydrophilic and its attraction to water forms sheets out of rain drops. Nanometer thick coatings are durable and could have selfcleaning and self-healing properties. Nano scale roughness of the coatings will have the property to repel water and dirt and can outdate the existing 'non-stick' technology. Self cleaning properties of a coating made using nano-particles would also help to keep the coated surface totally free of dirt and dust

Aluminum Oxide (Al_2O_3)/ Zinc Oxide (ZnO)/and CaCO3 Nanoparticles.

The addition of nano-Al_2O_3 improves the mechanical properties of concretes, in terms of higher split tensile and flexural strength.Alumina (Al_2O_3) component reacts with calcium hydroxide produced from the hydration of calcium silicates. We know that The rate of the pozzolanic reaction is proportional to the surface area available for chemical reaction.. in cement 2% nanoAl_2O_3 can be replaced in the concrete mixture(with average particle sizes of 15 nm),

Zinc oxide exhibits semiconducting and piezoelectric dual properties. It is a multipurpose material. Generally it is added into various materials industries and products, in civil engineering products such as, ceramics, glass, cement, , paints, , sealants also used ,. In cement concrete , addition of ZnO improves the processing time and the resistance of cement concrete against water. $CaCO_3$ Nanoparticles: experiments shows that addition od $CaCO_3$ reduces the strength but by adding nano particles of caco3 improves the strength.it has been reported that in Microhardness significant improvement in the strength is found when nano-$CaCO_3$ is added to cement. when 20% nano-$CaCO_3$ was added to the OPC microhardness value increased.[9]

Conclusions:

In finding the alternative solution of cement concrete and for enhancing the properties of existing materials Nano technology and nano materials providing new composites with enhanced properties such light weight, more flexibility, more compressive and tensile strength, corrosion resistant, and cost effective also. Some of the identified new materials are Carbon nanotubes, nano particles of ZnO, Al_2O, $CaCo_3$,and polymers. Some of the natural materials such as Geopolymers and nano clay are importat upcoming materials. These all materials are slowly changing the construction methodology, and planning and designing crieria which are currently dependent present OPC cement.

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AN AVARICIOUS CLUSTER-BEE FORWARDING ALGORITHM FOR NAMED BASED DATA NETWORKING

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Abstract

The Named data Networking (NDN) is a new approach for internet architecture on Content-Based Networking, Named Data Networking uses data, instead of IP or hosts, asa entity to send Data. Though, one of the most primary challenge is to support smart forwarding of Interests across multiple paths and at the same time allowing a name space which is absolute. To overcome this problem, this paper suggestanavaricious cluster-BEE Forwarding (GCBF) algorithm it is based onInternet Service Provider which is used to lower the content naming space. There are twokinds of BEEs in GCBF. One is Hello BEE that is used to get the all possible paths and optimize them; the other is Normal BEE that is used to get data and reinforce the optimization of the paths at the same time.

The GCBF algorithm is a forwarding algorithm for Quality of Service awareness in the complex dynamic network.

Keywords: Named data networking, Content Based Networking, BEE Colony Optimization, Quality of service, Multipath forwarding

1. Introduction

The Internet was formerly intended as a communication substrate sanctioning the data delivery among end-hostspairs. However, it now largely work for content-centric applications, e.g., Content Data Network [1] and Point-to-point Network. The architecture of Internet has grown significantly as a content-centric model from host-centric communication model, e.g., YouTube, Facebook. (CCN) is a new networking architecture placedon content distribution instead of point-to-point connectivity. This transformation from host-based to content-based has many engaging benefits, like reduction of network load, low dissemination energy efficiency [4]and latency,. The Named data Networking (NDN) [3] is a paradigm of the CCN.

Due to the fact today's era is not but ready to assist an internet Measure deployment Diego and Matteo concluded that a NDN deployment is possible at a content material Distribution network (CDN) and ISP scale. NDN moves the address size from one thousand millionIPs to a minimum of one thousand billion data names that increase of routing state that can be stored at routers of content. There are generally two problems with routing (i) shrinking the routing table whereas permitting an limitless name space; and (ii) supporting smart forwarding of Interests over multiple paths.

BEE Colony optimization (BCO) are based on the normal conduct of BEEs while finding out the shortest path between their nest and a few food supply. The BEEs interconnect indirectly by laying fragrancestraces and following traces with complex fragrances. Fragrances will find on the shortest path [7]. The BEE Colony is an simulatedcloud intelligence arrangement. Stutzle and Dorigo established the first BEE based algorithm that was referred to as BEE System [6]. it had been used to

solve the travelling salesman problem (TSP), a well-known NP-Hard problem [10][13]. BEENet [5] is one of the famous BCO centered routing protocols presented by M. Dorigo and G. D. Caro for packet switching network. Laura, Matteo, and Gianluca[8] proposed a BCO algorithm that main goal at decrease complexity of the nodes by the cost of the optimality of the solution is it notably suitable for environments wherever quick communication establishment and minimum overheadfor signal are requested. ShashankShanbhag et al [9] bestowed SoCCeR—Services over Content-Based Routing. Soccer extends CCN with integrated support for service routing choices leverage BEE-colony optimization.

On this paper, we present a QoS aware A Avaricious cluster-BEE Forwarding (GCBF) set of rules for NDN. We adopt the ISP-primarily based aggregation to reduce the issues due to the huge name space. In the contemporary internet, the massive a part of the famous contents is supplied by carrier company, e.G.Youtube, facebook. This technique reduces the Forwarding Information Base (FIB) table size considerably.

We undertake the BEE Colony Optimization (BCO) algorithm as the strategy of forwarding for NDN to solve the Quality of Services problems. The main objectives consist of selecting performance metrics to rank interfaces, e.g. delay, cost, bandwidth, delay jitter; and (2) avoiding variabilitywhile holding good performance for data delivery. Forwarding policy is a key factor in NDN nodes that makes them more effective than their IP counterparts. NDN's neighbor forwarding for multipath and its symmetric routing, data is sendback via the interest coursetraversing, inherently match the natural behavior of BEEs while finding for the shortest path among their food source and nest.

2. Design

2. 1 Node Design

Based on Diego Perino and Matteo Varvello's work, we understand that a NDN deployment is viable at a Content Distribution network (CDN) and ISP scale, while these days' technology isn't yet prepared to help a web scale deployment [2]. Especially challenge is given by means of the massive content naming space.

We adopt the ISP-primarily based aggregation to solve the issues due to the large name space. According to the Cisco visible Networking Index 2010, worldwide IP site visitors will quadruple every year until 2014 and approx. 55% of the overall net traffic can be video, and international cellular statistics visitors will double each year until 2014 and approx. 65% of the general cellular traffic can be video. In current net, a huge part of the popular facts is supplied at the provider platform. Even though there is a lot of information produced by way of the users, additionally they wBEE a platform to propagate their statistics. Accordingly, the nearer the interest packet is forwarded towards the Server, the more feasible it could be responded.

This method has two fundamental additives:(a) facilitate collection for hierarchical provider-allotted names ; and (b) a service for mapping to map names selected by users to provider-allotted names. For well suited with the modern internet, we can use the domain name for the main call of the hierarchical data call genuinely.

Inside the FIB, the primary name of the hierarchical content names has the very best priority. We maintain the authentic routing techniques proposed in NDN, however, when there may be no space for storing the content name routing facts, the routing entry of the content material call that has the most hierarchical names could be deserted first of all.An example of the FIB table is illustrated by means of the Fig.1 (a). We exploit the inherent advantagesof NDN and expand it by means of BCO to gather this facts. We upload a few parameters that are utilized by BEE Colony Forwarding algorithm. The FIB table includes the content call, the associated faces, the corresponding fragrances values, final delay time and the quantity of matched times.

Each hop hosts a FIB manage module that has the accountability to update the FIB table. In our thought, every node within the network acts autonomously and asynchronously

Content name	Matched	Interfaces	Overhead	Fragrances
Youtube.com	n(Youtube)	A	DA(t)	
Facebook.com	n(Facebook)	B C B	DB(t) DC(t) DB(t)	
		D F	DD(t) DF(t)	
…	…	…	…	..

(a)

ID	Type	Overhead	Timestamp stack	Bandwidth	Hops

(b)

ID	Type	Overhead	Hops	Data

(c)

Figure 1. (a) An example of the FIB table; **(b)** An example of Hello Data BEE packet; **(c)**An example of the Normal Data BEE.

2. 2 Overview of GCBF Progress

We treat the whole packet within the NDN as anBEE which emerges within the pair of interest BEE and information BEE. There are two varieties of packets, and that they have unique behaviors. One is normal packet which is generated through consumers and is used to retrieve the records; the opposite is Hello packet that is generated by using routers and is used to collect the routing and forwarding data. The HelloBEE packet includes extra data than the NormalBEE packet. It incorporates the direction overhead, the minimum

k the interfaces in the FIB by the facts contained inside Hello DataBEE. bandwidth, the round trip delay and hops of the entire path. To reduce the packet length and drop down the router operation time for the Normal BEE packet, the Normal BEE packet only consists of the path overhead. Fig. (b) 1 and (c) constitute the two varieties of the packets.

Let us introduce the forwarding progress of the Hello packet firstly. The source node, typically is a router, generates the Hello interest packet in a set period. The node randomly chooses a content material name in the FIB table by way of roulette technique. The roulette wheel is constructed with the aid of the probability of the content name being matched. Once the content material call is chosen, the variety of BEEs is determined by way of the variety of forwarding interfaces inside the FIB. There are two particular instances: the first is that at the initial degree there may be no forwarding facts in the FIB for a new content name; the alternative is that the packet lost happenings those instances, the Hello interest BEE packet might be forwarded to all interfaces of the node.

Whilst the middle node of the path receives a Hello Interest BEE, it will forward the packet to the one of interfaces in FIB probabilistically. The possibility of the interface being decided on is decided by the fragrances and the duration of queue for that interface. When the ISP node receives a Hello interest BEE, it's going to generate Hello DataBEE and calculate the parameters. E.G. The delay is calculated by plus the interface delay fee in the Neighbor link States table when. The node within the

direction gets a Hello Data BEE, it will replace the fragrances values and ran
Normal BEE packet is drove through the consumers. When a user makes an interest packet, the Normal Interest BEE is generated. Normal Interest BEEisn't the same as the Hello interest BEE in the forwarding strategy. The node sends the Normal Interest BEE voraciously to the primary interface which has the highest fragrances in the FIB. The Normal InterestBEE packet will be forwarded to all interfaces that the node has only in the situation of that the FIB has no forwarding records for the data name. The Normal Data BEE only contains the delay parameters. While a node gets a Normal Data BEE, it'll update the different method for the fragrances values .

2.3 Definition

2. 4 Construction of the solution

In this section, we talk about GCBF algorithm for dynamic NDN networks. InterestBEEs are dispatched from each supply node to all viable destination nodes inside the network throughout the BEE foraging segment (see functions BEE Generation () and interest BEE Forwarding () in set of rules 1). Data BEEs go back along the identical direction with the Interest BEEs however in reversed route. Data BEEs forwarding polices are certain by means of the function 4 in algorithm 1. While the node receives the DataBEEs, they will replace the corresponding fragrancess via the function 5. If there is no forwarding Data in the FIB table for content name ID, the node will generate the Hello Interest BEEs via the function 2.

For the subsequent hop choice hassle, Hello Interest BEEs calculate the possibility of interface being selected for forwarding with the aid of the similar method proposed within the BEENet[5], even as the Normal Interest BEEs select the exceptional interface determined with the aid of the fragrances and current queue length of that.

Algorithm 1. Avaricious cluster-BEE Forwarding Algorithm for NDN

1: ***Function:****BEEGeneration()*
Repeat
For each hop in the network
do If the hop*i*is a router
then
Randomly select an ID from FIB table and runHelloBEEGeneration(ID)
Else
Generate some different Normal Interest BEEs, Send them by *InterestBEEForwarding(ID)*
End if
End for
Increase the time by a time-step for BEEs' generation **until** end of simulation

2. Function *HelloInterestBEEGeneration(ID)*
If the ID exists in the FIB of node i **then**
Forwad
Generate | | Hello Interest BEEs for name ID
the Hello Interest BEEs to each interface j, j

Else Broadcst Hello Interest BEEs

End
If

3. Function *InterestBEEForwarding(ID)*
If the ID exists in the FIB **then**
Else
If the packet is Normal Interest BEE **then**
Forword the Normal Interest BEE to the best interface j, j
Else **End if**

Forword the Hello Interest BEE to a randomly selected interface j, j
Broadcast the Normal Interest BEEs and execute *HelloInterestBEEGeneration(ID)*
End if

4. Function: *DataBEEForwarding(ID)*
If the hop is a middle hop of path **then**
Update the information of data BEE and forward the packet to the packet coming interface Update the j by the equation (6) and (7), update the other interfaces by equation (8)
End if

5. Function: *HelloDataBEEReceive()*
If it is the initial stage **then**
Wait until All possible Data packet returned
Update the corresponding fragrances by the equation (5)
Else
Wait until All possible Data packet returned
Update the corresponding fragrances by the equation (9)

End if

2.5 Fragrances Update
After the construction of all solutions, the fragrances update is performed according to the specified algorithm.
3. Evaluations
So one can examine the effectiveness of our algorithm to growth the usability of NDN, we are building the simulations that run at the ccnSim [11] simulator and the OMNET++ simulator [12].
We examine the effectiveness of GCBF compared with authentic NDN wherein a router forwards the interests to all faces through which the Data is available. We put in force our method based totally at the ccnSim supply code. We run our simulation on an Intel middle 2 Duo CPU T9400 running at 2.53 GHz and 4 GB of memory.

4. Conclusions

On this paper we present aAAvaricious cluster-BEE Forwarding (GCBF) algorithm for NDN network. GCBF algorithm makes use of two sorts of BEEs to finish the whole routing and forwarding optimization progress. The responsibility of Hello interest BEEs is routing and optimizing the direction for Normal Interest BEE packets. The Normal InterestBEEs fortify the optimization of the best of service aware path. The Normal Interstate BEEs undertake the grasping approach for subsequent hop choice but, the Hello InterestBEEs pick out the subsequent hop probabilistically for the functions that the modern-day network states can be up to date in time and the new path may be found. The GCBF set of rules adaptively reduces the impacts incited with the aid of

the dynamic complex community, e.g. Link failure, network congestion and dynamic network topology.

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A RESEARCH PAPER ON UPGRADED BLACK BOX FOR AUTOMOBILES

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Abstract

The main purpose of the paper is to develop a prototype of Black Box for vehicle diagnosis that can be installed into any vehicle. Like flight data recorders in aircraft, "Black Box" technology plays a key role in vehicle crash investigations. This prototype can be designed with minimum number of circuits. This can contribute to construct safer vehicles, improving the treatment for crash victims, helping insurance companies with their vehicle crash investigations, and enhancing road status in order to decrease the death rate. The prototype provides complete information about the car along with Navigation system in collaboration with Google Earth. The prototype can provide Artificial Intelligence Support by having a communication channel between the user and the car. Car-To-Car Communication for analyzing abruptness in the forthcoming vehicle before it intends to collide is a major field studied in the paper along with live analysis through experiments.

Keywords—Black Box; Google Earth; Artificial Intelligence; Global Positioning Society.

I. INTRODUCTION

Have you ever wondered what really goes on under the hood of your car? Do you wish you could peek inside the engine-management system and read values from it? Are you annoyed that your dashboard displays a cryptic “check engine” light but gives absolutely no explanation what the problem might be? You don’t need a $10,000 specialist diagnostic console or even a laptop computer to get access to useful data from your car.

According to the World Health Organization, more than a million people in the world die each year because of transportation-related accidents [1]. In order to react to this situation, the black box system draws the first step to solve problem. Like flight data recorders in aircraft, "Black Box” technology can now play a key role in motor vehicle crash investigations [1]. A significant number of vehicles currently on the roads contain electronic systems that record in the event of a crash [1]. That is why it is so important to have recorders that objectively track what goes on in vehicles before, during and after a crash as a complement to the was used. Subjective input that is taken usually from victims, eye witnesses and police reports. This system is mainly committed to three sections. The first one is how to detect and collect the information from the vehicle. The second is how to present the data to the user in a simplified way. The most important is the third one, where the information related to abruptness and rashness in the driving skills of the driver are transmitted from one vehicle to another using Radio Frequency and suitable Transceivers. To measure the inclination of vehicle as well as measuring the tilting and analysing the speed of the vehicle, basically a Vehicle Dynamics Control Unit there are G-Sensors used in the vehicle which are connected to the microcontroller. C programming is being used to interface all the sensors on the Arduino Board as it provides great efficiency to the

microcontroller. This programming helps in not only recording the data but also retrieving the data from microcontroller memory to an LCD to display it.

In this project, the traditional version of Black Box is replaced by a newer technology i.e. the traditional black box used a OBD-II cable for diagnostics of the vehicle whereas the current version of Black Box uses sensors connected to the Microcontroller giving you better and more information about the vehicle along with the On-Board Diagnostics cable.

The applications of Car Black-box include:

1. Better crash research that may produce improved driver education programs, safer road designs and improve highway safety.
2. Collision data for research, data to improve vehicle design internally and externally.
3. To not only record the relevant data, but also try and prevent a possible collision by limiting the speed of the vehicle in accident-prone areas.
4. Wireless communication by transmission of alert message in the event of a collision along with the time and location co-ordinates through GSM.

II. Hardware And Software Resources

The hardware part consists of the components and the sensors used in the black box system. This part mainly collects the status of the sensors and stores it into the micro controller‘s EEPROM.

A. Sensors

1) Proximity Sensor: A proximity sensor is used to detect the lanes in which the vehicle is travelling.

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic or electrostatic field, or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal.

2) Ultrasonic sensor: The ultrasonic sensor is to measure the minimum distance in front of the vehicle Ultrasonic sensors work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor.

3) Pressure Sensor: A pressure sensor measures pressure, typically of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. This pressure sensor is mainly used to find whether an accident has occurred or not.

4) Temperature Sensor: This sensor is mainly used to detect the temperature of the engine of vehicle. It detects two types of temperatures one is abnormal temperature and other is engine temperature.

5) Leakage Sensors: This sensor is used to detect mainly the leakage in CNG or LPG vehicles and alarming the vehicle user about it through a buzzer or indication on the dash board.

6) OBD-II Reader: The On-Board Diagnostics cable v2.0 is connected to the vehicle to acquire information from the vehicle regarding the coolant temperature, internal combustion engine pressure and temperature, fuel level etc. The information which is not fetched through the OBD-II cable is acquired through the sensors and the modules connected to the programmable board.

B. Digital Processing

In order to control all these sensors and their inputs, a digital process can be used. As prototype a Arduino micro controller is selected to control the black box.

1) Arduino Uno Board: The Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

2) Arduino Mega 2560: The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs),

16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

3) Microcontroller's Program: The main function of the microcontroller program is to take input samples from different ports. These samples are taken from the sensors installed in the vehicle. After that, each sensor sample is saved into the microcontroller's EEPROM. After the accident all the data from the sensors is received by the microcontroller before it goes into the sleep mode. This data is used to analyzing the accident. The choice of the microcontroller's transmission protocol was the standard asynchronous format using 8 data bits, no parity bit and one stop bit with a 9600 baud rate. Since the complexity is in the interpretation of the data and not in the transmission, the need was for a format that guarantees minimum simplicity with maximum reliability. In addition, a MAX232 is used as an intermediary station, to connect the microcontroller to the serial port of the computer.

III. Vehicle Black Box Architecture

The In Vehicle based Car Black-box consists of an Arduino Microcontroller. The GSM/GPS module is also connected to the processor [2]. Different sensors are interfaced with the programmable circuit board as shown in the figure.

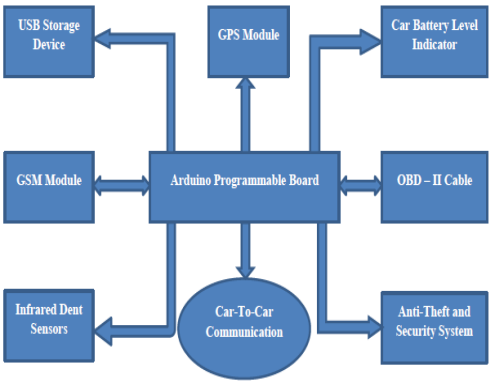

Fig 1. Architecture of Black Box

IV. Function and Design of The Proposed Prototype

The proposed system is an upgraded version of the Black Box designed earlier. The earlier box consisted diagnostics elements like Microphone and Camera for detection of any failure in the vehicle.

The upgraded version has sensor based activation with the programmable board along with the Diagnostics Cable put inside a single box allowing the user to configure and detect the malfunctioning in the vehicle system and navigate through roads and paths by tracking through a mass platform Google Earth. The newer version of Black Box offers a user friendly program with safe navigation by letting the driver know the details of the vehicle approaching the driver by communication through Transceivers which are sending and receiving the signals as soon as a threshold is crossed. This ensures safety to the user.

The basic and main purpose of the upgraded version of black box is to provide complete data analysis along with fleet management to the user by giving detailed list of the parts working within the automobile and the functions in a simplified non-technical language where the driver can identify and diagnose the wrong doings in the vehicle without him having the need to go to a mechanic where he is charged a huge amount for a simple malfunctioning.

Table 1. Function and Feature of Black Box Mining System Designed

Function	*Existing system*	*Proposed system*	*Function & Feature*
Function of detecting collision	Yes	Yes	Function of detecting external shock to car
Audio/video encoding	Yes	Yes	Function of encoding video & audio signal
Function of saving data	Yes	Yes	Encoding & storing information data of car
GPS function	Yes	Yes	Function of receiving current location information of car
Communication function	No	Yes	Function of transmitting car information to distant place using WCDMA modem
Function of transmitting video	No	Yes	Function of transmitting video of current load status to control center at distant place
Function of analyzing location information	No	Yes	Function of minimizing the load of network by analyzing current moving path of car and minimizing the transmission of data to distant place using moving path & pattern of car collected from mining system at distant place

Fig 2. Design of the Proposed System [3]

V. Conclusion

This paper has presented a new vision for the automobile industry. The use of Black Box system for vehicle diagnosis is a pitch capable to revolutionarize the way a layman visualizes his

particular vehicle. A full and detailed description was made for every part of this system. This paper also offers a user friendly embedded program to analyze the data of the accident. The Black Box system built can be implemented in any vehicle. As soon as the driver runs the motor, this system will begin saving the events and displaying the required details on the LCD screen of the corresponding vehicle. In case of an accident, an additional 10 seconds of events before and after this accident will be saved for complete analysis of the scene. The data saved can be retrieved only after the accident for privacy purposes. In addition, a detailed report will be given to the user containing the recorded data in the memory through the txt. File. The highlight of the prototype is the ability to communicate with another vehicle approaching it by transmitting the values of speed and RPM of the automobile for safety purposes and alarming the user for abruptness in the driving system of the approaching vehicle.

VII. FUTURE ENHANCEMENTS

We can enhance the present system to check other parameters like fuel level, tire pressure and working of headlights before starting the vehicle .Many other critical parameters can be read and stored in the memory. Another useful add-on to the present system could be cameras on front and backsides which keep recording live images and storing them in memory. This video data would be much useful for accident investigation.

ACKNOWLEDGMENT

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NETWORK SECURITY TOOLS: FIREWALL, INTRUSION DETECTION AND PREVENTION SYSTEM (IDPS)

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Abstract

Due to tremendous growth of usage of computer and Internet, the human has entered into an era where there is huge amount of information which is valuable and this information enter into their life via internet. No doubt that this kind of information, makes people's life faster and more convenient; on the other hand, various kinds of harmful contents are flooding the Internet, such as viruses, junk mails and so on, which do great harm not only to the individual but also to the whole society. Firewalls and intrusion detection systems are two most famous and important tools that are used to provide security. Firewall acts as first line of Defense against network attacks .They monitor network traffic in order to prevent unauthorized access. Although firewall can control network traffic but they cannot be entirely depended to provide security. Intrusion detection system (IDS) reduces security gaps and strengthens security of a network by analyzing the network assets for anomalous behavior and misuse.. Real time detection with prevention by Intrusion Detection and Prevention Systems (IDPS) takes the network security to an advanced level by Protecting the network against mischievous activities .In this Paper, we illustrate two important network security tools which includes firewalls and intrusion detection systems their classifications, shortcomings as well as their importance in network security.

Keywords—Firewall, IDS, IDPS, Intrusion prevention system (IPS).

I. INTRODUCTION

Nowadays, due to the boom in the usage of internet by people one of the most important aspects of networks is their security. Network security in today's world plays very important role there are many researches going on this domain by various people to provide more better security to the existing network. The network security and firewalls are two words which seem to be closely related to each other as we are aware of the fact that firewall provides security to network in organization efficiently. The need of firewall is not required to great extent if the network is only intranet based from network security point of view in comparison to the scenario where all the users are connecting with internet which acts as a medium from where the traffic (data) travel from outside to inside and vice-versa, in such case firewall are the first line of defense required at large because the surveillance of attackers increase and hence its mandatory to secure users data as well as to protect unauthorized user cum data to enter in network. In1980s emerged the concept of Firewall technology. The basic function of firewall is to provide access control between networks and to mediate connection requests based on predefined set of rules or policies of packet filters.

Firewalls generally comprise of some form of inspection engine that analyzes IP, TCP, and UDP packet headers and (possibly) packet application data against a "rule base". Due to large number of threats of network attacks, firewalls have become more important elements for defense than ever for any kind of network. Firewalls have been ideally designed for filtering out unwanted network traffic coming from or

going to the secured network. The filtering decision is based on the firewall policy [1] which is a set of ordered filtering rules defined according to predefined security policy requirements. The sequence of rules plays very important role in the firewall policy because matching will take place on the basis of first-match semantics where the firewall will take decision for accepting or rejecting a on the basis of the first rule that the packet matches. A firewall [6] is generally placed at the entry point between a private network and the outside Internet so that it can check all incoming and outgoing packets and decide whether to accept or discard a packet based on its policy. Firewall allows traffic with desired IP addresses and ports to pass through it, but it cannot identify whether the traffic is normal or Malicious one. Firewall no doubt has certain

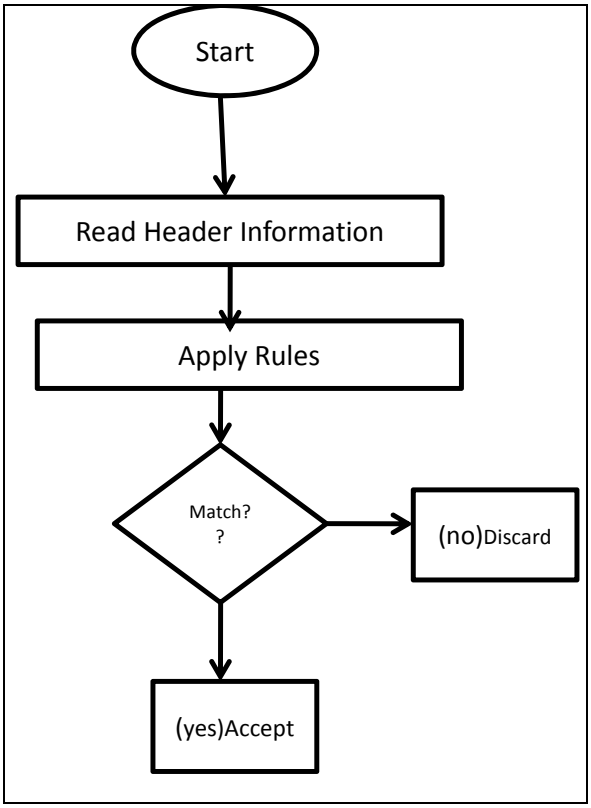

Fig.1. Packet Filter Firewall

advantages, but it lacks ability to detect attacks. On the other hand Intrusion detection system has the ability to detect threats and attacks by monitoring the network traffic. Whenever an intrusion occurs in a network, an alert is generated by IDS to the network administrator for taking an action to block the attack.History of intrusion events has proved that only detection is not enough to block the intruders from attacking the networks which brought intrusion detection and prevention system into existence (IDPS). IDPS not only report attack events to the administrator but also block them instantly. The paper is organized into different sections which include Introduction, Types of Firewall, Shortcomings Of firewall, Types Of Ids , IDPS, Conclusion .

II. Background And Related work

1) Different Types Of Firewall

Since firewall technology [2] evolved in era of 1980's there has been various changes made in their filtering techniques [4] adopted by them till now in order to make them more and more accurate so that they can provide high level of security to the network this lead into classification of firewall into different generation of firewalls. There are three different types of firewall First Generation Firewall evolved in (1988), Second Generation Firewall evolved in (1989-1990), Third Generation Firewall evolved in (1995–1998) now let's discuss each of them in detail.

1.1) First Generation Firewall (Packet Filters)

In 1988 evolved the first generation firewall which performed the filtering of the packet by evaluating the header contents of the packet .It have the ability to perform layers 3 or 4 inspection of packet data. IP Packet Filter Firewall takes decision whether to accept or to discard packet based on the header content of the packet's. Packet filter firewall uses the rule set to decide whether to accept or reject packet if the packet finds match against the rule set then packet is allowed otherwise it's discarded if it does not match with nay of the rules defined in the rule set. Packet filter firewall works on the network layer, physical layer, and transport layer of the OSI model .Packet filters maintain no state information (Connection State) to know whether the traffic is of existing stream or not which is one of the major drawback of First Generation firewall. This drawback lead to the evolution of Second Generation Firewall.

1.2) Second Generation Firewall (Statefull Filters)

In 1989-1990 evolved the Second generation firewall which performed the filtering of the packet by evaluating the header contents of the packet as well as overcome the drawback of First Generation Firewall by maintaining state table for each connection. Second generation firewall also known as Stateful packet filtering firewalls .Stateful Filters do not perform directly the filtering of the packets based on their header information but they retain packets until enough information is obtained in order to make decision about its state. It Have similar packet inspection capabilities, as that of Packet Filter Firewalls but it add the ability to interpret TCP session flags and establish a state table to monitor TCP connections. Second generation firewall records all connections that passes through it and decides whether a packet is new connection, or an existing connection, or not a connection. Now the rules contain connection state as one of their test criteria. What if an intruder performed Certain Denial of service attack in which attacker can attack firewall with thousands of fake connection requestto overflow the Stateful firewall connection state table. This leads to drawback and reason for evolution of Third Generation Firewall which will handle this kind of attack.

1.3) Third Generation Firewall (Application Layer)

Third Generation Firewall also known as Application Layer Firewall [6] evolved in 1995-1998 which worked on all the layers of OSI model specially more focus on the application layer to handle all the web attacks, traffic that come to or from the internet via application layer .It have the ability to inspect packet data all the way up through layer 7 of OSI model. Application Firewall is commonly known as proxy server. External network and internal network communicate via Proxy. It provides higher security than packet filtering Firewall. Application Firewall requires to inspect only few allowable Applications.

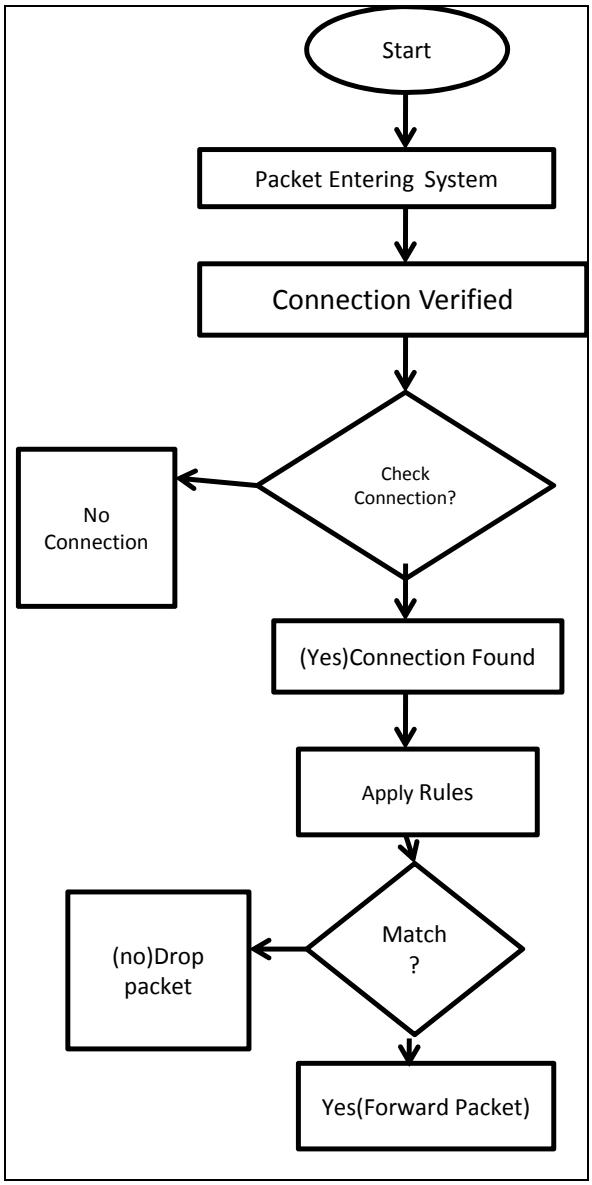

Fig.2.Statefull Firewall

All incoming traffic can be easily logged. Drawback of Application Firewall is that it requires Additional processing overhead on each connection. When the users wish to communicate, they do not communicate directly, instead proxy will act as intermediately between them. Function Offered by Proxy are Authentication mechanism**,** Content Filtering, Mature Log.

1.4) Shortcomings of Firewall

The Different Shortcomings [3] of Firewall includes Following Aspects. Firewall is not able to destroy the attack source. By setting appropriate Firewall it can stop internet virus, Trojan but can't clear the attack source. Firewall can't resist internal attacks behind of tight

defensive firewalls; the internal network is likely confused. For example, attackers through social engineering will send Trojan, Trojan email with URL in the way of internal host inject Trojan, and then the Trojan machine initiative connects to the attacker and destroy the firewall instantly. Own vulnerability Regardless of the hardware firewall or software firewall, there exists soft/hardware troubles, also more or less design flaws. The criminals may adopt these design problems to passthe firewall and launch attacks to the system. Firewall cannot analyze the network packets on the basis of signatures. It cannot detect malwares and viruses coming in from the known ports like port 80 and 110. Therefore we need a system which can analyze network traffic to detect malicious activity.

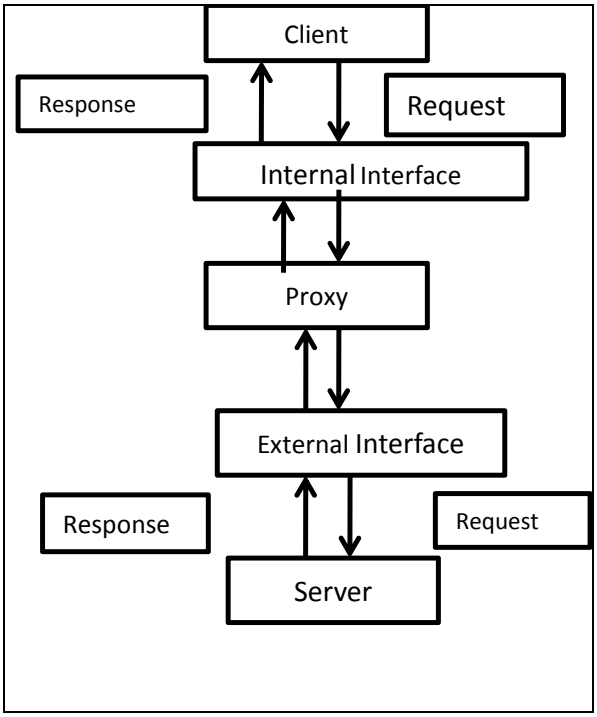

Fig.3.Application Firewall

1.5) Attacks On Firewalls

A) TCP attack on firewall

As dynamic state table is not maintained by packet filtering firewalls they are not able to purely evaluate incoming packets against the packet filters. By manipulating the TCP flags in the TCP packet header attacker can make it possible to force a TCP packet to pass through a packet filtering firewall by setting the "ACK" flag in the TCP header, which produces a match against a packet filter intended to allow return packets for outbound (Internet-bound) Domain Name System (DNS) requests.

B) IP Spoofing

The Process of manipulation of IP source address data in packets to achieve a match with a ruleset or packet filter configured on a firewall or access control device is known as IP Spoofing.If an attacker is able to spoof a source address associated with a "trusted" host, the attacker may be able to penetrate the firewall and enable the passing of packets to the target host.

C) Denial-of-Service

Firewalls and access control devices can be equally as vulnerable to application- or network-based denial-of-service as other devices, applications, and OS. If a firewall does not implement adequate resource safeguards, an attacker may be able to flood a target firewall with connection requests in an attempt to circumvent the firewall and operating systems TCP SYN Flood Attack Protection Mechanism: TCP SYN Flood Protection and connection rate limiters

D) Tiny Fragment Attack

TCP services are targeted by "Tiny Fragment" attack and they make use of IP packet fragmentation functionality to create small fragments that will force some of the TCP header information into a separate fragment. Such kind of attack can be used to bypass certain types of packet filtering devices where the device is unable to handle this type of exception.

Table.1. Different Firewalls

Firewall	License	Cost	OS
Cisco	Proprietary	Included On Cisco Switches and routers	Cisco hardware
Comodo Internet Security	Proprietary	Free	Windows 7,8, Vista
IpFilter	GPlv2	Free	Unix

IPCop	Various	Free	Linux
IPFire	GPL	Free	Linux
ipFirewall	BSD	Free	BSD Package
Netfilter /iptables	GPL	Free	Linux kernel Module
pfsense	ESF Licencse agreement	Free	Free BSD
Smooth wall	GPL	Free	Linux
Zeroshell	GPL ver 2	Free	Linux

2) Intrusion Detection System

An act of entering into a network or system forcibly with intent of either stealing information or damaging the system is known as "Intrusion". Intrusion detection system resides on the gateways or on the host machines to monitor the network traffic. If any malicious traffic is identified, an alert is generated by the IDS, informing responsible person to take action. The terminology "Intrusion Detection" addresses a range of technologies that are involved in the detection, reporting, and correlation of system and network security events. Intrusion detection technologies are detective rather than preventative they provide a security administrator with information on attempted or actual security events. Intrusion Detection Systems look for attack signatures, which are specific patterns that usually indicate malicious or suspicious intent.It can alleviate the following types of risks

- Data destruction
- Denial-of-service
- Hostile code
- Network or system eavesdropping
- System or network mapping
- System or network intrusion
- Unauthorized access

The IDSs are classified into three categories which are as follows .**Host-based IDSs** gets audit data from host audit trails. They are used to detect attacks against a single host. Security violations include attempted break-in, masquerading or successful breaking, penetration by legitimate user and etc.

Distributed IDSs collect information from multiple host and the network that connects the hosts. They are Capable of detecting attacks that involves multiple hosts.**Network-Based IDSs** make use of network traffic as the source of information, trying to reduce the burden of normal computing services provided by the hosts that .They are used to determine attacks from network.There are two basic types of IDS techniques, which are signature-based and anomaly based.

2.1) Signature based IDS (Misuse Detection)

On the basis of known list of attack signatures it detects malicious network packets. Database contains known list for latter comparison in real time mode. **Advantage:** It is very effective against known signatures of attacks
Disadvantage lacks in detecting unknown attacks.

2.2) Anomaly based IDS

System profile is used to detect any anomaly in the data packets. Initially, system is trained with a normal expected traffic and a profile is built with normal system behavior. Later on the trained profile is used to detect anomalous activities. **Advantage** it is more effective against unknown attacks. **Disadvantage**: it has a high false positive rate.

2.3) Hybrid based approach

To block the malicious network packets this approach combines the signature-based IDS and anomaly-based IDS techniques. The strengths of both the techniques are combined to overcome their drawbacks.

Table.2.IDS Techniques

IDS TECHNIQUE	Advantage	Disadvantage
Misuse Detection	Accurately and generate much fewer false alarm	Cannot detect novel or unknown attacks
Anomaly Detection	detect unknown attacks	High false-alarm

3) Snort open Source IDS

Snort is an widely used *open source* intrusion detection system that has capability of performing traffic analysis based on the rules, content searching or content matching and can be used to detect a variety of attacks like OS fingerprinting ,buffer overflows, SMB probes,stealth port scans, CGI attacks, and so on . An example of widely used NIDS is Snort [6].Snort has Detection Engine which has ability to detect the threats and generate alert to administrator. The Architecture of snort is depicted in the figure below. Packets from different types of network interfaces are taken by Packet Decoder which then prepares packets for processing. Preprocessor detect anomalies in packet headers ,keeps data ready for detection engine, reassemble TCP streams ,packet defragmentation ,decode HTTP URL. Detection Engine applies rules to packets and then outputs the alert

4) IDS Hacking Exploits

Different hacking Exploits for Intrusion Detection System (IDS) are as follows :

4.1. Address Spoofing or Proxying

IP spoofing or ARP spoofing techniques can be used to destabilize an IDS in the sense that they may impact the IP information and IDS logs related to a particular security event.

4.2. Denial-of-Service

IDS can be affected by denial-of-service attack which can flood IDS with port probes or connection requests.

4.3. Packet Fragmentation and "Session Splicing."

IDS systems that are not able to perform appropriate packet reassembly may be vulnerable to attacks that fragment packets in a manner that splices an attack signature over multiple packets Packet fragmentation attacks against IDS involve using some of the packet fragmentation techniques to evade an IDS.

4.4. Port Scan Evasion

An attacker may be able to evade an IDS by slowing port scans over an extended time period, while conducting a portscan of a system or network. Attacker can circumvent an IDS by coordinating a scan among multiple machines or utilizing scan decoy or proxy bounce scanning options .

4.5. TCP Session Synchronization Attacks.

Some IDS evasion tactics involve "desynchronizing" the TCP session that is being monitored to confuse the IDS, and undermine its ability to maintain a sense of session "state.

4.6. Web Evasion Techniques.

Certain tools have the ability to bypass IDS systems by employing various forms of HTTP evasion techniques.Such as premature request ending, Parameter hiding, Misformatting, Long URLs.

5) Intrusion Detection and Prevention System (IDPS):

IDS have ability to detect attack and generate alert but it cannot block the attack on its own. This limitation of IDS is overcome by Intrusion detection and prevention systems IDPS [5] which not only detects the attack, but also stops it from entering into the network or system. IDPS works as network based IDS (NIDPS) and host based IDS (HIDPS).

Parameter	Anomaly	Signature	Hybrid
Resistance to Evasion	Medium	Low	High
High accuracy rate	Medium	Medium	High
Market Share	Medium	High	Medium
Scalability	Medium	High	Medium
Maturity Level	High	High	Medium
Overhead on Monitored System	Medium	Low	Medium
Maintenance	Low	Medium	Medium
Performance	Medium	High	Medium
Easy to Configure	No	Yes	No
Easy to Use	Medium	Low	Low
Protection against New Attacks	High	Low	High
False Positives	High	Low	Low
False Negatives	High	Medium	Low

Table.3.Parameters for Evaluating IDS

5.1. Network intrusion detection and prevention system (NIDPS)

It works at point from where it can monitor the traffic and block the malicious traffic on basis of either signature or anomaly methods**.**

5.2. Host based (HIDPS)

Host Based IDS detect security violations from abnormal patterns of system usage. Security violations include attempted break-in, masquerading or successful breaking, penetration by legitimate user and etc. Abnormal activity in a host is detected by HIDPS by monitoring the logs such as Kernel logs and application logs. Insider attacks happening in a host are also handled by HIDPS

III. CONCLUSION

Thus we have specified the two most popular tools that are used to provide security to the network which are Firewall and IDS , the classification of Firewall and Intrusion detection and Prevention Technology , the Shortcomings of each of them. The Future Work involves In Implementing these tools to Protect the Network From Growing Threats and evaluating them on the basis of level of security, performance, time, cost and other essential parameters

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FOR REDUCE SUB-SYNCHRONOUS RESONANCE TORQUE BY USING TCSC

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Abstract

Series capacitive compensation is the most economical way to enhance transmission capacity and to improve transient stability of transmission grids. However one of the impeding factors for the widespread use of series capacitive compensation is the potential risk of sub-synchronous resonance (SSR). In this paper, SSR phenomenon is studied with IEEE second benchmark model & a complete model of TCSC is used for damping of SSR Torques. TCSC is one of the FACTS devices which can be utilized to perform flexible series compensation and damping of SSR Torques.

The analysis of SSR is carried out by using eigen value analysis and results are validated by using MATLAB/SIMULATION software.

Keywords: Series Capacitive Compensation, Sub synchronous resonance, FACTS, TCSC, Eigen Values

I. INTRODUCTION

Series capacitive compensation in long transmission lines is an important way to improve power transfer capability, to improve system stability, to reduces system losses, to improve voltage profile of the lines and to optimize power flow between parallel lines. However when this technique is applied together with a steam T-G it may lead to Sub-synchronous resonance phenomenon. It means that the interaction between the electrical oscillation modes of the series compensated network and the mechanical oscillations modes of the T-G set may generate oscillating torsional torques which may result in the failure of the T-G shaft. Sub-synchronous resonance is addressed in three categories (i) Induction Generator effect, (ii) Torsional Interactions, (iii) Torque amplification. The first two types are caused by a steady state disturbance, while the third is excited by transient disturbance. FACTS devices have the flexibility of controlling both real and reactive power which could provided an excellent capability for improving power system dynamics. TCSC is a FACTS device proposed for enhancing power transfer, improving transient Stability, damping power oscillations, and mitigating sub-synchronous resonance torques [1-2].

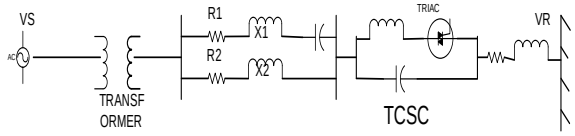
Many countermeasures to sub-synchronous resonance problem have been reported in the literature [3]. However sub-synchronous resonance control through FACTs controller is gaining importance. Based on the above considerations, this paper focused the attention on control of sub-synchronous resonance torques with FACTS controller such as TCSC. SSR analysis with and without TCSC is proposed. SSR analysis with TCSC uses constant angle control method. This paper attempts to highlight the effectiveness of TCSC control in stabilizing

the critical torsional mode in addition to the enhancement of power transfer capability [4].

II. POWER SYSTEM MODELING

The analysis of SSR phenomena requires a detailed modeling of overall electrical system comprising of synchronous machine, excitation system, power system stabilizer, AC network, TCSC and mechanical system.

The system considered is a modified IEEE second benchmark model. The complete electromechanical system is represented in fig.1.



(a) Electrical System

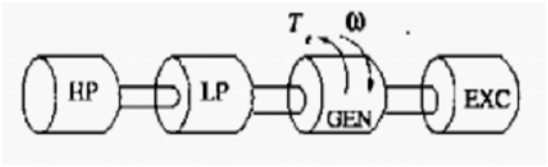


Fig. 1 (a) Electrical system of IEEE second benchmark model with TCSC (b) Four mass mechanical system.

The modeling of the electromechanical system comprising the synchronous generator, the mass-spring mechanical system, the excitation system, power system stabilizer, torsional filter, the transmission line containing the series capacitor and TCSC along with PI Controller. The combined system equations are linearized to carryout the Eigen value analysis [5].

III. SSR ANALYSIS

The SSR phenomenon involves energy exchange between mechanical and electrical systems. Therefore the details representation of both electromechanical dynamics of the generating units and the electromagnetic dynamics of the transmission network is required for the analysis of SSR. There are several methods available for the study of SSR. In this paper, Eigen value analysis method is used to study SSR. The equations of the individual masses of the shaft can be developed considering the rotors of the generators and the turbines. Equation (1) gives set of equations of mechanical and electrical quantities. This equation consists of input torque, output torque, damping torque and accelerating torque.

$$M_i\delta_i + d_{ii}\delta_i + \sum_{j=i-1}^{i+1}\left[d_{if}\left(\delta_i-\delta_j\right)+k_{ij}\left(\delta_i-\delta_j\right)\right]=T_{mi}-T_{ei} \quad (3)$$

where [M] is a diagonal matrix, consisting of inertia of all masses, [D] and [K] are tri-diagonal symmetric matrix consisting of damping co-efficient and spring co-efficient of the various mass sections. [Tm] and [Te] are the N-vectors of mechanical and electrical torques. [Te] has only one non-zero element corresponding to generator rotor. Now if

$$X = \left[\delta_1\delta_2\delta_3\delta_4\delta_5\delta_1\delta_2\delta_3\delta_4\delta_5\right]^t \quad (4)$$

From eq. (4) it can be written as:

$$\delta_i = M[M][M]^{-1}[D]\delta_i - [M]^{-1}[K]\delta_i + [M]^{-1}[T_{mi}-T_{ei}] \quad (5)$$

$$\therefore X = [A]X + [B]u \quad (6)$$

Equation (8) gives set of equations of the torsional mode of the turbine–generator mechanical system in the state space form, [6], where [A] is the state-coefficient matrix of the turbine–generator mechanical system and u is the forcing torque vector. The eigen values or the natural torsional modes of the shaft system are calculated from [A] matrix of the state variable model.

The SSR analysis is carried out based on the following initial operating conditions and assumptions

1. The generators deliver 1.0 p.u. power to the transmission system.
2. The input mechanical power to the turbine is assumed constant.
3. Compensation level provided by the series capacitor is set at 56% of the line reactance X_{L2}.
4. For transient simulation, a step decrease of 10% mechanical input torque applied at 1 sec. and removed at 1.5 sec.

A. Case-I Without TCSC

In this study, the series capacitors provide 56% compensation of the line reactance X_{L2}. The Eigen values of the system matrix [A] are obtained which gives information concerning all the modes of oscillations along with their respective frequencies. Table I shows that mode 1 is unstable**.** This is also verified by transient simulation of the system using MATLAB-

SIMULINK [7]. The response of the system obtained with transient simulation is shown in Fig. [6] and [7]

TABLE I
Eigen values of the system without TCSC

Modes	Eigen Value
0	-3.399000+j9.654000
1	0.380600+j155.250000
2	-0.045000+j203.450000
3	-0.049400+j321.180000
Network Mode	-15.415000+j5.020000
Network Mode	-15.605000+j598.960000

B. Case-II With TCSC

IV. MODELING OF TCSC

A TCSC consist of a capacitor in parallel with an inductor that is connected to a pair of opposite-poled thyristors. No interfacing equipment like high voltage transformer is required By using firing angle of the thyristors, the inductance reactance is varied, which in turns changes the effective impedance of the TCSC. The TCSC is modeled as a voltage source using equivalent impedance at fundamental frequency in each phase. The TCSC can operate in capacitive or inductive mode.

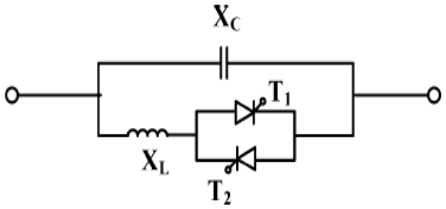


Fig.2. Model of TCSC

The equivalent TCSC reactance is given by

$$X_{TCSC} = X_C - \frac{X_C^2}{X_C - X_L}\frac{2\beta + Sin2\beta}{\Pi}$$

(8)

Where β = angle of advance (before the forward voltage becomes zero)= π – α, α is the firing angle of the thyristor.

CONTROL CIRCUIT OF TCSC

The TCSC controller model consists of second order feedback filter, PI-controller, series compensator and a transport delay model. The TCSC voltage feedback control is used. The continuous model includes the first order delay given by time constant T_{d1}. Additional lag is introduced represented by the delay filter with T_{d2} Simulation results demonstrate improvement in the response with the introduction of this delay elements. The second order filter with V_C reduces harmonic on the feedback signal [8-9].

The stability of the system is analyzed through eigen value techniques and it is noted that the TCSC controller stabilizes critical torsional mode 1 at the specified operating point [10]. To validated the results obtained by the eigen value analysis, transient simulation is carried out using MATLAB – SIMULINK. The simulation results are shown in Fig. 8 and 9.

TABLE II
Eigen values of the system with TCSC

Modes	Eigen Value
0	-2.165800±j2.356980
1	-0.386700±j147.580000
2	-0.019500±j201.355400
3	-0.047500±j305.020000
Network Mode	-15.024550±j149.856200
Network Mode	-15.220000±j523.325800

I. SIMULINK IMPLEMENTATION

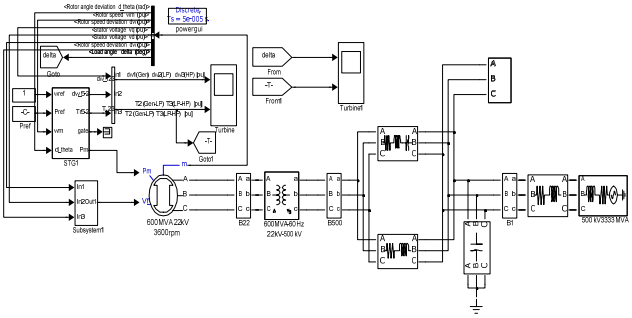


Fig.3. Simulink modeling with TCSC

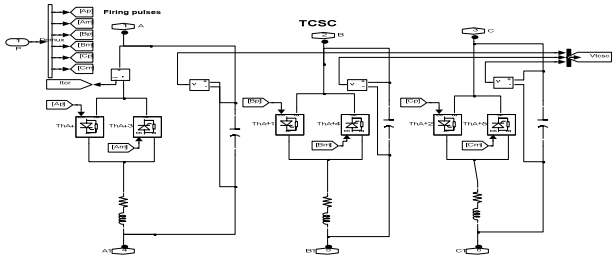


Fig.4. Simulink modeling subsystem of TCSC

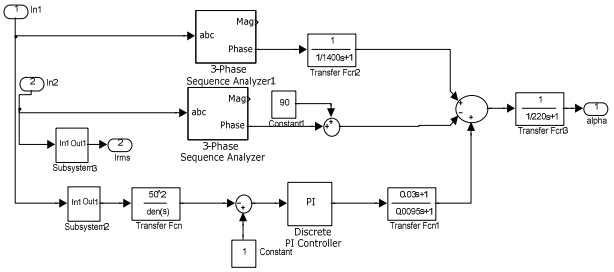
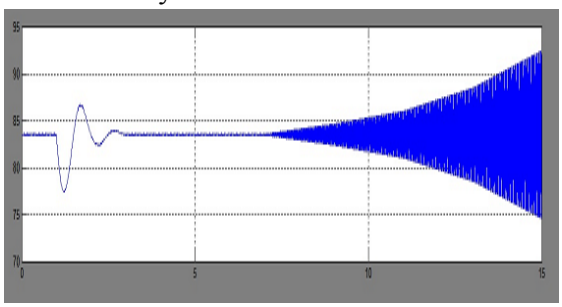


Fig.5. Simulink modeling subsystem of TCSC firing unit controller

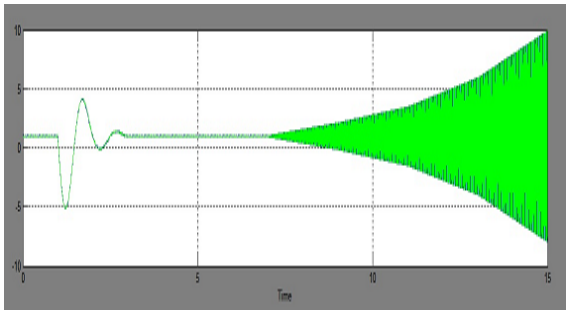
V. RESULT

Case-I Simulation results of electro mechanical system without TCSC



Time (Sec)

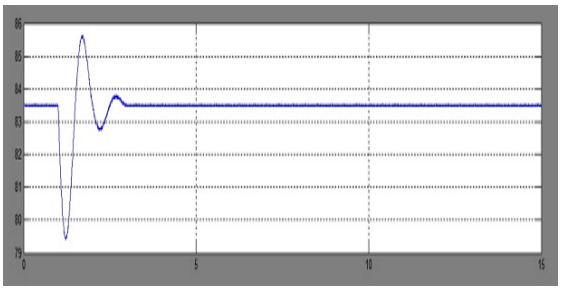
Fig.-6. The variations of rotor angle (δ) in degrees Vs Time in seconds



Time (Sec)

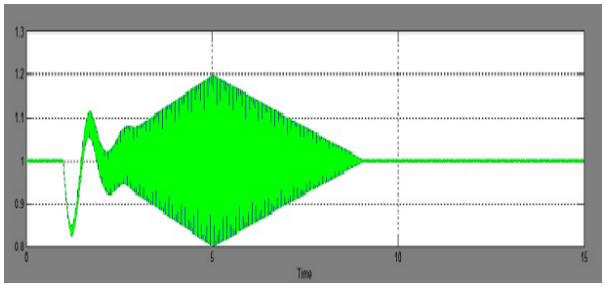
Fig.-7. The variations of SSR torque LP-GEN in p.u.Vs Time in seconds

A. Case-II Simulation results of electro mechanical system with TCSC



Time (Sec)

Fig.-8. The variations of rotor angle (δ) in degrees Vs Time in seconds



Time (Sec)

Fig.-9. The variations of SSR torque LP-GEN in p.u.Vs Time in seconds

VI. CONCLUSION

The analysis and damping of sub-synchronous resonance torques of the electromechanically system has been studied in this paper. The eigenvalue techniques and MATLAB-SIMULINK has been adopted for the purpose of analysis. The analysis of basic electromechanical system shows that the without TCSC, mode 1 is unstable at the specified operating point. The TCSC is provided at the receiving end of the transmission line control by TCSC controller. When TCSC is controlled by PI-controller, the critical torsional mode 1 is stabilized with good stability margin. However, method for further improvement in the stability margin of the other torsional modes needs to be investigated.

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SURVEY ON CALL ADMISSION CONTROL (CAC) SCHEMES IN WIMAX NETWORK

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Abstract
Call admission control (CAC) mechanism plays a critical role in providing quality-of-service (QoS) guarantees for various traffic classes with different QoS requirements in IEEE 802.16e networks. Network resources can be efficiently utilized when a proper CAC scheme is chosen as a call admission criterion. In this paper we have studied and surveyed many mechanisms that have already been adopted to enhance QoS of the system. This paper contains the work done in the field of Call Admission specifically to enhance QoS and the paper guides newcomers who are willing to work in this field.

Index Terms— Mobile WiMAX, Handoff Connection, New Connection, Admission Criteria.

I. INTRODUCTION

A) An Overview of IEEE 802.16e

IEEE 802.16e standard does not specify the criteria to admit a call in the network. It is remained as an open issue to developer. The mail objective behind designing CAC mechanism is to accept or reject a new or handoff call depending on its required QoS parameters. If all the required parameters are satisfied, the developed CAC module will admit a call the network. Fig 1 gives the architecture of WiMAX network. The IEEE 802.16 standard divides all service flows in five scheduling classes, each of which is associated with a set of QoS parameters for measuring its bandwidth requirement. With the handling of users in the WiMAX network, there are two terms associated mostly together: The Call Admission Control (CAC) and Scheduling.

The CAC procedure is implemented at the Base Station (BS) that ensures the load supplied by the Subscriber Station (SS) can be handled by the network. While the Scheduling mechanism guarantees that the mandatory amount of resources is allocated to the connections, so that QoS requirements are met, the admission control mechanism bounds the number of connections entered in the network so that network will never be overloaded. This scheme only focuses on admission criteria. The call admission is about accepting or rejecting incoming connections. Call admission control is done at each subscriber station to limit the number of ongoing connections through that subscriber station. Traffic from all uplink connection is gathered into a queue at each subscriber station. This queue has limited size and if this queue is full the next arriving packets will be dropped.

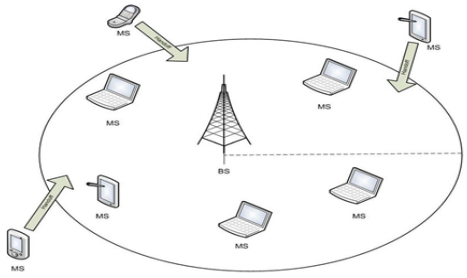

Figure 1 WiMAX Architecture [1]

B) Challenges in CAC

In WiMAX (Worldwide Interoperability for

Microwave Access) network *resource allocation* to all the entered connections, fairness between all of them is the major challenge in designing particular algorithm. On the acceptance of the new or handoff connection, already admitted call should not be compromised its requirement from the network.

IEEE 802.16e network supports mobility of the WiMAX network users, so handover process should also be taken into consideration while developing any call admission scheme. Thus *handoff calls* should be maintained through CAC mechanism.

Accepting new connections should not affect the QoS requirements of the already admitted calls in the network. Thus *QoS provisioning* is another main challenge in creating CAC scheme.

Communication in WiMAX network happens between WiMAX Customer Premises Equipment (CPE) and base station at Non Line Of Sight (NLOS). This is a major challenge for WiMAX networks as the *link security* requirements are more than that of in wireless technology. Setting up radio links with high performance that are capable of providing data rates as high as wired networks and cable modem that can increase data rate in NLOS environment.

C) Traffic classes [1]

The *unsolicited grant service* (UGS) periodically generates constant-size data packets for real-time traffic such as VoIP without silence suppression. UGS is sensitive to transmission delays, and the BS allocates grants to the MS in an unsolicited fashion using the maximum sustained traffic rate (MSTR), traffic priority, and maximum latency tolerance as its QoS requirements.

The *real-time polling service* (rtPS) generates variable-size data packets for real-time traffic such as MPEG video. It has less stringent delay requirements and is periodically polled by the BS for each MS to individually determine its bandwidth requirement. Its mandatory QoS specifications are the minimum reserved traffic rate (MRTR), MSTR, traffic priority, and maximum latency tolerance.

The *extended real-time polling service* (ertPS) generates variable-size data packets for real time traffic such as VoIP with silence suppression. It combines features of both UGS and rtPS and has strict, guaranteed delay requirements and provides unicast grants in an unsolicited manner by the BS, as with UGS. Because UGS grants are of constant size whereas ertPS grants vary in size, an MS can request a change of its bandwidth grant to suit its requirements. The ertPS QoS requirements are MRTR, MSTR, traffic priority, maximum latency tolerance, and delay jitter tolerance.

The *non–real-time polling service* (nrtPS) generates variable-size data packets for non–real-time traffic such as FTP. It has minimum bandwidth requirements that are delay tolerant. It is polled by the BS in order for each MS to state its desired bandwidth. The QoS requirements are MRTR, MSTR, and traffic priority.

The *best-effort service* (BE) is designed to support traffic for which delay and throughput are not guaranteed, such as HTTP. It requests bandwidth through contention request
Opportunities and unicast request opportunities.

II. PARAMETERS FOR DEVELOPING CAC SCHEME IN WIMAX

In this paper we have consider many parameters that effecting the call admission control scheme like delay means we have to minimize the delay from source to destination, throughput means from source to destination maximum throughput we have to consider. Call blocking probability that gives the probability of blocking the new incoming connection request. Handoff call dropping probability should also be considered. Arrival rate of the connection requests should need to be covered over here.

III. CAC MECHANISMS

IEEE 802.16 is connection oriented standard and the Subscriber Station must establish an end to end connection before actually transmitting data. Call Admission Control is done by base station. It blocks or avoids an unwanted call in order to guarantee the QoS of existing call in the network. Thus main objective behind designing

any CAC mechanism is to limit the number of active connections and provide guaranteed QoS to all that admitted calls. When BS receives the connection request it takes the decision whether to accept or reject that request, based on the current network load, bandwidth requirement of requested connection and bandwidth available in the network.

In [1], proposed CAC scheme, prevents starvation of service classes and enhance utilization of network resources. Bandwidth degradation policy is used in this scheme to admit more users when there is no available bandwidth to admit a user. Adaptive threshold is used to decide the quantity of reserved bandwidth for handoff connections based on traffic intensity of handoff connections. Among the five types of service classes this scheme only degrades the bandwidth requirements of ertPS and rtPS service classes. This scheme uses adaptive QoS strategy in which the scheduled service class is assigned MSTR or MRTR requirements. The admission criteria are dynamically determined by three classification of the network load: low, moderate and heavy. If the network load is low, the QoS requirement is adjusted to MSTR. If the network load becomes moderate to heavy then linear adaptation policy is used to reduce the bandwidth requirements from MSTR to MRTR. The scheme also uses adaptive threshold that is dynamically changed based on arrival rate of new or handoff connections.

In [2], An efficient Call Admission Control (CAC) scheme for IEEE 802.16e Mobile WiMAX that satisfies both bandwidth and delay guarantee to the admitted connections has been proposed. The scheme provides higher priority to Handoff connections, because it is more annoying to drop an on-going connection than blocking a newly originated connection. Also UGS connections are given higher priority because UGS is the most common service used by the people for communication in everyday life. ertPS connections requests are considered to be same as rtPS connections, because both connections have same QoS parameters and differ only by the way of Request/Transmission policy. Also BE connections are not measured in this scheme, because they are designed to support best effort flows which does not require QoS guarantees. Therefore BE service flows are always admitted into the network and are controlled by available bandwidth basis.

In [3], density based CAC scheme is proposed. It refers to different areas in a single OFDMA-based WiMAX cell. Users are permitted to move internally in those areas as well as externally in other cells. It decreases the dropping probability of user moving away from base station lacking increasing blocking probability of new calls. This scheme gives a resource allocation strategy which is also referred to as a Max-Min problem. As dropping a call in progress, is considered to have more negative impression from user's point of view than blocking a new call. So in order to limit call drops, this scheme assigns higher priority to calls migrating from one region to an adjacent one over new calls arriving to network. Conditions for accepting new or migrated calls are different. This scheme has one equation that gives the region, and no. of accommodated users in that particular region is adjusted dynamically. As it is based on the level of dense region, this scheme is known as density based CAC mechanism.

In [4], a dynamic connection admission control (CAC) and bandwidth reservation (BR) scheme for IEEE 802.16e Broadband Wireless Access networks to simultaneously improve the utilization efficiency of network resources and guarantee QoS for admitted connections is proposed. The proposed algorithm dynamically controls the admission criteria according to network loads and adopts an adaptive QoS strategy to improve the utilization efficiency of network resources. After new or handoff connections are accepted in the networks based on current admission criteria, the proposed adaptive BR scheme adjusts the amount of reserved bandwidth for handoffs according to the arrival distributions of new and handoff connections in order to increase the admission opportunities of new connections and provide

handoff QoS as well.

In [5], they proposed an adaptive CAC method and two different scheduling schemes for multihop WiMAX networks. The proposed CAC, Base Station reserves some bandwidth for the mobile users and changes the BW reservation adaptively based on recent connection requests from the handover connections. When there are few or no handover users are in a network, the residual reserved BW is allocated to low priority Best Effort (BE) users for effective BW utilization. While admitting the New Calls or Handoff Calls, the BS verifies both BW and multihop delay requirements to satisfy the QoS of the call. When there are few or no handover users exist in a network, the remaining reserved BW is allocated to low priority Best Effort (BE) users to effectively utilize bandwidth. While accepting the new Calls or handoff Calls, the BS verifies both BW and multihop delay requirements to satisfy the QoS of the call. This scheme also proposes two downlink scheduling algorithms (P+E) and (P+TB) for the BS in multihop networks. The (P+E) scheduler combines the Priority and Earliest Due Date (EDD) scheduling methods, while the (P+TB) scheduler combines the Priority and Token Bucket (TB) scheduling methods. When the network is lightly or moderately loaded, the (P+E) scheduler performs well for both single and multihop users but the performance of real time services are highly affected under high load conditions. On the other hand, the (P+TB) scheduler has very good QoS performance for real time services under high load conditions and also has closer QoS performance to (P+E) scheduler for multihop users under low and moderate load conditions.

In [6], they have proposed a novel admission control scheme which employs the ant colony algorithm and lays stress on the fairness between services. Their revenue-weighted scheme mainly focuses on fairness of service response. However, it is also based on the revenue value which results in the most efficient performance. In WiMAX, with regard to limitations of bandwidth, this algorithm tries best to leverage revenue and fairness. But optimization of this revenue strategy is still can be expanded.

In [7], they proposed a new algorithm Forward Selection Call Admission Control with Intrusion Detection System [FSCACIDS], It provides proper and reliable communication for all WiMAX nodes. It access the gateway based on higher energy and low mobility nodes and provide high security using Intrusion detection system. FSCACIDS is used to find the best Gateway based on High Energy and Low Mobility to choose and access the long and High Data communication. This reduces the routing overhead and results in fewer broadcast storm problems in the MAC layer. This increases the probability of successful route discovery and improves the Quality of service. This gives greater bandwidth and Frequency Utilization and reduces the routing overhead.

In [8], proposed mechanism is using dynamic admission criteria which based on predefined standard for all service classes. For QoS provisioning bandwidth reservation and bandwidth degradation policy is taken into account. Degradation is only applied on nrtPS service class. Maximum priority is given to UGS class and minimizes blocking probability of service classes. Handoff calls are not taken into consideration in this scheme. Bandwidth reservation scheme will reserve predefined amount of bandwidth for all the service classes. On the other hand degradation policy is applied only on the nrtPS classes. Amount of degraded bandwidth requirement is also adjusted dynamically based on available network resources and amount of reserved bandwidth for handoff connections.

In [9, 10], CAC and packet scheduling both schemes were proposed for WiMax networks that provisions QoS. A token bucket based CAC scheme is used that allows a new connection by ensuring that QoS of the already admitted connections will never be degraded or affected and they will be provided the same required QoS. Bandwidth reservation is used only for

UGS and rtPS service classes and other available bandwidth is used for other service classes. When bandwidth requirements are satisfied it also ensures delay guarantees to rtPS class. Drawback of this scheme is that it starves low priority class and ignores handover calls and efficient network resource utilization.

In [11], proposed CAC scheme supports both new and handoff calls based on characteristics of an adaptive multimedia service. When there is no available bandwidth to admit a new connection in network it will degrade bandwidth of active connections. And when network traffic reduces, the degraded bandwidth will be upgraded in the reverse order. This method utilizes network resources efficiently and reduces blocking and dropping probability. But this method is somewhat unfair because it degrades bandwidth of lowest priority class to its minimum bandwidth in a step wise fashion.

In [12], bandwidth borrowing policy to assign high priority to handoff connections comparatively new connection and also guard channel is used in the proposed CAC mechanism. Policies used in this scheme provide reasonable priority order to new and handoff calls to different service classes. This scheme maximizes bandwidth utilization and reduces connection blocking and dropping probability. Only one shortcoming of this scheme is that if handoff connections don't consume reserved bandwidth then certain portion of bandwidth may be wasted because it then never be utilized to accept a new connection request.

In [13], a CAC scheme is developed in order to guarantee QoS to different traffic service classes in IEEE 802.16e. Service classes are divided into two groups: real time and non-real time. Scheme is using dynamic guard channel that dynamically changes between minimum and maximum reserved threshold, based on entry and exit of handoff connections. This scheme reduces blocking and dropping probabilities.

In [14], dynamic CAC and BR mechanisms are proposed for IEEE 802.16e.It not only improves network resource utilization but also guarantees QoS for all admitted new and handoff connections. Admission criteria is adjusted dynamically based on network loads. The admission criteria used starved the high and the low service classes when the traffic load is moderate or heavy. It also uses fixed maximum reserved amount of bandwidth based on arrival rate of new and handoff connections.

IV. CONCLUSION

From this paper, we have presented analytical comparisons of the existing call admission schemes in mobile WiMAX network and listed according its challenges and issues. We have also discussed advantages and limitations of the mentioned CAC schemes. For the future research work this paper might be useful in current field of Mobile WiMAX networks and also motivate them toward further design of it.

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ENHANCEMENT OF OLSR ROUTING PROTOCOL IN MANET

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Abstract
MANET stands for "Mobile Ad Hoc Network." A MANET is a type of ad hoc network that can change locations and configure itself by the controller. Because MANETs are mobile, they use wireless connections to connect to various networks. Optimized link state routing (OLSR) protocol is a one means of the proactive routing protocols for MANETs. It is based on the multi-point relays (MPRS) procedure to achieve all nodes in the network with a restricted number of broadcasts. In this paper, our scenario design of OLSR using grouping technique for nodes involves the factor distance and sink. We apply various techniques to enhance the performance of OLSR, which are discussed.

Keywords: Hello, MANET, OLSR, OPNET, Routing

I. INTRODUCTION

A mobile Ad-Hoc Network (MANET) is a collection of mobile nodes which communicate with each other via wireless link either in a straight line or relying on other nodes as routers. The operators of MANETs don't depend on pre-existing communications or base station. Network nodes in MANETs are free to move arbitrarily. By the cause of mobility of nodes, network topology of MANET may vary dynamically without rotating to any present central management. All network actions such as discover the topology and deliver data packets have to be execute by the nodes themselves, either independently or in a group. In MANETs every node is a likely router for other nodes. The task of specify a routing protocol for a mobile wireless network is not a small one. The main difficulty in mobile networking is the restricted bandwidth and the high speed of topological change and link breakdown caused by node movement. As a result routing in Ad-Hoc wireless system play an important task for data forwarding where each mobile phone node can act as a communicate in addition to being a source or destination node. For the reason that, a large number of routing protocols have been developed to give services with Ad-Hoc network. Movable Ad-Hoc routing protocols are conventionally divided into two classes (Proactive and Reactive) depending on when nodes obtain a route to a target .proactive protocols are characterized by all nodes keep up routes to all target in the network at all period. Thus using a proactive protocol, a node is instantly able to route (or drop) a packet. OLSR i.e. "optimized link state routing" is suitable specimen of proactive protocols, Which are marked out by nodes obtained and keep up routes on demand i.e., a route to a target is not acquired through a node until packet is not received by a target node. Specimen of reactive protocols is "Ad-Hoc on Demand Distance Vector Routing Protocol" (AODV).

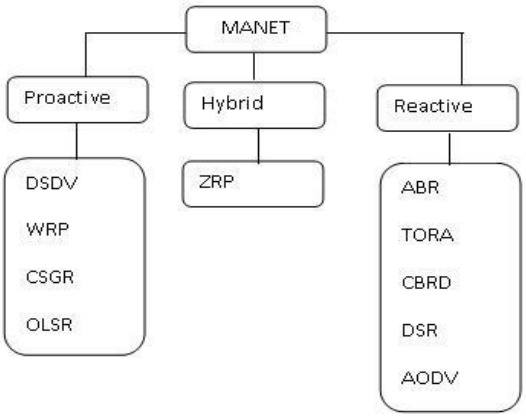

Fig. 1 MANET protocol structure

The rest of this paper is planned as follows. Section II, gives an overview of the Investigative study of routing protocols in MANET with help of various research papers. Section III, presents our simulation parameters and proposed work for performance enhancement. Section IV, presents results and discussion of our proposed work. In Section V, concludes and presents some future works.

II. LITERATURE REVIEW

Navaid Akhter et al. had proposed "Performance Improvement of Optimized Link State Routing (OLSR) Protocol" [1]. An author concludes that the optimization of OLSR control messages intervals has shown to consistently outperform the default implementation of OLSR under specific mobility conditions considered during this study. Author visualize undertaking research to analyze the scalability of OLSR protocol in respect of control messages intervals with number of nodes and to set the boundary limits through detailed simulation studies. N. ENNEYA et al. had proposed "Enhancing Delay in MANET Using OLSR Protocol**" [4].** The author of the above paper concludes the two versions of the real OLSR protocol, in the goal to meet and improve its presentation to the dynamic nature of MANETs mark out by the link location and topology changes. These statements are based on a mobility grade that is quantified and evaluated in point by each mobile node in the network. Yang Cheng Huang et al. had proposed "Tuning OLSR" [6]. An author concludes the performance of the OLSR protocol by tuning soft state refresh intervals. Through simulations see OLSR routing performance is more sensitive to the value of HELLO intervals than the value of TC intervals. Although a smaller HELLO interval could speed up neighbor and link failure detection, the improvement is not linear with the decrease of the interval. So it may be possible to tune the operation of OLSR dynamically, during operation, by measuring metrics presented in this paper, but the mechanism for performing such a dynamic tuning requires further investigations. Kuldeep Vats et al .had proposed "Simulation and Performance Analysis of OLSR Routing Protocol Using OPNET" [13]. An Author concludes MANET routing protocol in the OLSR were performance analyzed. The presentation of OLSR protocol in the course of a network different size carried out a proportional analysis of the performance and found it had improved performance in all aspects in a network. The performance of OLSR which can be achieved by Hello Traffic Sent (bit/sec), Total TC message sent (TTMS) and Total TC message forward (TTMF), Total hello message and TC traffic sent (bit/sec), Routing traffic received (pkt/s), Routing traffic sent (pkt/s), MPR Count.

III. SIMULATION PARAMETERS AND PORPOSED WORK

The aim of proposed work is to enhance the performance of OLSR routing protocol. In this paper the values of various control interval are altered which are beneficial for OLSR for enhance its performance. The values of control interval are optimally used considering the factors like distance and energy. The network in divided in some groups based on initial energy. The forwarder node from each group is selected each round which is responsible for sending and receiving data packets. The CHs are elected on bases on left energy which result in optimal use of network energy. The scenarios are designed using OPNET-14.5. The simulation results had shown that proposed OLSR perform better in compare with their original version. We have to take the various parameters for fulfill our importance that are explain as given below in Table I.

TABLE I Simulation parameters

Maximum Simulation Time	600 Sec
Environment Size	100 *100 meter
No. of Nodes	70
Routing Protocol	OLSR
Data Rate	1Mbps
Packet Size	1Mbps
Speed	11 Mps
Traffic Type	HTTP
Trajectory	OLSR Move
TTL (Time to Live)	System Defined

IV. RESULTS AND DISCUSSION

In OLSR routing protocol simulation research result using special parameters of OPNET

Modular with the help of DES graphs which use the global statistics for analysis result of OLSR routing protocol.

A. Hello Packets

The Hello messages are initially broadcasting in network. The hello messages are used to check the link states of various nodes in network. Also the Hello interval gathers the information like energy, node id and distance from various nodes. In our work we have to decrease the interval of Hello messages and its performance better than existing by default value. In fig.2 shows the enhanced OLSR and existing OLSR performance.

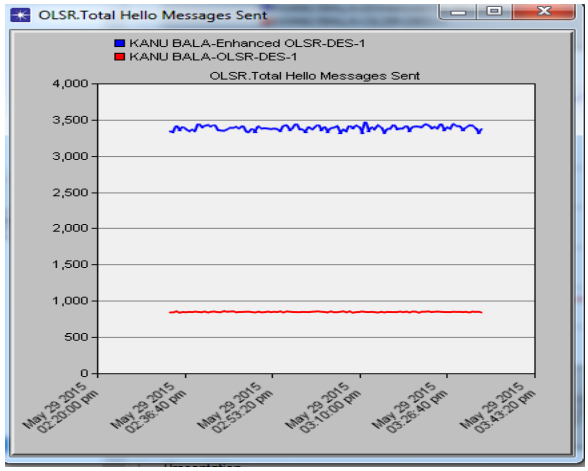

Fig. 2 Total Hello message sent

B. Topology control messages (TC)

This attributes specify the time interval to control topology. The TC messages are forwarded in network by MPR (Multipoint Relay) nodes. Basically TC messages are responsible for changing (Top to Bottom Activity). Higher the TC packets sent rate in network, it results in changing the network topology frequently. As the result more fresh roots are available in network for better routing. Figure 3, represents the values of total TC messages sent in network. Enhanced OLSR had shown much higher value for TC messages sent in evaluation with OLSR. The better roots results in enhancing the overall OLSR performance.

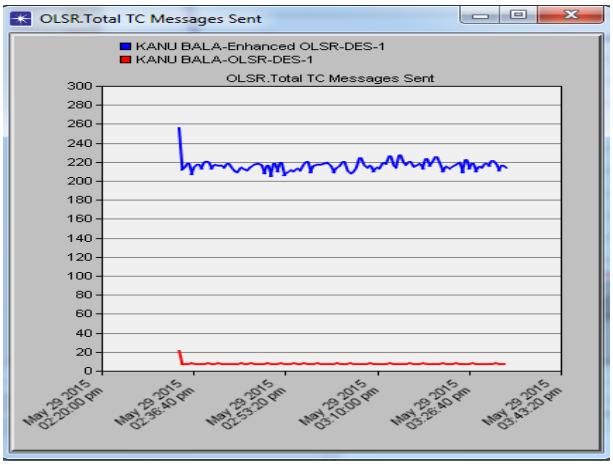

Fig. 3 Total TC messages sent

C. Throughput

The term throughput is defined as number of requests fulfilled for second. The enhanced OLSR has much higher throughput than OLSR. The change in interval and optimal use of energy results in improving the throughput. Figure 4 shows the higher throughput as compared to existing routing protocol performance.

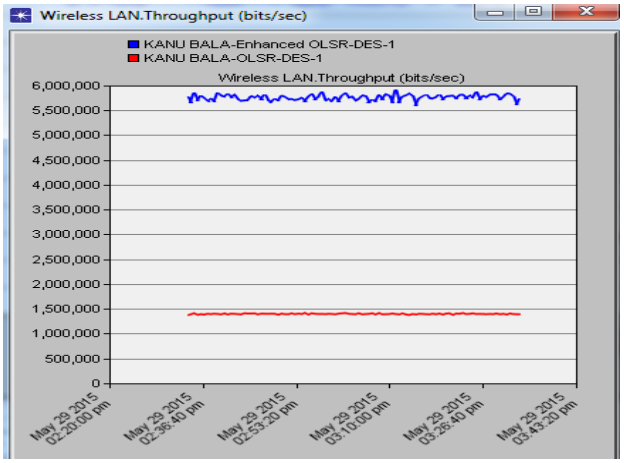

Fig. 4 Throughput of Existing and Enhanced OLSR

D. End to End Delay

The end to end delay is total time taken to send data packet from source to destination until last data bit received. The delay is shown by fig. 5, for enhanced and default OLSR. The delay is almost same for both enhanced and default OLSR. The delay reflects the efficiency of proposed routing for OLSR.

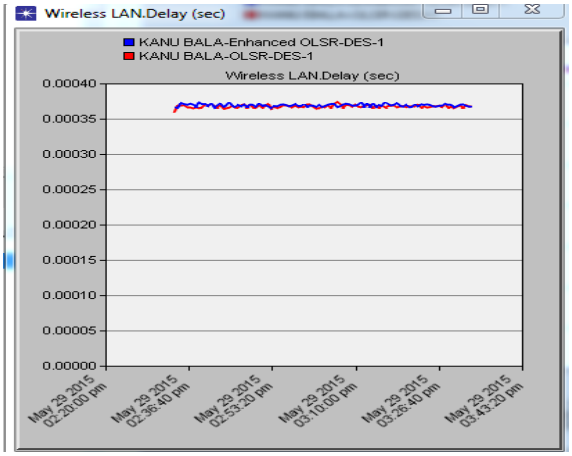

Fig. 5 Delay of Existing and Enhanced OLSR

E. Load

Load represents the total load (in bits/sec) submitted to MANET by all higher layers in all MANET nodes of the network. In fig.6 shows the Load is higher for enhanced OLSR protocol but at the same time throughput is too high, which shows that there is no case of congestion. The proposed routing for OLSR is reliable too.

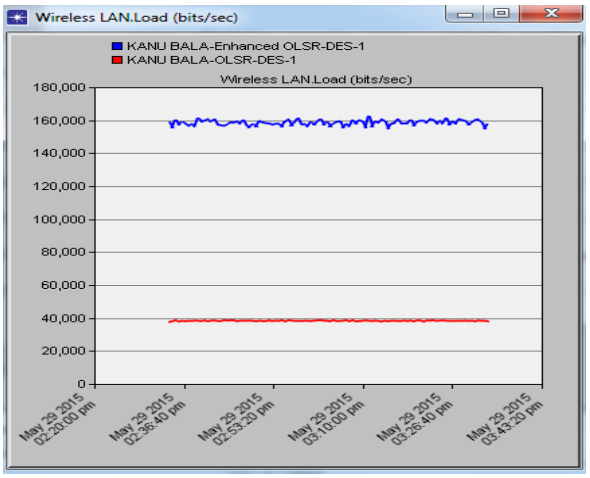

Fig. 6 Load of Existing and Enhanced OLSR

V. Conclusion

In this paper the work had been done for the enhancement of OLSR routing protocol. The technique employed for enhancement purpose as discussed above, the simulation study for OLSR had been done by using OPNET 14.5. As the simulation study the proposed OLSR perform quite efficiently in contrast with normal OLSR over in terms of throughput, delay and load of enhanced OLSR is highly acceptable in terms of overall performance. There will be forever scope to progress the work that has done in this learning. The results could be enhanced by choosing other configuration parameters and by using more group heads.

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COMPARATIVE ANALYSIS OF DIFFERENT MODES OF A PID CONTROLLER USING A HYDRAULIC LEVEL CONTROL TRAINER

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Abstract

Stability is one of the most important criteria in the field of automatic control. The most widely used control strategy in industries is the proportional integral derivative (PID) controller. PID controllers are popular as they can perform robustly in a wide range of operating conditions and due to their functional simplicity. In this work, PID controller's four modes of operation have been compared for providing optimum stability to a hydraulic level control system. It is shown that how P, P-I, P-D and P-I-D controllers change the steady state response of the level control trainer. It is meant to show how one can gain a feature but lose the other.

Keywords*:* PID, hydraulic, controller, automatic, stability

I. Introduction

Feedback is the most basic and commonly used control strategy [1-2]. Through feedback control a desired process condition is achieved and maintained by measuring the process condition with respect to the desired condition, set point, and initiating a corrective action based on their difference [3-8]. For example: Level is the controlled variable. Level in the tank is measured by the sensor/transmitter and signal is transmitted to PID controller. Set point is given through the PID controller and depending on the error between the set point and the measured variable a corrective signal is given to the control valve. Control valve, through the E/P converter. The valve opens or closes according to the signal and the flow of water in to the tank is adjusted. This in turn adjusts the level in the level tank till the level that is controlled variable equals the set point. Thus here PID is acting as feedback controller where the controlled variable is the output from flow transmitter and the manipulated variable is the flow into the tank.

II. Methodology

Pump is used to deliver water from a sump tank to the transparent level controlled tank. Control panel houses the PID controller, pneumatic regulator and is used to make adjustments. The liquid level is measured by a pressure transducer. The transmitter is generally fitted at the bottom of the tank and it measures the head pressure. The pressure is translated into a resulting liquid level. Pneumatic control valves control the flow of pressurized air.

The bypass valve triggered by a spring-loaded mechanism that opens when fluid pressure becomes too high or too low. As long as the pressure is same on both the inlet and the outlet side of the spring, the switch remains closed. But if the pressure build-up iss too much on one side, the spring got compressed, causing the switch to open. E/P converter forms the link between electrical measurements and pneumatic control systems. They also convert the electronic controller outputs into air pressures for operation of pneumatic valves.

III. Experimental Work

The experimental setup used in this work has been shown in Fig.1. It is to be noted here that

for tuning the PID controller following steps are to be followed:

1. Observe the level fluctuations for three minutes. If it is not close to the set point then increase the proportional band gradually till the level becomes steady and equal to the set point.
2. Observe the output for three minutes. If the response is very sluggish then decrease the proportional band.
3. When the actual level value comes close to the set point value reduce the integral time gradually till sufficiently fast response is obtained.

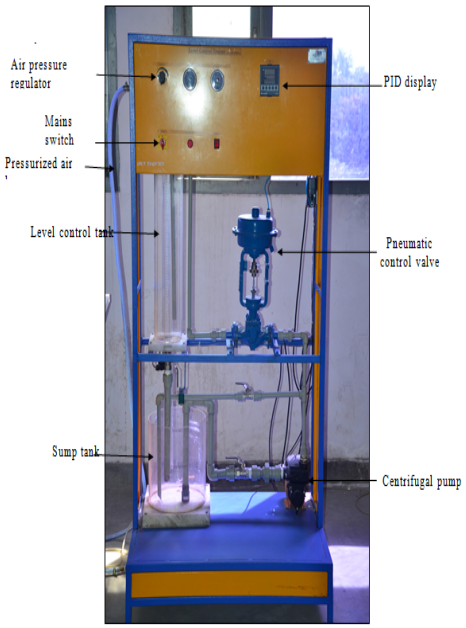
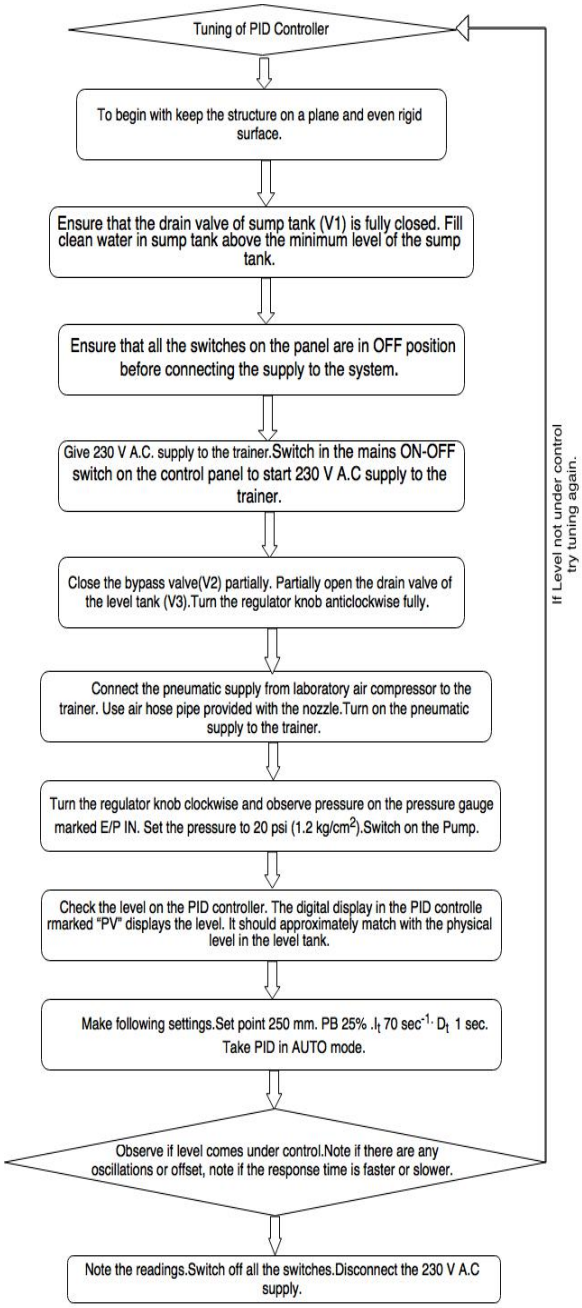


Figure 1: Experimental set-up for P, PI, PD and PID control

Figure 2: Flow chart showing the tuning



procedure

Analysis has been done using the graphing in excel and output versus time plots generated using adaptive neuro fuzzy interference system. It uses a hybrid learning algorithm to tune the parameters of a Sugeno-type fuzzy inference system. The algorithm uses a combination of the least-squares and back-propagation gradient descent methods to model a training data set. Fuzzy logic starts with the concept of a fuzzy set. A *fuzzy set* is a set without a crisp, clearly defined boundary. It can contain elements with only a partial degree of membership. Fuzzy sets

describe vague concepts (fast runner, hot weather, weekend days). A fuzzy set admits the possibility of partial membership in it. The degree an object belongs to a fuzzy set is denoted by a membership value between 0 and 1. A membership function associated with a given fuzzy set maps an input value to its appropriate membership value. The membership functions used in this work have been shown in Figs. 3 to 5.

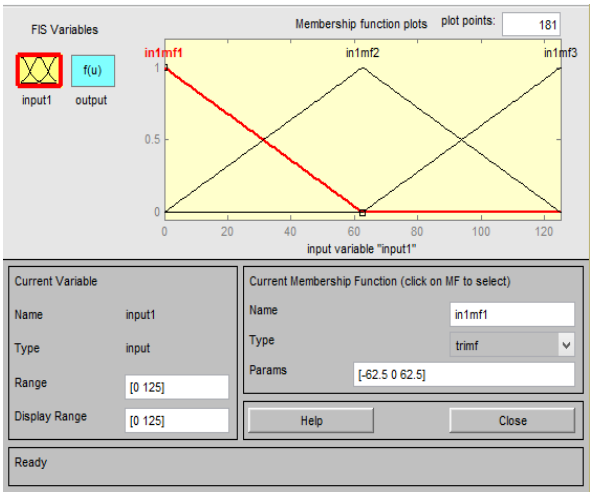


Figure 3. Triangular membership function plot

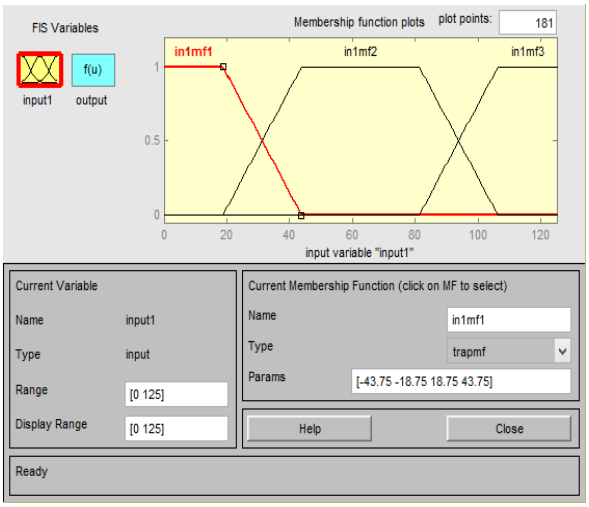


Figure 4. Trapezoidal membership function plot

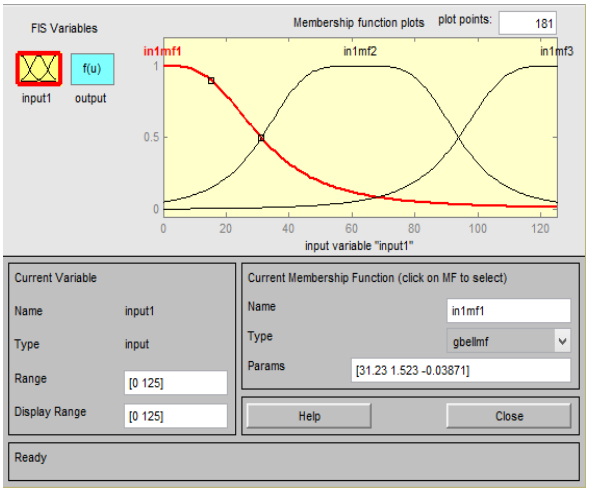


Figure 5. Gauss membership function plot

The generalized bell membership function is specified by three parameters and has the function name gbellmf. The bell membership function has one more parameter than the Gaussian membership function, so it can approach a non-fuzzy set if the free parameter is tuned. Because of their smoothness and concise notation, Gaussian and bell membership functions are popular methods for specifying fuzzy sets. Both of these curves have the advantage of being smooth and nonzero at all points.

IV. Results and Discussion

Numbers of nodes used are sixteen and number of linear parameters in usage are three, number of linear parameters are nine. So total number of parameters are 12. Number of data pairs used for the training are 26 that have been obtained from the data used for plot of PID [25,10, 25].The three fuzzy rules have been used which are predefined. The membership functions are also three and are predefined.

P Controller

P mode control and the characteristics observed are as follows:

1. After certain limit, increasing K_p only causes overshoot.
2. Increasing K_p reduces the rise time.

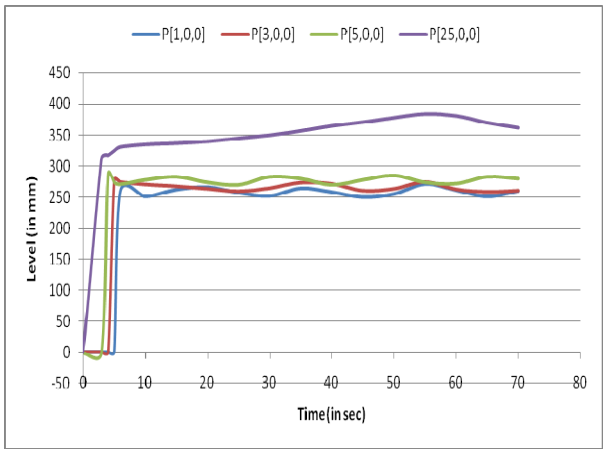


Figure 6. Performance of P controller under different setting

P-I Controller

PI mode control and the characteristics observed are as follows:

1. Integral control reduces steady state error.
2. After certain time, increasing K_i will only increase overshoot.
3. Variation in the level is reduced to much extent by increasing K_i.

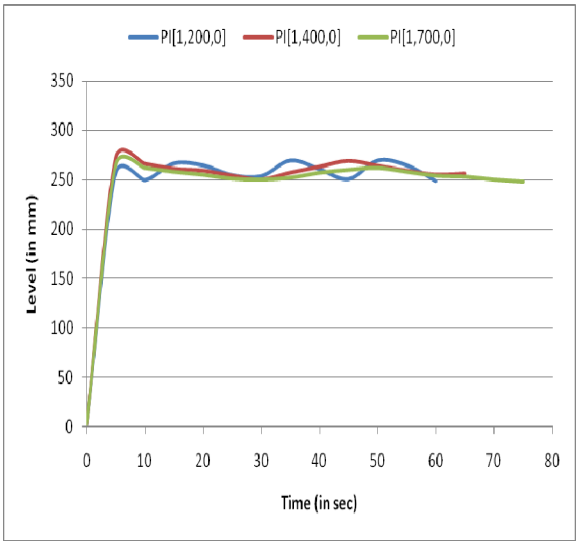


Figure 7. Performance of PI controller under different setting

P-D Controller

PD mode control and the characteristics observed are as follows:

1. D mode is designed to be proportional to the change of the output variable to prevent the sudden changes occurring in the control output resulting from sudden changes in the error signal.
2. In addition D directly amplifies process noise therefore D-only control is not used.

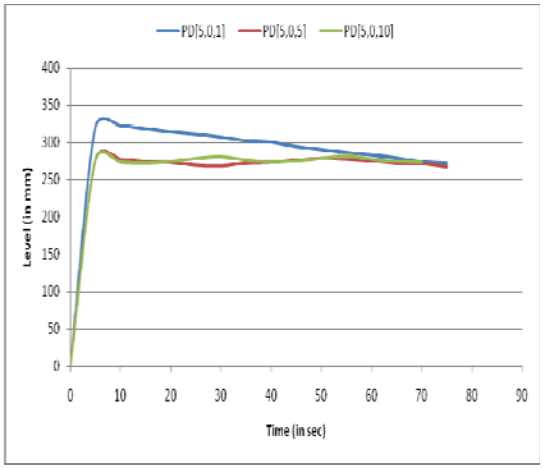


Figure 8. Performance of PD controller under different setting

PID Controller

PID mode control and the characteristics observed are as follows:

1. P-I-D controller has the optimum control dynamics including zero steady state error, fast response (short rise time), minimum oscillations and higher stability.
2. Increasing K_d decreases the overshoot.
3. Increasing K_d reduces the settling time.

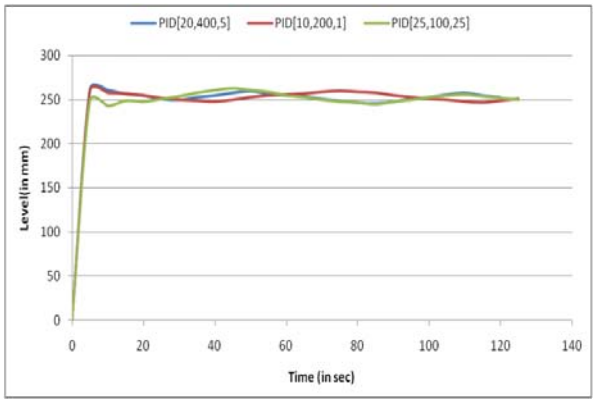


Figure 9. Performance of PID controller under different setting

V. Conclusion

Different types of controllers have been compared against each other in terms of their ability to reduce the overshoot, optimize the rise time, and minimize the steady state error along with higher stability in achieving the water level control. The study concludes that the performance of PID controller is better in all respects when compared with its P, PI and PD counterparts.

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RESOURCE ALLOCATION USING COORDINATED MULTIPOINT IN LTE-ADVANCED

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Abstract

The research shows that Coordinated Multi Point (CoMP) transmission can improve significant gains in terms of the overall capacity of cell and the throughput of cell-edge user. The main purpose of this paper is to enhance the throughput of cell and, the cell-edge user's, and the user equipment terminals (UEs) in LTE-Advanced (LTE-A) systems using CoMP[15]. In this paper we propose a scheme for coordinated multipoint (CoMP). The transmit power is allocated to spatial layer under the total base station power constraint and the per base station power constraint[1]

Keywords: LTE A, CoMP, UE, MIMO, 3GPP

Introduction

In order to maintain the competitiveness of the 3GPP cellular system, Long Term Evolution (LTE), is developed. For downlink transmission the technique selected is Orthogonal frequency division multiple access (OFDMA). In this time and frequency resources are reused in adjacent cells, inter cell interference becomes the crucial limiting factor. This problem can be overcome by using interference mitigation techniques. The interference mitigation techniques are interference cancellation, interference coordination and the third one is interference randomization currently investigated within 3GPP [13]. However, by using these techniques also the performance or improvements offered by the mitigation techniques are limited since inter cell interference is difficult to remove completely. A promising method to provide high spectral efficiency in downlink transmission is coordinated multi-point (CoMP) [2], It is called as network MIMO(multiple input multiple output). CoMP technique is one of the techniques of LTE-A under investigation to achieve the spectral efficiency requirements for LTE-A [3].
The advances in wireless communications such as the use of multiple-input-multiple-output (MIMO) systems and orthogonal frequency division multiplexing technique (OFDM) have managed to reduce the detrimental effect of fading in cellular systems. Therefore, the capacity of wireless cellular networks is mainly limited by interference.

In coordinated multipoint transmission(CoMP) technique, multiple base stations (BSs) share data and channel state information via a high-speed backbone network to coordinate their transmissions. By multiple BSs combining together to turn unwanted intercell interference (ICI) into useful signals, CoMP techniques mitigate ICI and improve spectral efficiency. In multiple input multiple output orthogonal frequency division multiple access (MIMO-OFDMA) system, its channel is braked down into parallel sub-channels in the space and

frequency domains [4], [5]. It enables flexible resource allocation (RA) to improve the resource utilization and throughput of the system [6]–[9]

CoMP is a new technology based on network MIMO. The data rates targeted by LTE-A require a great improvement in the SINR at the UEs, CoMP will increase data transmission rates on LTE-A networks. By coordinating or combining signals from multiple antennas, CoMP technology makes it possible for UEs to enjoy consistent performance whatever may be the condition whether they are close to the center of the cell or at its outer edges.

The basic principle of CoMP, is to make use of multiple transmit and receive antennas from multiple antenna site locations, which may or may not belong to the same cell, to improve the received signal quality as well as to reduce interference, increase the spectrum efficiency and enhance effective coverage area by making use of the co-channel interferences. CoMP mainly has been targeted to increase the cell-edge UE experience, but despite of the location it also use to enhance system throughput to UEs those experience strong signals of different BSs/cells. The main categories of CoMP are inter-site CoMP and intra-site CoMP. In inter-site CoMP, the coordination is performed between BSs located at separated geographical areas. Where the intra-site CoMP enables the coordination between sectors of the same BS, where the coordination is done through multiple Antenna Units that allow the coordination between the sectors. Figure 1 illustrates both CoMP categories[14].

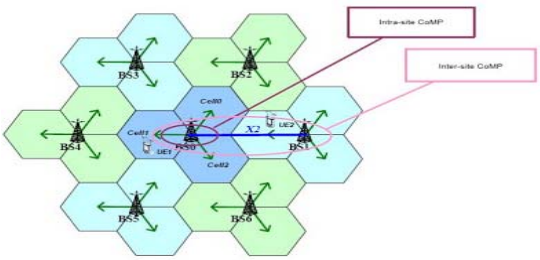


Fig 1 CoMP categories

The main objectives of CoMP are

1. To mitigate the interference;
2. To provide high spectral efficiency over the entire cell area; and
3. To increase the overall throughput especially the cell-edge throughput . [6]

Although CoMP naturally increases the complexity of system, it provides significant capacity and coverage benefits, making it worth a more detailed consideration.

The coordination in CoMP technology are as simple as in the techniques that focus on interference avoidance or more complex as in the scenario where the same data is transmitted from multiple transmission channels. In CoMP systems, two approaches are mainly considered. The first is coordinated scheduling (CS) where the data is transmitted from one RRE at a time with scheduling decisions made with coordination between all RREs. The second approach is joint processing (JP) where the data is made available at each RRE and then transmitted from various RREs simultaneously to each UE. JP is achieved by means of precoding, typically precoding matrices are selected so that the received signal-to-interference-plus noise ratio (SINR) is maximized at each scheduled UE.[13]

In this case, the transmission to a single scheduled UE is performed by a unique RRE (each UE receives the data from its serving RRE), see Figure 2[15] for reference, where the solid line indicates signal and the dotted one indicates interference. However; the scheduling, including any transmission weights, is dynamically coordinated between the RREs in order to control and/or reduce the unnecessary interference between different transmissions. In principle, the set of best serving UEs will be selected so that the transmitter beams are constructed to decrease the interference where as UEs, while increasing the served UE's signal strength. So, the cell-edge user throughput can be

improved due to the increase in the received Signal-to-Interference-plus-Noise-Ratio (SINR)

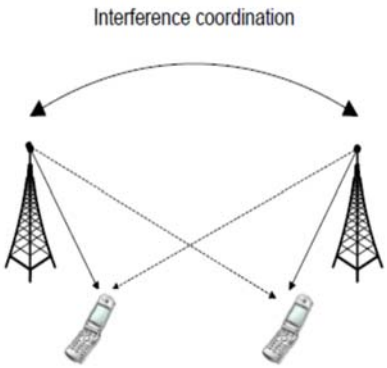


Fig.2 Coordinated Scheduling CoMP

Finding an optimal RA for CoMP schemes so as to maximize the sum rate is a very complicated problem. Hence, many suboptimal strategies have been proposed. In, RB optimization was explored considering a single RB. Two sectors and two UEs were considered such that each sector serves one UE. The purpose was to maximize the sum rate for both UEs. The conclusion was that the optimal power allocation is binary; either both sectors transmit with full power or just one of them transmits at full power and the other is turned off. In the case of multiple RBs, an algorithm must determine which RB should be allocated to a specific UE and how much power should be allocated to each of the scheduled RBs given the overall power limitation. An optimization problem should be solved to maximize the sum rate subject to power and bandwidth constraints while taking into consideration the interference between sectors. In, a model with two sectors and multiple RBs was considered. It was proved that if one RB is used by both sectors, then all RBs need to be used by both sectors (i.e. a frequency reuse of 1). Similarly, if one RB is used by exactly one sector, then all RBs need to be used by exactly one sector.

System Model

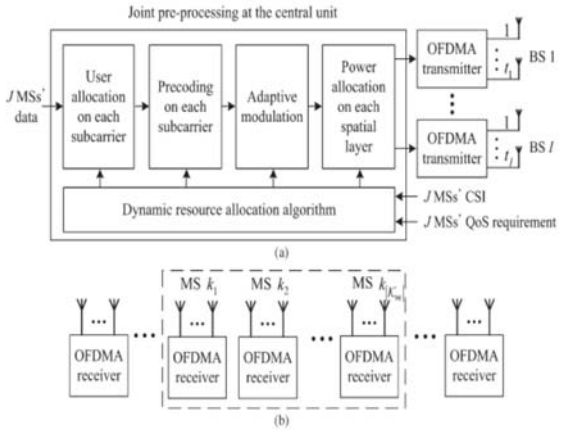


Fig.3 System model. (a) Transmitter structure. (b) Receiver structure.

The system model consist of :

1. Transmitter structure
2. Receiver structure

In the proposed schemes[1], the pre- and post processing of data are used to cancel inter user interference and decompose a single-user MIMO channel into parallel non interfering spatial layers. The transmit power is devoted to the spatial layers to maximize the sum rate. When adaptive modulation is adopted , the transmit power is sequentially allocated to increase the number of bits per symbol on every spatial layer under TBPC and PBPC according to the channel condition.

Algorithm:

Algorithm 1: TBPC

Set $M = \{1,2, \ldots \ldots, M\}$,

$K=\{k_1, k_2, \ldots\ldots, k_{|km|}\}$,

$L_{m,kj} = \{1,2,3\ldots, l_{m,kj}\} \forall m, kj$

Set $b_{m,kj,l} = 0 \; and \; p_{m,kj,l} = 0 \forall m, kj, l$

Step 2:

Calculate $P_{m',kj',l'} = g(b'_{m',kj',l'} + 2,$

$\sum'_{m',kj',l'} BER^{target}_{m',kj',l'})$

Step 3: TBPC

$if\ \sum_{i=1}^{I}\sum_{m=1}^{M}\sum_{kj\in Km}\sum_{l=1}^{Lm,kj}\|P^{i}_{m,kj,l}\|^2\ P_{m,kj,l} \leq P_{tot},\ Calculate\ b'_{m',kj',l'} = b'_{m',kj',l'} + 2$

If $b'_{m',kj',l'} = 6, then\ L_{m',kj'} = L_{m',kj'} - \{l'\}$

And go to step 2,

Otherwise go to step 2.

Otherwise calculate $P_{m',kj',l'} = g(b'_{m',kj',l'} \sum'_{m',kj',l'} BER^{Target}_{m',kj',l'})$

Finish the algorithm

Algorithm 2: PBPC

Steps 1 and 2:These are the same as step 1 and step 2in algorithm 1

Step 3: PBPC

If

$$\sum_{m=1}^{M}\sum_{kj\in Km}\sum_{l=1}^{L_{m,kj}}\|P^{i}_{m,kj,l}\|^2\ P_{m,kj,l} \leq P_{per}\forall i$$

Calculate $b'_{m',kj',l'} = b'_{m',kj',l'} + 2$

If $b'_{m',kj',l'} = 6, then\ L'_{m',kj'} = L'_{m',kj'} - \{l'\}$

And go to step 2

Otherwise go to step 2.

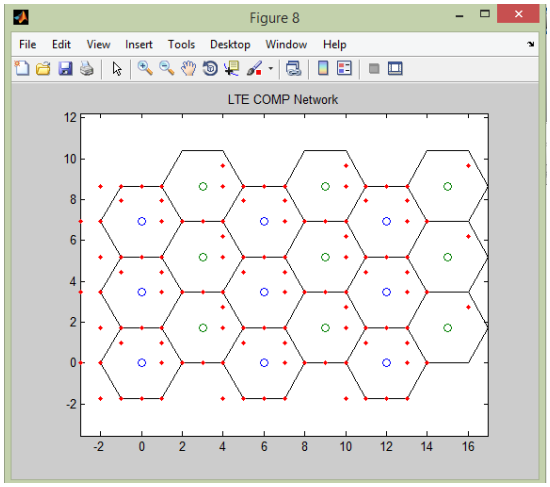
Otherwise calculate $P_{m',kj',l'} = g(b'_{m',kj',l'} \sum'_{m',kj',l'} BER^{Target}_{m',kj',l'})$

Finish the algorithm

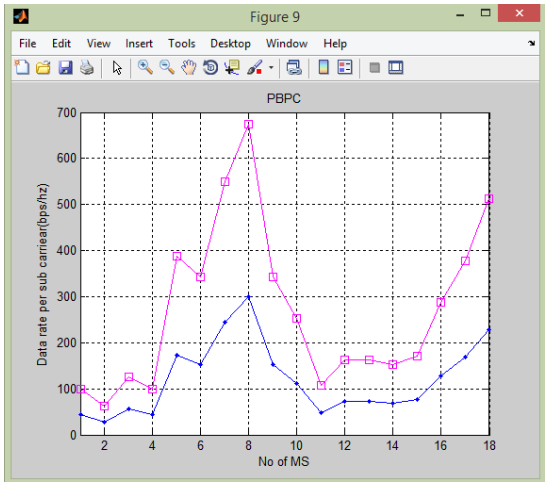
Result :

1. LTE network

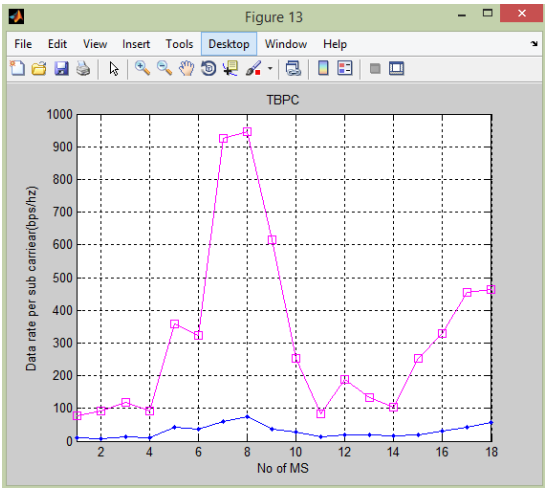
Here we have shown the CoMP network. In this we have created the cluster of cells and mobile users.



2. PBPC Algorithm
   In PBPC algorithm we have plotted the graph of number of mobile stations verses Data rate per subcarrier. Here we have plotted the graph for Per Base station Power constraints.



3. TBPC Algorithm
   In TBPC algorithm we have plotted the graph of No. of mobile stations verses data rate per subcarrier.
   In TBPC method we achieve higher data rate as compared to PBPC



Conclusion :

In LTE Advanced technology by using coordinated multipoint technology we can achieve higher data rate as compared to normal scenario.

It is shown that the proposed schemes achieve higher data rate than the conventional cellular system with multiuser MIMO-OFDMA. The reason is that the proposed schemes can cancel ICI

By using TBPC algorithm we can achieve higher data rate than PBPC algorithm because PBPC is more stringent than TBPC.

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SURVEY ON ROUTING PROTOCOLS FOR MOBILE AD HOC NETWORK

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Abstract— Mobile ad hoc networks (MANETs) is a collection of wireless mobile nodes which dynamically exchange data among themselves without wired backbone network. MANET nodes are typically characterized by their limited power, processing, and memory resources as well as high degree of mobility. MANET has dynamic topology and due to the limited transmission range of wireless network nodes, multiple hops are usually needed for a node to exchange information with any other node in the network. Thus routing is a crucial issue to the design of a MANET. In this paper we specifically examine routing protocols based on route selection like single path routing and multipath routing. In MANET multipath routing is major area for research. Therefore we discussed some multipath routing with their advantages and disadvantages.

Index Terms—Mobile ad hoc network, DSR

I. INTRODUCTION

Ad-hoc network are mobile wireless network that have no fixed infrastructure. A MANET (Mobile Ad-hoc Network) in simple words can be defined as ad-hoc network with rapidly changing topology. MANET is characterized by dynamic topologies due to uncontrolled node mobility, process and memory resources, limited power. In MANET node moves frequently, therefore topology changes frequently and the rate of change is directly proposal to the velocity of the nodes. The mobile nodes may enter or leave the network dynamically which is the basic functionality of the MANET. In that case routing is major issue to design of a MANET.

Routing is a mechanism to transfer data packet from source to destination. Routing protocols are classified into two different categories as proactive (table-driven) and reactive (source-initiated or on-demand). In proactive routing protocols, each node should maintains routing table of other node in the network. Like Destination Sequence Distance Vector (DSDV). On Other hand, on–demand routing protocols were designed to reduce the overhead because routing paths are searched only when needed. Like On-demand Distance Vector (AODV) and Dynamic Source Routing (DSR).

A. AN OVERVIEW OF MANET

MANET is a collection of wireless mobile nodes which dynamically exchange data among themselves without relay on any pre-existing infrastructure. Due to dynamic topology of MANETs any node can enter or leave the network at any time. Also each node has some inherent limitations in terms of limited resources such as battery, processing power, and on-board memory. Routing means a mobile node sends a packet to the destination node via intermediate node. Therefore routing is crucial issues in MANET.

B. ROUTING IN MANET

MANET has two types of routing categories: unipath (single path) and multipath. Unipath routing means there is single path available between source and destination. In single path routing, if intermediate node will be fail. It will

not work. Thus communication between nodes would typically endure period of intermediate node failure and as well as packet loss. Second, many of nodes are power constrained in MANET. Because of that, it is possible that some of the nodes might not be able to work. Therefore long term failure will occur. Major issues in single path routing is node failure or link failure. To overcome this limitation multipath routing is introduced. It is proposed as an alternative to single path routing to distribute load and alleviate congestion in the network.

C. Challenges and Issue

1) How to find multiple path: To find multiple path between source nodes to destination node, the basic route discovery process used in AODV and DSR protocols needs to be modified. For multipath routing, route should be node disjoint or link disjoint. Thus, the route discovery process of existing routing protocols need to be modified to find a maximum number of node joint or link disjoint path. After discovering route there is arise another issues how to select a suitable path or what node should make this selection, mainly the source or destination.

2) How to select path: Once all multiple paths are discovered, a multipath routing protocol should decide how to select a path form source to destination. So if there is more than one path available, then check for that which paths should be used? If few paths are used, then it will work same as shortest path algorithm. On the other hand if all path are used, then there is a chance to selecting largest path, which will helpful for multipath routing protocol.

3) How to distribute load: Once all suitable path are discovered, a good protocol need to decide that how to use these multiple paths to send data. For that there is more option available like randomly path selection, path can be selected to send a present number and then a different path can be selected to send the same number of packets and last path can be selected based on delay constrain of the network. So after selection of path or set of paths from source to destination there is again one issues arise how to send data. Either it may divide a packet into multiple segments and send these segments into different path or it may send duplicate copies of packet through different paths.

II. PARAMETERS FOR ROUTING PROTOCOL

Paper	Throughput	Latency (msec)	Packet delivery	Number of packet	Normalize routing load	Hop distance
[1]	No	No	No	No	No	No
[2]	Yes	yes	No	No	No	No
[3]	No	Yes	Yes	Yes	Yes	Yes
[4]	No	yes	No	No	No	Yes
[5]	No	No	No	No	No	No
[6]	No	Yes	No	No	No	Yes
[9]	No	Yes	Yes	No	No	No
[10]	No	Yes	Yes	No	No	No

Table 1. Survey table

III. UNIPATH ROUTING IN MANETS

Routing protocols are used for finding routes between sources to destination. Many routing protocols have been proposed and these protocol categorized into two part: table driven (proactive) and on-demand (reactive).

In proactive routing protocol like destination sequence distance vector routing (DSDV), each node should maintain routing table which contains routing information to all nodes in to the network. Each node must periodically exchange message with routing information to keep routing tables up to date. Therefore it is not suitable for large area network. In on-demand routing protocol (reactive) the nodes only discovers path when they are needed.so that on demand routing protocols are more scalable to dynamic large network. When a node needs a path to another node it will initiates a route discovery process to find new route. On demand

routing protocol has two main phase: first route discovery, source node will find the route to the destination and second route maintenance, worked when source node detect any topology change or any kind of route failure. Two most common routing protocol used for MANET is Dynamic Source Routing (DSR) and Ad-hoc On Demand Routing (AODV) protocol.

A. DSR

The DSR[1](Broch et al.,1998) is an on-demand routing protocol for MANET .In DSR source node include full route in the packets' header. DSR protocols consists of two basic mechanism:1)route discovery and 2)route maintenance. In route discovery mechanism, when source node want to send data packet, it will show the route cache if path is available or not. If path is not available it will initiate route discovery mechanism using broadcasting of RREQ (Route Request) message to its neighbor node. The RREQ message includes a route record which specifies the sequence of nodes traverse by the message. When an intermediate node or neighbor node will receive a RREQ message , it will check whether it is already in the route record or not. If it is, it will drop the message, this is help to prevent routing loops. If an intermediate node finds that it is the destination, it will send RREP(Route Reply) message back to the source after copying of routing information contained in RREQ message into a RREP message. If neighbor node is neither destination nor a it has a route in route cache to the destination, it attaches its address in the RREQ message and then it forward to its next neighbor .this process will continues until a RREQ message find its destination node. If an intermediate node has route to destination in its cache then it can append the route in to the route record and find RREP back to its source node. It can reduce limit flooding of the RREQ. Now in route maintenance mechanism when a node detects any topology change or broken link, it removes link from its routing cache and send route error(RERR) message back to each node that has sent packets from that link.

B. AODV

The AODV (Ad-hoc On-demand Distance Vector) protocol (perkins,1997)[1] is an on demand, loop free distance vector protocol. AODV contains on-demand route discovery mechanism in DSR with the concept of destination sequence number from DSDV.DSR uses source routing while AODV use hop by hop routing mechanism to maintain routing table at intermediate node. AODV protocol also contains two mechanism like DSR-1) Route discovery and 2) Route Maintenance. But format of route request message (RREQ) of AODV protocol is different from DSR protocol. To find a fresh route from an unavailable route, each node should maintain two counters one is node sequence ID and another is broadcast ID. Each route request message contain information of the destination sequence number and source sequence number and in addition it also contains source address and destination address. When route is needed source node initiate route discovery procedure. If neighbor node is destination node it will send route reply (RREP) message back to the source node. If it is not, then it needs to keep track of Request message to set up reverse path and forward path. Node can find that this route is a current one or stale one by comparing the destination sequence number in the route request (RREQ) message with that of the sequence number stored in the route record. If the RREQ sequence number is greater than the stored sequence number then it does not send RREP message to the source. An intermediate node can only reply if its sequence number is greater or equal to the RREQ sequence number. While maintaining a route mechanism when a node detects any broken link while it is broadcasting a packet to the next hop, it generates a RERR message that is sent to all source which are using these broken link. If source receives RERR message and it still required destination, then it initiate new route discovery process.

IV. MULTIPATH ROUTING PROTOCOL

Reactive routing protocols like DSR and AODV do not work with large area network. The scalability problem arises from high delay, excessive routing overhead and unreliable data transfer and energy efficiency. In unipath routing protocol message control overhead is very high during route discovery process to find destination node. Another problem in reactive routing protocol is high end to end delay. This delay occurs because of unreliable path

selection, unfair load distribution and high overhead. Next unreliable data packet transfer is another problem of reactive routing. This problem occurs due to node movement.

Benefits of Multipath Routing:

1) Multiple paths routing can provide load balancing, fault-tolerance, and higher aggregate bandwidth. Spreading the traffic along multiple routes can be achieved by Load Balancing. This can alleviate two issues such as congestion and bottlenecks.

2) Multipath routing protocol has three main phase: route discovery, route maintenance, and traffic allocation.

A. SMR

Split multipath routing (SMR) is on-demand multipath source routing protocol introduced in Lee and Gerla(2000).In SMR route discovery process is similar to DSR protocol, but intermediate node is not allowed to reply from its route cache if it has already path available to the destination therefore intermediate node do not need to keep a route cache. This protocol uses the scheme to distribute a load into multiple path. Therefore it is reduce the control overhead of the network. SMR protocol allows destination to accept all receiving route and find maximally disjoint path and maximally disjoint path means minimum number of nodes or links are common. In DSR protocol, intermediate node need to discard duplicate Route request(RREQ)message. Instead, it forwards this request message in a different incoming link and whose hop count is not larger than that previously received RREQ message. In route discovery process when destination node receives multiple RREQ message, it selects two maximally disjoint paths. In that paths first it selects shortest delay path. After then destination waits for more route request message .From that it selects maximally disjoint from the shortest delay path. If more than one shortest path is available then it selects shortest hop path. But in this protocol intermediate node do not discard duplicate RREQ message, sop frequency of route discovery process need to be reduce to curb the overhead.

B. AOMDV

Ad hoc on-demand multipath distance vector routing(AOMDV)an extension to the AODV protocol for computing multiple loop-free and link disjoint paths. AOMDV has three batter ways to compare to other protocols. First, it does not have high inter-model coordination overheads like some other protocols like TORA. Second, without the use of source routing it ensure disjointness of alternate routes via distributed computation. Finally, AOMDV computes alternate paths with minimal additional overhead over AODV. In AOMDV RREQ message can traverse from source to destination through multiple reverse paths both at intermediate node as well as destination node. In AOMDV, it also provide an alternate path at intermediate node if they are useful in reducing route discovery frequency. To keep track of multiple routes, the routing entry for each destination will contains a list of the next hops along with the corresponding hop counts. All the next hops have same sequence number. So for each destination a node maintains the advertised hop count, which is defined as the maximum hop count for all the paths and it is used for routing advertisements of the destination. Each duplicates route advertisements received by a node define an alternate path to the destination. In this paper they describe comparison between AODV and AOMDV and they give simulation result that AOMDV in comparison with AODV, reduce the packet loss up to 40% and improve routing overhead 30% by reducing frequency of route discovery operations. But still many issues describe in this paper. Initially the protocol can be improved by effectively dealing with the route cut-off problem and compute more disjoint path when source-destination pairs are far away. Second, they do not studied carefully interaction between timeout setting and AOMDV performance.

C. AODVM

AODVM is also an extension of AODV protocol for finding multiple node disjoint path. Unlike AODV, intermediate node does not discard duplicate RREQ message and it stores this information in RREQ table. In AODVM intermediate node is not able to send reply

message to the source .When a destination node receives a RREQ message, it updates its sequence number and generate route reply (RREP) message. Route reply message contains an additional field called last hop id to indicate a neighbor from which this particular copy of RREP message is received. Then destination node sends reply message to all of its neighbors. When an intermediate node receives the RREP message from a neighbor node, it deletes the entry for that neighbor node from its RREQ table and adds routing entry into its routing table. Each entry in routing table indicates the discovered route from itself to destination node. While forwarding a RREP message to a neighbor node, an intermediate node selects a neighbor that is on shortest path. When an intermediate node receives RREP message and if there is no recorded in RREQ table entry to which it can forward that reply message, it will generate a path identification with an error message and sends it to its neighbor from which it has received that route reply. When a source receives a route reply packet from destination it sends another type of message called route request confirmation message (RRCM).one of the advantage of AODVM is that intermediate nodes cannot use previously cache routing information to generate RREP.

D.TROA

The TROA (Temporally Ordered Routing Algorithm) is a highly adaptive, efficient and scalable distributed routing algorithm based on the concept of link reversal. These algorithm is proposed for highly dynamic mobile, multi-hop wireless networks. It is a source-initiated on-demand routing protocol. The main feature of TORA is that the control messages are localized to a very minute set of nodes near the occurrence of a topological change. To achieve this, the nodes maintain routing information about adjacent nodes. The basic functionality of the protocol consists of creating routes, maintaining routes and erasing routes. These protocol models the network as a graph initially and thus all the edges in the graph i.e. links in the network are undirected. So each link will be undirected or directed from node i to node j or directed from node j to node i. Each node maintains a metric called “height”. This metric is used in assigning directions to links with each neighbor. Routes can be formed in reactive or proactive mode. The Reactive mode route creation require establishing a series of directed links from the source to the destination node. This is done by constructing a directed acyclic graph rooted at the destination using a query reply process. When a route is required the source broadcasts a QRY (query) packet to its neighbors. The query packet is propagated until it is received by one or more routers that have a route to the destination. The router that has a path to the destination sends an UPD (update) packet to all its neighbors. The node which receives an update packet from the other node will set its height one greater than the height of the node from which it received the UPD packet. In a proactive mode it is noted that the destination initiates route creation by sending a OPT which is known as optimization packet which is then processed by the neighbors and forwarded further. Route maintenance is performed only for routers that will have a non-null height. And so the routers with a null height will not use for computations. When a node loses its last downstream link at that time only reaction to link failure is initiated. Temporally Ordered Routing Algorithm has a unique feature of maintaining multiple routes to the destination so that in order to make any topological changes it do not require any reaction at all. So the protocol only reacts when all the routes to the destination are lost. When considering network partitions the protocol is able to detect the partition and erase all invalid routes.

E. ZRP

The ZRM algorithm aims to address the issues by combining the best properties of both approaches. ZRP can be categorized as a hybrid or reactive/proactive routing protocol. It proactively maintains the routing table information of nodes inside the local zone, which reduces the time in route search operation if the destination is inside the zone. However, for the nodes outside the local zone, it re-actively searches the route on the basis of route discovery procedure. A routing zone or radius is the distance in number of hops from the node under consideration. Routing zone is divided into two parts: peripheral nodes and interior nodes. Peripheral nodes are nodes

whose minimum distance to the central node is exactly equal to the zone radius ρ and even whose minimum distance is less than ρ is interior node. ZRP refers to the locally proactive routing component.

V. CONCLUSION

This paper presented a survey of most recent routing protocols for MANETs. The surveyed protocols showed that multipath routing can improve network performance in terms of delay, throughput, reliability and life time. Yet it is hard to find a single protocol or a set of protocols that can improve all these performance parameters. Selection of a multipath routing protocol depends on a particular application and trade- offs. Some of the objectives are energy efficiency, low overhead, reliability and scalability. With this survey paper, researchers can acquire what has been investigated, and network designers can identify which protocol to use, and what are the trade-offs.

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AN AUGMENTATION OF TCP FOR COMPETENCY ENLARGEMENT IN MANET

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Abstract
The Transmission Control Protocol (TCP) was mainly designed for wired network, where there is very less chances of packet loss due to transmission errors. But in Mobile Ad hoc Network (MANET) there is no fixed topology or wireless topology, so error occurs due to link failure as a result of movements of nodes. The TCP protocol for wired network is not performed well for MANET. Most of the MANET based TCP is analyzed the performance under different mobility pattern in existing literature. More frequent dynamism is also not considered in most of the protocols. In this report TCP protocol is modified to use in Mobile Ad Hoc Network (MANET). The modified TCP will reduce ratio of packet loss which is occur due to link failure, congestion, node mobility or link breakage. To achieve the goal we will adopt simulation study through ns-2 simulator. We aimed at controlling the congestion window in TCP by taking into consideration of the mobility pattern of nodes. Two bits of TCP header (Reserved bits) may be manipulated by the source and destination to indicate the mobility of node. Congestion window may be adjusted based on the specified two bits.

Keywords: TCP, Transmission Control Protocol, MANET,Mobile Ad hoc Network, Network, Link Failure, Packet Loss, Node Mobility, Link Breakage.

I. INTRODUCTION

Transmission Control Protocol (TCP) is one of the main protocols in TCP/IP networks. TCP works on transport layer in OSI model. The IP protocol deals only with packets, whereas TCP enables two hosts to establish a connection and exchange streams of data. TCP guarantees delivery of data and also guarantees that packets will be delivered in the same order in which they were sent. The TCP was mainly designed for wired network, where there is a very less chances of packet loss due to transmission errors, and most of the time packet losses is due to congestion in the network. Now a days, mainly research is done on effective error and congestion control mechanism for wired and wireless network. Instead of effort made by many researchers, there is still need for further improvements in the transport layer protocol to make it suitable wireless communication. However, the problem itself has lots of challenges and issues to be addressed for effective use in wireless environment. These issues mainly includes characteristic of wireless media including signal fading, multipath propagation, etc. Being a potential protocol for next generation network, the TCP protocol needs much attention to make it acceptable for the wireless environment. The traditional assumption of assuming packet loss in the transport layer due to congestion only and it need to be improve packet loss due to other reasons that exist in the wireless environment. TCP is reliable protocol because uses acknowledgement mechanism and also provide end-to-end packet delivery. TCP achieves good performance in wired network but when it used over wireless network it degrades the performance. In wireless network, a central node which is called base station or access point exists in the network that all the connections are

done through central node. But when we configure the network in ad hoc mode, every couple of nodes can communicate with each other independent of the central node. MANET allows wireless connectivity directly between wireless nodes without connecting through an access point (infrastructure mode Networks). Each device in a MANET is free to move independently in any direction, and changing its links to other devices frequently where wireless LAN is a wireless computer network that links or more devices using a wireless distribution method within limited area such as home, school, computer laboratory or office building. This gives users the ability to move around within a local coverage area and still be connected to the network and can provide a connection to the wider internet. There are two basic modes of operation of wireless LAN:

1) Infrastructure mode: In which wi-fi networks are deployed.

2) Ad hoc mode: In which peer-to-peer connections are there where station communicate. So need to improve mechanism of TCP for good performance for wireless network.

II. TRANSMISSION CONTROL PROTOCOL

A. Details of TCP

TCP is a transport layer protocol. In OSI network architecture stack TCP provides a number of service for higher layers [11]. It guarantees that a stream of bytes sent from the sender side is delivered reliably and in the same order to receiver side. The counterpart to the reliable TCP service is the UDP, which provides a datagram service where latency is reduced at the cost of data delivery. A few key features set TCP apart from UDP:

1. Data packets are arranged in order before handing over to all.
2. On request for lost packet from destination, retransmission process can be occurred.
3. It uses acknowledgement mechanism and also provide reliable data transfer.
4. TCP controls flow of data packets or decrease the speed of packets as per destination requirement.

B. Challenges and Issues

In wired TCP, Packet losses due to congestion where in wireless TCP, packet losses due to link failure most of the times and packet will no reach to the destination successfully. TCP solutions for Wireless network assumes only one segment in wireless communication.

Signal attenuation, due to this issue a decrease in intensity of the electromagnetic energy at the receiver, which leads to low signal-to-noise ratio (SNR).

Doppler shift, due to this issue the relative velocity of the transmitter and the receiver. Doppler shift causes frequency shifts in the arriving signal, thereby complicating the successful reception of the signal.

Due to multipath fading Electromagnetic waves reflecting off objects or diffracting around objects can result in the signal traveling over multiple paths from the transmitter to the receiver. Multipath propagation can lead to fluctuations in the amplitude, phase, and geographical angle of the signal received at a receiver.

Due to effect of multiple failures on the same route is always possible that multiple route failure occur independently along different links of the route. This is however not a serious concern in case of TCP-F as the source will then receive an RFN from the nearest and behave accordingly.

Due to the effect of congestion on the feedback mechanism is possible that in a congested network, the Route Failure Notification (RFN) and Route Re-transmission Notification (RRN) packets may be lost delayed.

TCP throughput drops or sometimes it may loss when mobility occurs. Due to mobility or link failure congestion take place and it may also drop the packet.

When node moves or congestion occurred node will be put in standby mode and packet transmission will freeze for sometimes.

Due to high Bit Error Rate (BER), bit errors causes packets to get corrupted which result in lost TCP data segments or acknowledgment.

Due to route re-computation, when an old route is not available for longer time, then the network layer at the sender attempts to find a new route to the destination.

Due to network partitions, it is likely that the ad hoc network may periodically get partitioned for several seconds at a time.

If the sender and the receiver of a TCP connection lie in different partitions, all the senders' packets get dropped by the network resulting in the sender invoking congestion control.

Due to multipath routing, some routing protocols maintain multiple routes between source destination pairs, the purpose of which is to minimize the frequency of route re-computation.

As the number of hops on a path increases, the probability of a link failure and consequential packet losses on the path increases.

Due to node mobility, limited communication range of radios, such constant node mobility immediately leads to frequent link breakages and there for route changes and packets may get lost.

Due to wireless link errors, Wireless links posses high bit error rates that cannot be ignored. But TCP interprets packet losses caused by bit errors as congestion. As a result, its performance suffers in wireless networks when TCP unnecessarily invokes congestion control, causing reduction in throughput and link utilization.

Congestion Control is widely considered to be a key issue for MANETs. It has severe throughput degradation and massive fairness problems.

A problem with Explicit Link Failure Notification (ELFN) schemes is that still a number of data packets and ACK may get lost before the state is frozen. This has negative effects after the state is restored: missing packets or missing ACKs will then cause timeouts or duplicate acknowledgments.

The traditional Additive Increase (AI) mechanism does not increase the TCP window size fast enough to fully utilize the available bandwidth.

In fact, if the sender reduces the sending rate on each packet loss, TCP cannot quickly take the available bandwidth after congestion disappears.

Especially in high-bandwidth delay network case, it takes intolerable duration between congestion events for a standard TCP flow to achieve a steady state throughput. This will result in slow sending rate and low bandwidth utilization.

The problem of TCP lies in the Congestion Control mechanism i.e., multiple TCP connections can share network and link resources simultaneously.

Once the sender receives three duplicate acknowledgement causes by non-congestion loss, the TCP sender assumes that a packet has been lost due to network congestion and reduces the size of the congestion window needlessly.

III. TCP FOR MANET

The challenges for TCP in MANETs span all the layers below the transport layer in the OSI network stack. [11] At the physical layer, interference and fading may result in bit errors and lost packets. At the MAC layer, the medium access may induce delay and is not able to totally avoid collisions potentially causing packet loss if retransmission mechanisms are unable to salvage the problem. Retransmission will also create delay and jitter. Some MAC protocol implementations are able to dynamically change the data rate based on the transmission success. At the network layer, the routing protocols delay in detecting topology changes may lead to periods without connectivity. Also, the end-to-end transmission time will change as a result of changing paths between the source and destination. The IEEE 802.11 wireless stack [12, 13] is by far the most common wireless platform that is used for ad hoc networking today. Many MANET challenges have been identified based on work with 802.11 platform and in some cases the problems and subsequent solutions have focused more on mending the 802.11 standard than on addressing MANET problems generically. However, it is important to note that the 802.11 stack implements several mechanisms that are necessary for a functional MANET based on a Carrier Sense Multiple Access (CSMA)/ Collision Avoidance (CA) MAC protocol. The performance of several proposed MANET adaptions of TCP (TCP-F, ELFN, ATCP, Fixed RTO and TCPDOOR) is investigated in [14].

Numerous enhancements and optimizations have been proposed over the last few years to improve TCP performance over one-hop wireless networks. These improvements include infrastructure based WLANs [15,16,17,18], mobile cellular networking environments [19,20], and satellite networks [21,22].

A. *TCP in MANETs challenges and Solutions*

The Transmission Control Protocol (TCP) is the protocol that saved the Internet, most importantly because of its congestion control mechanism. It is a vital building stone in IPbased networks, but it faces serious challenges when used in MANETs, since MANETs are challenged with interference and high grade of mobility, from which wired networks are spared. This report is aimed at introducing the TCP protocol, describing the challenges that TCP faces in MANETs, and give an overview of ongoing research to adapt TCP to MANETs.

Many challenges are included in this survey paper. Only overview is given in this survey paper.

B. *A Survey of TCP over Mobile Ad Hoc Networks*

The Transmission Control Protocol (TCP) was designed to provide reliable end-to-end delivery of data over unreliable networks. In order to adapt TCP to MANET environment, improvements have been proposed in this paper to help TCP to differentiate between the different types of losses. Indeed, in MANETs losses are not always due to network congestion, as it is mostly the case in wired networks. In this paper, an overview of this issue and a detailed analysis of major factors involved.

Many Challenges and proposals are included i.e. TCPF, ATCP, ELFN TCP, Split TCP, Bus TCP. End-to-end and reliable delivery of packets. This process is time consuming process. TCP can no distinguish between looses induced by network congestion or other types of losses. Route failure or packet loss occurs due to congestion overhead.

C. *A Feedback Based Scheme For Improving TCP Performance In Ad-Hoc Wireless Networks*

In this paper, a feedback scheme, the source can distinguish between route failure and network congestion. The main idea is to inform the source by a Route Failure Notification (RFN) when the route is disrupted allowing the source to freeze its timers and stop sending packets as the source cannot reach the destination. When the route is re-established, the source on being informed through a Route Re-establishment Notification (RRN), resumes by un-freezing timers and continuing packet transmissions.

Packets are rarely lost in wired network. Route Failure Notification (RFN) and Route Re-transmission Notification (RRN) is useful at time of failure. Same route is affected by multiple failures. Time consume on route re-transmission process. Effect of failure on multiple transport connections.

D. *Analysis of TCP Performance over Mobile Ad Hoc Networks*

Mobile ad hoc networks have attracted attention lately as a means of providing continuous network connectivity to mobile computing devices regardless of physical location. In this paper, the effects that link breakage due to mobility has on TCP performance. Through simulation, the TCP throughput drops significantly when nodes move, due to TCPs inability to recognize the difference between link failure and congestion.

Provide information about link failure and route failure so packet sending process may freezes for some times. Host Unreachable message as a notice to the TCP sender to avoid packet collision. When TCP sender receives an Explicit Link Failure Notification (ELFN), its disables re-transmission timers and enters in Standby Mode so it may more time consuming process.Bit Rate Error (BER) value is more then wired TCP.

E. *ATCP: TCP for Mobile Ad Hoc Networks*

Transport connections set up in wireless ad hoc networks have some problems such as high bit error rates, frequent route changes, and partitions. In this paper, there is an implementation of a thin layer between Internet protocol and standard TCP that corrects these problems and maintains high end-toend TCP throughput.

Ad Hoc TCP (ATCP) Re-transmits failed packet or reorders it. Explicit Congestion Notification (ECN) used to quickly notify sender of congestion. Route change force by mobility. Partitions are formed and recombined by the mobility. In ATCP ICMP Destination Unreachable message puts sender in persist mode until new route found.

F. *Split TCP for Mobile Ad Hoc Networks*

When TCP used in MANETs the fairness and throughput has been suffered. This is a direct value of TCP wrongly attributing packet losses due to link failures or mobility of nodes to congestion. This problem causes an overall degradation throughput, it affects connections with a large number of hops, where link failures are more likely. Split TCP separates the functionalities of TCP congestion control and reliable packet delivery.

The TCP source then freezes the connection until the route is restored. When link failure occurs in one segment other segment will be affected.

G. *A Survey on TCP Over Mobile Ad Hoc Networks*

In this paper authors will survey on TCP performance in MANETs. Then describe the problems of TCP in ad-hoc networks, and then present the design and existing solutions to improve TCP throughput. Author uses a detection- response framework to categorize different approaches and analyze the possible design options.

Freezes its current state for route disruption problem as soon as the route breaks i.e. sender stop sending more packets and resume as soon as a new route is found. When a TCP sender receives an ELFN, it disables its re-transmission timers and enters a Standby Mode, which is similar to the snooze state of TCP. The main advantage of freezing TCP is, the sender can react very quickly to the link failure, and therefore minimizes the number of packet losses and subsequent delays.

The disadvantage of relying on a network layer feedback is, it results in a reinvention of feedback support in each new ad hoc routing protocol. There is potential danger of malfunction if the RFN or RRN packets are lost. Route disruption problem is one of the main disadvantages.

H. *A Survey on Congestion Control for Mobile Ad-hoc Networks*

Congestion Control is a key problem in MANETs. The standard TCP congestion control mechanism is not able to handle the special properties of a shared wireless multihop channel well. In particular the frequent changes of the network topology and the shared nature of the wireless channel pose significant changes.

It uses Selective ACK (SACK), Duplicate ACK (DACK), Cumulative ACK schemes as per need. An intermediate node generates an RFN message when it detects a link failure on the route. ECN used to quickly notify sender of congestion. Route changes force by mobility. Unsteady packet delivery delays. Route changes due to node mobility as well as inherently unreliable medium result in packet losses.

I. *Split-TCP Based Acceleration Gateway over Packet Lossy Networks*

The Conservative Additive Increase Multiplicative Decrease mechanism of traditional TCP causes the link under-utilization in the WANs due to the WANs intrinsic nature of high latency and high packet loss. Split-TCP Based Acceleration Gateway (STAG) is built on embedded network equipment and act as a transparent proxy. In STAG, a new improved congestion control method named Rapid TCP is adopted, which determines whether or not to decrease the congestion window based on the packet loss trend.

Rapid TCP doesnt traditionally reduce the congestion window quickly when the network transmission loss occurs. In the fast recovery phase, Rapid TCP chooses a different window adjustment strategy based on the current congestion window size. This arrangement significantly increases the transport speed and thus reduces the latency of WAN application. STAG achieves the traffic control by limiting the data sending rate of the server. STAG is able to support approximately 20,000 concurrent sessions for every giga-bytes of RAM, at the configuration of 8KB CircleQueue and 16KB buffer for each Clint-Server session. STAG performs better with increasing bandwidth. STAG can more efficiently utilize the network bandwidth with a high speed up ratio because the proposed Rapid TCP provides an active CWND growth mechanism. The throughput of Cubic increases very slowly with increasing bandwidth in a long delay or a high loss rate environment. The packet transmission rate of the Server-STAG session is higher than that of the Client-STAG,

which may cause a long packet queue at the server side. Due to the conservative multiplicative decrease (MD) mechanism, the transmission rate of a TCP session is reduced significantly upon the detection of the congestion, and is not able to recover immediately even if the congestion disappear momentarily. Rapid TCP handles the long delay and high packet loss in WAN network environments.

J. Simulation for Congestion-Less Losses Control over MANET using TCP Scheme

Transport Mobile Ad hoc Network (MANET) is a collection of independent mobile nodes that show its mobility. Due to mobility the network congestion has been occurred. TCP is the most popular connection oriented transport layer protocol used in current internet. Whenever TCP Scheme applied over MANET, TCP found new challenges in respect of network congestion and non-congestion.

As data is transmitted by the sender and then acknowledged by the recipient, the window slides further to wrap more data in the byte stream. Due to TCP NJ-Plus scheme improve the performance of TCP by distinguishing between congestion and non-congestion losses. Route changes force by mobility. Congestion control is the typically disruptive parts of TCP. In both the case static network and mobility model, the performance of the network is not much efficient for end to end delay.

IV. ANALYSIS

TCP works on transport layer and it provides reliable packet delivery. TCP uses end-to-end methodology and acknowledgement mechanism. TCP was mainly designed for wired network in which chances of packet loss is very less and it may occur either due to transmission errors or congestion most of the time. But in MANET, node can move independently in any direction. So, topology may get change any time. Due to node mobility or change in topology packet may loss, it will not reach to the destination properly.

TCP guarantees that a stream of bytes sent from the sender program on one computer is delivered reliably and in the same order to receiver program on the other computer. The counterpart to the reliable TCP service is the UDP, which provides a datagram service where latency is reduced at the cost of data delivery reliability.

The traditional assumption of assuming packet loss in the transport layer due to congestion only and it need to be improve packet loss due to other reasons i.e. link breakage, route failure, node failure etc. that exist in the wireless environment.

There are ample of research work found addresses issues in transport layer for MANET. Few of such work have been discussed below.

The work reported in [3] by Kartik Chandran et al. has said that Two Mobile Hosts (MHs) are said to be within range and said to be neighbors of each other if each can receive the others transmission. Route Failure Notification (RFN) and Route Re-establishment Notification (RRN) is used at the time of route failure or node failure or link failure in feedback based scheme. This is the main advantage of wired network in which packets are rarely lost. In MANET, more packets are lost as compared to wired network due to mobility of nodes.Kartik Chandran et al. Has observed No of Nodes (10), Throughput, Packets and Sequence number of packets having data rate of 1.28 kbps, size of window 4KBytes and size of packets is 200bytes. The issues raised are: Mobility, Efficiency (System Performance, Throughput, bandwidth) Packet loss, Route Failure, Node Failure and Topology Overhead.

The author Ahmad Al Hanbali et al. of [2] (2006) suggested another mechanism of end-to-end methodology and reliability of packet delivery is used. Many challenges and proposals are included i.e. TCP Feedback (TCP-F), Ad-hoc TCP (ATCP), Explicit Link Failure Notification (ELFN) TCP, Split TCP, Bus TCP. To improve TCP performance in MANETs in two categories: cross layer proposals and layered proposals. In cross layer proposals, TCP and its underlying protocols work jointly. In layered proposals, the problems of TCP is attacked at one of the OSI layers. Ahmad Al Hanbali et al. has Observed No of Nodes (1-N multihop channel), Throughput, Packets and sequence number of packets. The issues raised are: Mobility, Efficiency (System Performance, Throughput, bandwidth) Packet loss, Route Failure, Node Failure and Congestion Overhead.

The work reported in [4] by Nitin Vaidya et al. (2002) has provided that link failure or route failure. So, packet sending process may freezes for sometimes or it may put the whole process of

sending and receiving packet in standby mode. It also send Host Unreachable message as a notice to the TCP sender to avoid packet collision. When TCP sender receives an ELFN, its disables retransmission timers and enters in Standby Mode so it may take more time to complete the process which similar to the snooze state of TCP-F. In DSR, ach packet injected into the network contains a routing header that specifies the complete sequence of nodes on which the packet should be forwarded. Nitin Vaidya et al. has observed No of Nodes (30), Throughput, Packets, Time, Transmission radius (250 m2) and Sequence number of packets having size of packets 1460bytes, simulation area 1500*300m2 and speed of sending packets is 10 m/s-30 m/s. The issues raised are: Mobility, Efficiency (System Performance, Throughput, bandwidth) Congestion Overhead, Packet Dropping and Standby Mode.

The author Jain Liu et al. of [5] (2001) suggested another mechanism Ad Hoc TCP retransmits failed packet or reorders it. It also uses Explicit Congestion Notification (ECN) used quickly notify sender of congestion. ATCP retransmits failed packets which is lost through link failure or node failure or congestion overhead or mobility of nodes. ATCP also reorders the failed packet. Bit errors causes packets to get corrupted which results in lost TCP data segments or acknowledgement. A serial timeout is a condition wherein multiple consecutive retransmission of the same segment transmitted to the receiver while it is disconnected from the sender. Difference between TCP and ATCP is that TCP invokes congestion control frequently during the experiment because of lost packets or duplicate ACKs. TCP uses slow start to increase its transmit window. ATCP, on the other hand, puts the TCP sender in persist mode and retransmits the packet whose retransmit timer was about expire. Jain Liu et al.has observed Throughput, Packet, Time, Congestion Window, Bit Error Rate (10-5), Bandwidth having Packet size 100 bytes, Transfer size 1MB, Average Delay 10ms-30ms, Acknowledgement Size 40bytes. The issues raised are: Efficiency (System Performance, Throughput, bandwidth) Packet loss,

Route Failure, Node Failure, Congestion Overhead, Network Traffic and Route Retransmission.

The work reported in [8] by Christian Lochert et al.

(2007) has said that TCP uses Cumulative ACK, Delayed ACK (DACK) and Selective ACK (SACK) scheme as per requirements. Congestion control is widely used considered to be a key issue for MANETs. Congestion-related problems have been identified which are severe throughput degradation, massive fairness problems. TCP uses a time limit that depends on the measured Round Trip Time (RTT) of the connection. If Round Trip Timeout (RTO) elapse without an acknowledgement TCP concludes severe congestion. While slow start is active, the window size is not increased but one segment size for every round-trip time, but instead for every received acknowledgement, this means that during this phase the window size grows exponentially. Route changes due to node mobility as well as the inherently unreliable medium result in unsteady packet delivery delays and packet losses. Christian Lochert et al. has observed Throughput, Fairness, Bandwidth and Congestion Window having Delayed ACK value is 2, Segment of Congestion Window is 4 and Propagation Delay is 4. The issues raised are: Mobility, Efficiency (System Performance, Throughput, bandwidth) Packet loss,

Route Failure, Node Failure, Congestion Overhead, Network Traffic and Route Retransmission.

The author Feng Wang et al. of [7] suggested another mechanism TCP sender can react very quickly to the link failure and therefore minimizes the number of packet losses and subsequent delays. In MANET, route disruption problem is major problem for packet loss. The effectiveness of any performance enhancement approaches highly depends on the timeliness of responses to the route disruptions. Slow start is the reaction of TCP timeout events. When there are triple duplicate acknowledgements, TCP sender simply halves its current congestion window size and then increases it linearly. The network layer feedback includes the information provided by the underlying ad hoc routing protocols, such as the routing error messages. The transport layer feedback is the information generated by and accessible to the transport

protocol, such as the timing and sequence of TCP packets. A heuristic is employed to distinguish between route failures and congestion. When timeout occur consecutively, the sender assumes a route failure has happened rather than network congestion. Feng Wang et al. has observed Throughput, Time, Route Reestablishment Delay (RRD), Speed (10m/s), Hop-to-Hop Delay, Frequency, Delivery Rate having 30 nodes, Data rate of 10kbps, Simulation area (1500m*300m), size of packers are 100bytes. The issues raised are: Mobility, Efficiency (System Performance, Throughput, bandwidth) Congestion Overhead and Route Retransmission.

The author Swastik Kopparty et al. of [6] (2002) suggested another mechanism that the TCP source then freezes the connection until the route is restored. As the number of hops on a path increases, the portability of a link failure on the path increases. Split TCP can handle mobility better than the plain TCP. One link failure can cause an entire TCP session to choke, when in fact packets can be transferred on other links that are still up. Split TCP helps to take advantage of these links that are up when a link on a local segment fails, it is possible for TCP with proxies to sustain data transfer on other local segments. Thus, the hit on TCP throughput due to mobility is of much lower impact. The fairness and throughput of TCP suffer when it is used in MANETs. This is a direct consequence to congestion. While this problem causes an overall degradation of throughput, it especially affects connections with a large number of hops, where link failures are more likely. Thus, short connections enjoy an unfair advantage over long connections. Swastik Kopparty et al. has observed No of Nodes (50-100), Throughput, Packets, Time, and Fairness having Spread Region 1km*1km and Speed 010ms. The issues raised are: Mobility, Efficiency (System Performance, Throughput, bandwidth) Congestion Overhead and Topology Overhead.

The work reported in [9] by Dong Pingping et al. (2015) has said that Split-TCP Based Acceleration Gateway (STAG) is built on embedded network equipment and act as a transparent proxy. STAG can more efficiently utilize the network bandwidth with a high speed up ratio because the proposed RAPID TCP provides an active Congestion Window (CWND) growth mechanism. In STAG, a new improved congestion control method named Rapid TCP is adopted, which determines whether or not to decrease the congestion window based on the packet loss trend. STAG employs Rapid TCP, an enhanced congestion control protocol that splits the TCP connection into two, with the consideration that the split TCP connections can decrease feedback delay and react more quickly to packet loss and thus achieve higher throughput. Rapid TCP does not traditionally reduce the congestion window quickly when the network transmission loss occurs. Rapid TCP adjusts the congestion window size on the basis of the increment of the lost packets. In this way, Rapid TCP offers a robust mechanism to improve the performance of applications in wide area networks. Dong Pingping et al. has observed Throughput, Packet, Time, Speedup Ratio and Bandwidth (2mbps) having Size of Packet is 100bytes, Round Trip Time (RTT) of the links is 100ms. The issues raised are: Efficiency (System Performance, Throughput, bandwidth) Packet loss, Route Failure, Node Failure, Congestion Overhead and Route Retransmission.

The author Narendra Sharma et al. of [10] (2014) suggested another mechanism that detection of non-congestion losses and packet reordering from network congestion loss author design a new TCP scheme called TCP NJ-Plus. Due to this scheme improve the performance of TCP by distinguishing between congestion and non-congestion losses. Congestion control is the typically disruptive parts of TCP. When TCP operates in Wireless Mobile Networks (WMNs), the throughput of TCP degrades considerably due to its failure to distinguish non-congestion losses and packet reordering from network congestion. Once the sender receives three duplicate acknowledgements cause by non-congestion loss, the TCP sender assumes that a packet has been lost due to network congestion and reduces the size of the congestion window needlessly. Narendra Sharma et al. has observed Throughput, Packet, Time, Congestion Window, Segment Size (1460 kb) and Bandwidth having 5 nodes, Size of Packet is 1024 kb, Segment of Congestion Window is 5 and Destination for Loss is 250m. The issues raised are: Mobility, Efficiency (System Performance, Throughput, bandwidth) Packet loss,

Route Failure, Node Failure, Congestion Overhead, Network Traffic and Route Retransmission.

V. CONCLUSION

The target objective of this project is to provide an enhanced Transmission Control Protocol (TCP) for Mobile Ad hoc Network (MANET). In order to understand the problem of link failure or packet loss in current scenario, few existing types of TCP protocols are critically analyzed. A new mechanism of such protocol is proposed and prepared to address issues of congestion, packet loss, link failure and node mobility. Our study of existing papers that includes pros and cons, issues and observed parameters with its values are mentioned. We aimed at controlling the congestion window in TCP by taking into consideration of the mobility pattern of nodes. Two bits of TCP header (Reserved bits) may be manipulated by the source and destination to indicate the mobility of node. Congestion window may be adjusted based on the specified two bits.

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MATHEMATICAL MODELS OF WOUND HEALING- AN IMPORTANT BENEFACTION TO MEDICAL SCIENCE

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ABSTRACT

The processes of wound healing, bone regeneration, and problems in tissue engineering have been a dynamic area for mathematical modeling from the last decay. The present model is an application to aim strategies for improved healing presented. In wound healing, the models have particularly focused on the different response in order to improve the healing of the chronic wound. The mathematical models have been applied to design optimal and new treatment strategies for normal and abnormal healing. For the field of tissue engineering, the author focuses on mathematical models that analyse the interplay between cells and their biochemical cues to ensure optimal nutrient transport and maximal tissue growth. Finally, a brief comment on numerical issues arising from simulations of these mathematical models is presented.

Key words: Tissue Engineering, Wound Healing, Numerical Methods, Mathematical Models.

INTRODUCTION:

Mathematics has a great history as a tool for biologists, plays an essential role in understanding biological systems on many different scales like size and time. Biomathematics encompasses the application of mathematical methods to the study of living organisms. Mathematical models not only explain the physiology of human beings but it is very helpful to understand the theoretical aspects. Various mathematical models have been developed by researchers time to time. It is very necessary to understand the all essential factors involved in the process to develop its mathematical model. Present study deals with mathematical model of wound healing. So it is essential to know the facts of healing process.

Skin is the largest organ of the integumentary system plays an important role to maintain the body core temperature (Tb) at 37°C. Any disturbance in the temperature regulation may cause lots of abnormality in the body. Humans are homeotherms, able to maintain an average, relatively constant body temperature of 37 ºC (±0.5 ºC), despite widely ranging environmental temperatures. This temperature varies depending on individual differences, time of day, the stage of sleep, and the ovulatory cycle in women. Thermoregulation is the balance between heat production and heat loss mechanisms that occur to maintain a constant body temperature. Exercise or fever may raise core temperature by up to three degrees, while exposure to cold may lower core temperature by a degree. Beyond these boundaries, the human is susceptible to heat stroke (elevated temperature) or hypothermia, both of which are life threatening conditions. The human autonomic thermoregulatory system consists of a set of temperature sensitive neurons, which senses change in skin and core temperature. A branch of the central nervous system receives, integrates and coordinates afferent sensory information into a thermo effectors response and a set of effectors, through which the body makes the appropriate thermoregulatory response[A. S. Milton, 1990]

Heat is transported from body core to the body surface through skin. Skin is the most important

and the largest organ of integumentary system made up of multiple layers. It is the first line of defense, which covers and guards the underlying muscles, bones, ligaments and internal organs. Skin is the interface with the environment, plays an important role in protecting against infectious agents called pathogens and excessive water loss[E. Proksch, 2008]. The SST region (skin and subcutaneous region) is structurally divided into three sub layers viz. epidermis, dermis and hypodermis or subcutaneous layer (Fig. 1).

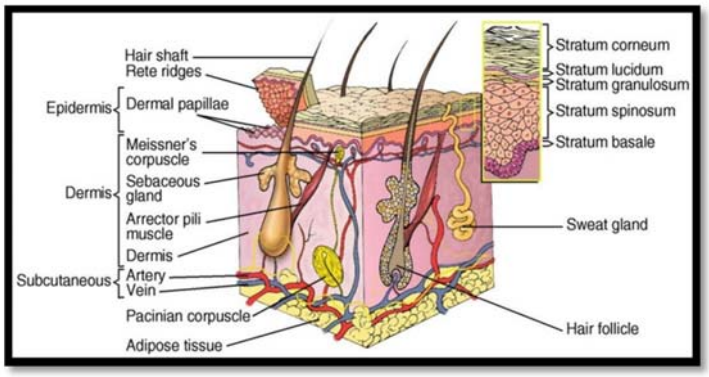


Fig. 1 : Human Skin

Any injury accidental or surgical(Fig.2-3) can be represented as a split in the epithelial integrity of the skin and punctures of the epidermis, dermis, subcutaneous tissues, fascia, muscles or even bone is known as a WOUND. Wound due to surgery is a type of injury in which skin is torn, cut or punctured. It is the blunt force trauma causing contusion and an opening made in the skin or a membrane of the body incidental to a surgical operations or procedures.

Fig. 2: Accidental wound

Fig. 3: Surgical Wound

PHYSIOLOGY OF WOUND HEALING PROCESS

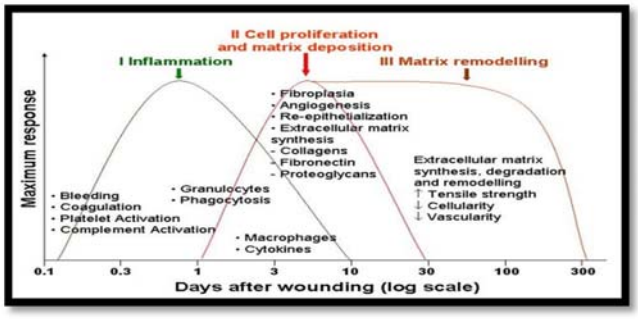


Fig.4: Wound Healing Phases

The phases of wound healing normally progress in a predictable and timely manner. Any disturbance in the phases may cause to either a chronic wound [A. Desmouliere,2005] such as a venous ulcer or pathological scarring such as a keloid scar.

Fig.5: Chronic Ulcer

Fig 6: Kaloid Scar

FACTORS AFFECTING WOUND HEALING

Various intrinsic and external factors affects the wound healing [J. Pfeiffer, 1954], In intrinsic factors role of enzymes, metabolic activities, overall physiology, diabetic conditions etc. whereas in external factors surrounding temperature, diet, stress etc. play important role. It is difficult to manage internal factors but somehow external factors can be managed.

Role of enzymes cannot be neglected in the case of abnormality like wound healing process because the miracle of life would be impossible without enzymes. Enzymes are protein chemicals, which carry a vital energy factor needed for every chemical action, and reaction that occurs in our body. The health of our organs and glands is completely dependent upon our enzyme making abilities [S. O. Brattgard,1978- S. D. Mahanty, 1980], . Proper functioning of the enzymes depend upon two major factors : pH value and temperature.

Out of many intrinsic and extrinsic factors like health, nutrition, temperature, growth factor etc. temperature are one of the most important factors in wound healing process. Like most chemical reactions, the rate of an enzyme-catalyzed reaction increases as the temperature is raised whereas many enzymes are adversely affected by high temperatures. The reaction rate increases with temperature to a maximum level, then declines as temperature increases further.

Level of body temperature has much importance in diagnosis and prognosis in every disease because any disturbance in mechanism of temperature regulatory system can cause lots of complications in natural processing of the body. Body core temperature (T_b) plays an important role and affects all biological processes in human being. The body requires a stable core temperature of 37^{o}C (+0.5 ^{o}C), to maintain cell metabolic activity. Core temperature is the balance between heat gain produced by cell metabolism and heat loss by various mechanisms, including respiration via the lungs and evaporation via the skin. Apart from the core temperature, the measurement of the surface temperature of the human body is also important; in this regard various studies have been done by many investigators. Skin temperature affects the local blood flow [R. Gannon, 2007 & Kathryn Vowden, 2002) and a small rise in temperature can increase metabolic activity and oxygen demand.

Wound healing is body's natural requirement. From wound to healing process every biological and physical activity is very important. Aftereffects of all these activities directly depend on the body core, skin and ambient temperature.

Experimental studies suggested that wounds heal most effectively at normal core temperature (37^{o}C). Wound healing is delayed when temperature falls below normal body core temperature or rise above 42^{o}C [W. McGuinness, et al., 2004]. A delayed or poorly healing wound may have decreased tensile strength or low collagen accumulation but may eventually heal to normal. Delayed wound healing, especially in the context of stress-induced immune suppression may result in increased infection, scarring, poor esthetic outcome, and poor regenerative potential.

In wound healing process, wound bed preparation is the important phase because it creates an optimal wound-healing environment. The body core, skin and ambient temperature

play important roles in preparation of wound bed. The wound bed temperature can be controlled by proper cleansing and dressing of wound time to time. Among the various objectives of wound healing management, following are very important aspects which have been ignored earlier [27].

- To examine the wound bed temperature reduction resulting from cleansing during dressing changes.
- To examine the association between the time taken to cleanse a wound and the degree of temperature loss.
- To measure the time taken for the wound temperature to return to the pre procedural temperature.

Temperature of wound bed can be controlled by proper dressing materials and appropriate temperature of cleansing solution [G. Kammerlander, 1999, WANG Cheng-chuan, 1999) During and after wound dressing following measurements are very important

- Ambient (atmospheric) temperature
- Temperature of the outside of the dressing material (before removal)
- Wound bed temperature immediately after dressing removal
- Wound bed temperature at the completion of cleansing

The role of evaporation has a great importance during the process of healing. Experimentally it is proved that as proper wound dressing is necessary to heal, proper rate of evaporation is also important. The rate of evaporation neither be more nor be less. Both the cases are not suitable for the acute wound because if the rate of evaporation after dressing change is more wound will be dry and in case of less evaporation wound will be wet all the time. Therefore maintaining a physiological moist environment in treating wound is important[G. Kammerlander, 1999, WANG Cheng-chuan, 1999).

All the above facts suggest that, temperature plays a significant role in wound healing process. Any disturbance in temperature affects the functioning of enzymes, growth factors and ultimately wound bed temperature. This disturbance may be due to the varying atmospheric temperature, rates of evaporation or cleansing solution temperature. This theoretical work has been carried out by studying thermal variations caused at different atmospheric temperatures and different rates of evaporation. This study may be very useful for clinical purposes related to wound healing.

MATHEMATICAL MODELING OF THE PROBLEM

Temperature of tissue, wound bed temperature and surrounding temperature etc. are very important factors for healing process. Wound is assumed after plastic surgery. In third degree burn plastic surgery is the only option to get the new skin.

The partial differential equation for heat and mass transfer in human body tissues given by Perl is

$$Div(K\ grad\ T) + m_b c_b (T_b - T) + S = \rho c \frac{\partial T}{\partial t} \qquad (1.1)$$

Here the effect of metabolic heat generation and blood mass flow are given by the terms S and $m_b c_b(T_b\text{-}T)$ respectively. T_b, K, ρ, c, m_b and c_b are body core temperature, thermal conductivity, density and specific heat of tissue, blood mass flow rate and specific heat of blood respectively. Right hand side of eq.(1) shows the storage of heat in tissues. The first two terms of the left hand side represents conduction of heat in the tissues, caused by the temperature gradient and third term is for heat transport between the tissues and microcirculatory blood perfusion. The last term represent heat generation due to metabolism.

The outer surface of the body is exposed to the environment and heat loss at this surface takes place due to conduction, convection, radiation and evaporation. Thus the boundary conditions at the outer surface

$$-K\frac{\partial T}{\partial n} = h(T - T_a) + LE \quad for \quad t > 0 \qquad 1.2$$

Where h heat transfer coefficient, T_a is atmospheric temperature, L and E are respectively, the latent heat and rate of evaporation and $\frac{\partial T}{\partial n}$ is the partial derivatives of T along the normal to the skin surface and for the inner surface

$$T = T_b \quad for \quad t \geq 0 \qquad 1.3$$

The outer surface of the skin assumed to be insulated at time *t=0* and hence the initial condition is given by

$$T(x,0) = T_b = 37^o C \qquad 1.4$$

The values of physiological parameters for unwounded and wounded sites are different from each other. These values are almost negligible in transplanted tissues just after the surgery and they increase gradually with respect to time, causing increase in tissue temperature of human body therefore mathematically it can be written as:

$$K(x,t) = \varsigma(t)\sum_{d=0}^{1}\alpha_d x^d,\ M(x,t) = \psi(t)\sum_{d=0}^{1}\beta_d x^d,\quad S(x,t) = \zeta(t)\sum_{d=0}^{1}\gamma_d x^d \qquad 1.5$$

Here the thickness of SST region is along x axis, therefore, changes in these parameters are the functions of x only. The values for α_d, β_d and γ_d are calculated layer wise.

For normal region **(**tissues of donor site) K, M and S depend on position only.

$$\varsigma(t) = 1,\ \psi(t) = 1 \text{ and } \zeta(t) = 1$$

SOLUTION OF THE PROBLEM :

Above mathematical equations can be solved by using finite element method, finite difference method or any other suitable numerical method by incorporating suitable values of parameters like K, M, S, at different atmospheric temperature and Rate of Evaporation.

NUMERICAL RESULTS AND DISCUSSIONS

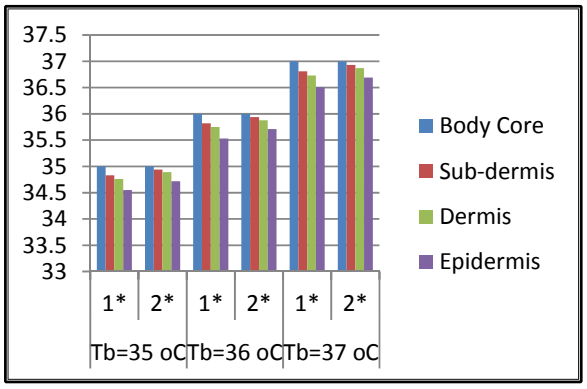
Results have been calculated at E=0, $0.24\text{x}10^{-3}$, $0.48\text{x}10^{-3}$ (gm/ cm^2min) and Surrounding temperature Ta= 0, 15, 23 and 32 (Degree Celsius). It is observed that for the same rates of evaporation the decline in tissue temperature is more at lower atmospheric temperature. This is because more temperature gradient occurs due to low atmospheric temperature. For higher rates of evaporation at the same atmospheric temperature, the fall in tissue temperature of epidermis, dermis and subcutaneous is noted more i.e. at T_a=23°C, the fall in tissue temperature is more for E=$0.48\text{x}10^{-3}$than that of E=0. It shows that the rate of evaporation significantly effects on temperature profile in the region. The results obtained in the model are agreement to the physiological facts.

For Abnormal Region (T_b=37°C)

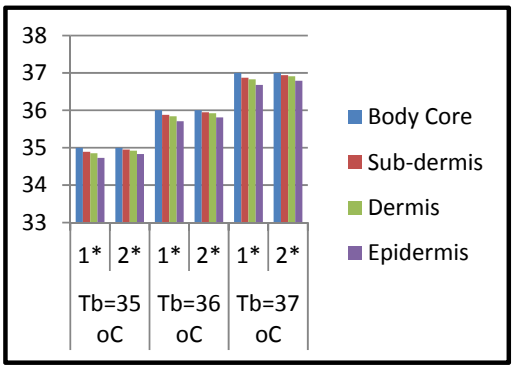
1*: Maximum fall in temperature till 20 min.

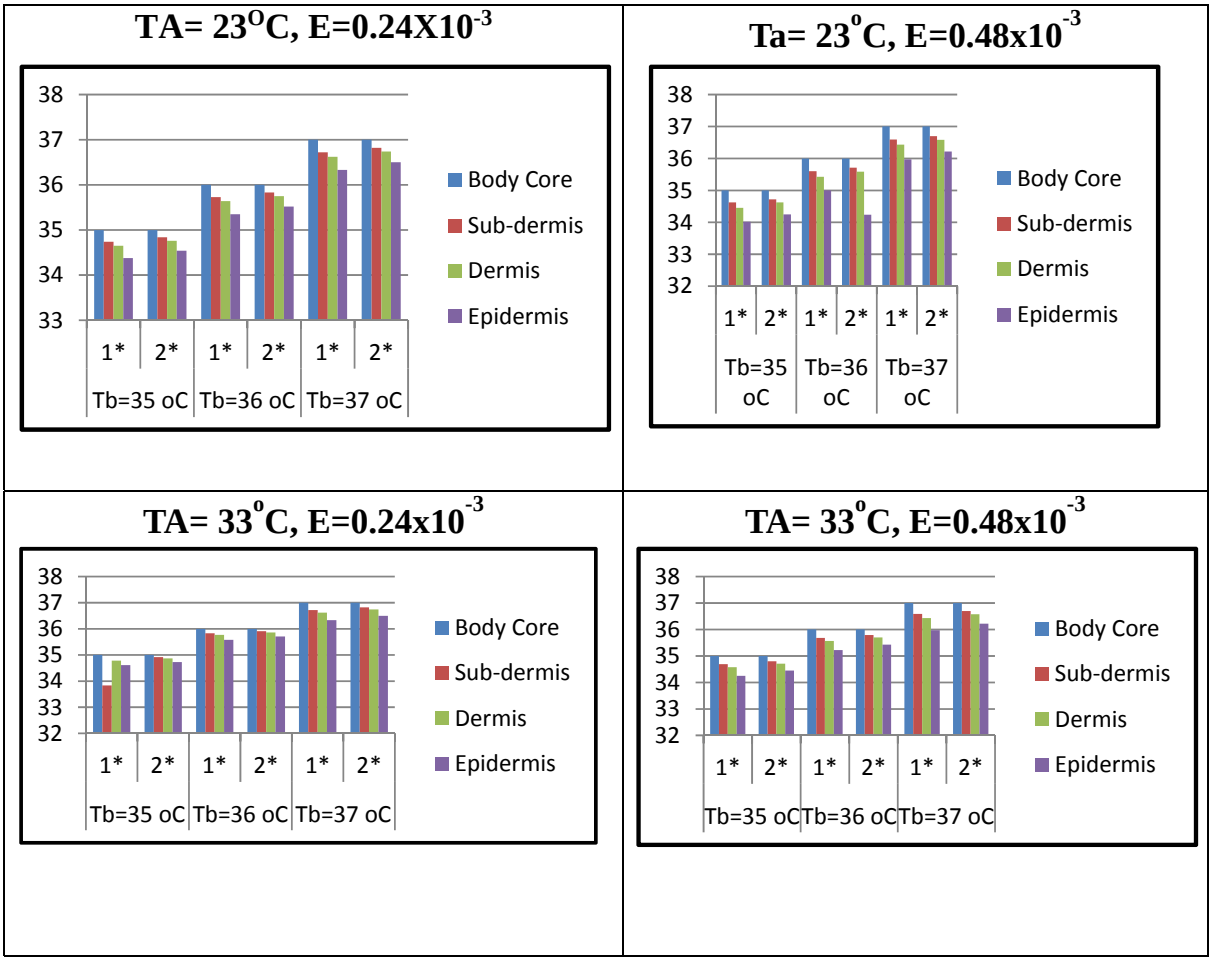
2*: Maximum rise in Temperature after 250 min.

TA= 15°C, E=0



TA= 23°C, E=0





IMPORTANCE AND FUTURE SCOPE

Mathematical modeling for thermal regulation of human body has great importance in treatment of various diseases because treatment of diseases using thermographic technique known as thermography is popular for detecting thermal asymmetry. Thermograghy needs thermal information and relation among physical and physiological parameters of patient. Temperature information of human body offers the physician an added dimension to the diagnostic picture, detecting neurological and vascular information not available on X-ray. Temperature monitoring is the test of choice for monitoring various diseases like cancer, breast health and changes associated with breast disease. Areas of chronic pain, inflammation, wound healing or disease can be evaluated thermographically to assist the physician with a diagnosis and treatment plan. Detect thermal indicators as they relate to infection, inflammation or fibrocystic disease.

Study of temperature variations during wound healing process has great importance because

- Such mathematical models can be useful to prevent adverse effects of wound.
- Models can be developed for wound healing in hypothermia and hyperthermia cases.
- Wound healing process for different atmospheric temperatures and rates of evaporation can be studied further for more realistic situations.
- Wound healing in diabetic patients is novel idea for research.
- These models can be applied to other situations of engineering and sciences.
- Such models can be further developed to study interesting relationship among various parameters of the body region and understanding the thermal changes occurring in the process.
- This study is helpful in treatment of various diseases, to develop protocols for medical

purpose and for evaluation of effectiveness of hyperthermic treatments.

- It will also help in developing more effective devices for temperature measurement. It may also help in investigations of thermoregulatory mechanisms.

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SURVEY ON COGNITIVE RADIO ROUTING PROTOCOLS

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Abstract

Today's emerging usage of ISM band introduces concept of the Cognitive Radio (CR), they are intelligent transceivers that accommodates dynamic frequency allocation (DSA). Based on challenges in cognitive radio networks there are some approaches categorized into Graph based approaches, Common control channel based and Non-common control channel based approaches are explained in this paper. Also we have explain basic concept and analysis of the each paper and limitations of the papers are described in each category. Discussion of this survey help us to study new era of the cognitive radio routing solutions.

Index Terms— Cognitive Networks, Routing, Survey.

I. INTRODUCTION

Cognitive Radio (CR) Network is a kind of wireless communication network in which nodes are equipped with an intelligent transceiver [1]. This intelligent transceiver can detect the status of all wireless communication channels in it surrounding area. These nodes can shift from one frequency to another frequency dynamically for data transmission. The CR technology is based on the concept of Dynamic Spectrum Allocation (DSA) that controls by Software Defined Radio (SDR) as applied to Spread Spectrum (SS) communications. The users in the CRNs are divided into two classes. The first class of users is called Primary User (PU) and the other class is called Secondary User (SU). The PUs are those users that operate on Licensed Frequency band and SUs are those users that operates in unlicensed Industrial Scientific and Medical (ISM) frequency band specified by Federal Communications Commission (FCC). Research on the devices that use Licensed Frequency band shows that they use its allocated bandwidth is used minimum of *15*% and maximum of 85% [2]. On the other hand, the devices operate is ISM band faced a crisis of bandwidth as there are large number of users in such network.

A) An Overview of CRN

The main goal of the CRNs is to optimize the use of available radio-frequency (RF) spectrum while minimizing interference to other users. It ensures efficient utilization of unused licensed frequency band. In order to achieve this, the available licensed band of PUs is used opportunistically by SUs. To have such opportunistic use of bandwidth, both the PUs and SUs must collocate. The SUs in the CRNs must have the capability of determining its geographic location, identify and authorize its nearby users, encrypt or decrypt signals, sense neighboring wireless devices in operation, and adjust output power and modulation characteristics.

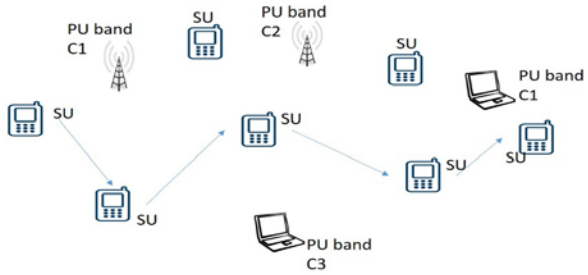

Fig. 1 Typical CR Network [3]

Rest of the paper is organized as follows. Section II describes the parameters for CRN routing evaluation. CRN routing solutions are explained in Section III. The paper is concluded in Section IV.

B) Routing Solution Approaches

In this paper we are categorize cognitive routing solution into five subsection (1) Graph based approaches (2) Common Control Channel based approaches and (3) Non Common Control Channel based approaches. This approaches are categorize as claimed by routing challenges described in the next section.

C) Routing Challenges in CRN

There are three types of network architectures found in the CRNs: Infrastructure, Ad-hoc and Mesh architectures. For our discussion a mesh architecture is considered which is actually a combination of Infrastructure and Ad-Hoc architectures [4]. The architecture enables communication between BSs (or APs) as it is done in Hybrid Wireless Mesh Networks [5] with a formation of wireless backbones by BSs. The mobile stations can access the BSs either directly or through other mobile stations in multi-hop mode of communication. Some BSs are also connected to the wired backbone and they act as gateways. However, the CR nodes access the network in the spectrum hole opportunistically.

The main challenges of routing in CRNs with an architecture described above are listed below:

The *spectrum-awareness* is one of the main challenges in designing routing protocols for CRN. Since CRN devices are allowed to access the network only in the spectrum hole, so the routing algorithm must take into account the availability of spectrums during packet transmission. There must be coordination between the routing module and the spectrum management module of a CR device. Moreover, the routing module must take care of the upcoming PU activities during their transmission.

Selection of quality route is another major challenge in CRN routing. This is due to dynamic behavior of PUs in cognitive environment. There is no specific pattern of appearance and disappearance of PUs in such environment. Since, the CUs must leave the channel as soon as some PU appears so the SUs must try to use the available spectrum in an optimized way to ensure nominal bandwidth, high throughput and minimized delay.

The *route maintenance* imposes difficulties in designing routing algorithms for CRNs. The PUs may become visible at any occurrence of time thereby forcing the SU to vacate the occupied channel. Releasing the channel causes an unpredictable broken path in the ongoing conversation between CRs. So, a new path must be discovered despite of staying in the same location of a CU. Furthermore, the path discovery process must impose minimal effect on the perceived quality of services to the end users.

II. PARAMETERS FOR CRN ROUTING EVALUATION

In this paper we have consider many parameters that effecting the cognitive routing solutions like end-to-end delay means we have to minimize the delay from source to destination, throughput means from source to destination maximum throughput we have to consider, No. of Primary and Secondary users, required bandwidth, Hop count means number of intermediate nodes we also have to consider, Interference range, latency means time varies between source to destination, Channel switching means consider minimize switching delay, Link quality and link stability according to route failure and route reparation etc.

III. CRN ROUTING SOLUTIONS

1) Graph Based Approaches

Route design in classical wired/wireless networks has been tackled widely resorting to graph-theoretic tools. Graph theory provides effective methodologies to design routing in wired as well as wireless networks. It also helps to theoretically examine the feasibility and flaws of a routing algorithm in a multi-hop network topology. The graph based approach for designing routes multi-hop networks goes

through two phases: the graph abstraction and the route calculation. In the graph abstraction phase the physical network topology is converted in to a logical graph. This phase generates a graph structure *G* represented as *G = (N, V, f(V))*, where *N* is the number of nodes (also called vertices) in the graph, *V* is the number of edges, and *f(V)* is the function that assigns a weight to each edge of the graph. The second phase of the approach i.e. the route calculation phase represents a path in the graph between any source and destination pairs. In CRNs there are few protocols proposed which are based on graph theoretic approach. Some of such proposals are discussed in this section.

A. Routing through layered-graphs

The very same two-phase approach to route design has been leveraged also for multi-hop CRNs. The work reported by C. Xin et al. in [6, 7] describes a framework to address channel assignment and routing. They have done a comprehensive analysis using two phased graph theoretic approach in a semi-static multi-hop CRNs.

Basic concept: The authors considered a CR environment where, the PU dynamics are low enough. In such environment the channel assignment and the routing among SUs can be designed statically. They also assume that the secondary or the cognitive devices are equipped with a single half-duplex cognitive radio transceiver. These SUs can be tuned to multiple (say M) available spectrum bands (or channels). One layer of graph among the SUs is formed by each of the available channel.

Analysis: The proposed framework given in [6] is a general one and different routing metrics as applicable can be applied to analyze any network topology. In [7], the authors considered a specific case in order to execute the framework given in [6]. In this paper, the horizontal links are assigned weightage form the traffic load and interference level on those channels. A centralized heuristic algorithm for finding shortest path between SU nodes are also proposed in [7]. However, these protocols [6, 7] have several limitations. Firstly, they follow iterative method of finding shortest path. Only one pair of source and destination is explored at a time. After completion of one path, a new layered graph is constructed from the previously constructed layered graph. The new layered graph is constructed by eliminating all unused incoming horizontal or vertical edges in the previous graph. The weights assigned to edges are also recalculated. The entire process involves considerable computational complexities for route finding. Secondly, the algorithm works only for semi static CRNs, where the topology changes very slowly. In highly dynamic environment its applicability is not discussed in [6] and [7]. Thirdly, the algorithm is centralized and hence need network wide signaling support to generate the layered-graph. This signaling process consumes large amount of channel bandwidth for large network size. Moreover, the iterative algorithm proposed in the paper cannot produce optimal solution as it is based on a greedy approach. Finally, iterative path computation over graph abstractions may not scale well for a network of large size.

B. Routing through colored-graphs

A similar graph theoretic approach is also proposed in [8] by X. Zhou et al. They have used colored multigraph to design the topology of available spectrum for cognitive devices. The authors have emphasized on maximizing the network capacity and minimize interference among neighboring nodes.

Basic concept: The colored graph denoted by *Gc = (N,V,W),* where N is the set of vertices that represents CU, and V denotes the set of edges that connects two SUs with available channels. *W* denotes the weights assigned to an edge. There may be M number of edges connecting two vertices where *M* is the number of available channels between the two nodes. Each channel is represented by an edge with different color. In the paper authors assumes the value of *W*=1 for all edges in the initialization phase of the process. The two nodes in the topology may communicate with each other directly if they have common available channels. Two nodes with a common channel are termed as potential neighbors. There exists an edge with color *k* between two nodes if and only if they are potential neighbors and have channel Ch_k as available channel in common. One example

discussed in [8] is reproduced here for better understanding of the graph coloring method.

Analysis: The algorithm suggests that it ensures optimization in terms of hop count and adjacent hop interface. However, the optimization of Adjacent Hop Interface (AHI) measured in terms of largest number of continuous adjacent edges with same color is not accurate. This approach has the same drawbacks as in [6] stated above. The proposed solution approach is centralized and heuristic which leads to suboptimal routing solution.

C. Routing through conflict Graph

The work stated in [9] is a routing and spectrum selection through conflict-graphs. They have modeled routing and spectrum assignment as different activity in a single transceiver half duplex cognitive radios network. They have shown all available routes between source and destination pairs for a given network topology. They also suggest the assignment patterns of available channels using a conflict graph. Considering each wireless link as a vertex in the conflict graph, the paper suggests a combination of routing and channel assignment. An edge stay alive between two vertices if the corresponding link cannot be active concurrently.

Basic concept: The proposed algorithm for route construction and channel assignment is centralized in nature. The algorithm derives a conflict-free channel for nodes by calculating the maximum independent set in the conflict graph. The down side of the algorithms is its supposition of having apriori knowledge concerning available spectrum bands, neighboring nodes, etc. Centralized computation on the other hand imposes another limitation of the accuracy and overhead for information by centralized unit. Moreover, the problem of defining the most efficient conflict-free scheduling can be reduced to a problem of calculating the maximum independent set on a properly defined ‘‘conflict graph”, which is known to be NP-Hard [3].

Analysis: The paper only focuses on interference avoiding in theory, which is not practical for high computing complexity in practice [14 Personal Communication].

2) Common Control Channel Based routing

A. Spectrum aware routing

A distributed routing protocol for CRN mesh network that addresses hidden and exposed primary nodes. Each SU prepares a list of available channel in advance. Channel list is sorted in ascending order according to the channel usage ratio by PU. As claimed by authors, route failure probability is less as an SU selects alternate channel if PU appears suddenly. Delay is used as a metrics for route computation instead of hop count. Capacity of a channel is computed considering noise into account. **Common Control Channel.**

Proposal made in this paper [10] is an implementation of AODV protocol for CRN. However, the paper suggest to uses a low rate channel in the frequency range of 902 MHz for energy efficient CCC for managerial packet transmission among SU devices. The paper claims that 2.4 Ghz frequency band if used for CCC produces interferences with other devices that uses this frequency and affective only for short distance communication. Further, 2.4GHz band for CC consumes higher energy and hence not suitable for energy sensitive environment. They have provided algorithm for selecting CC and then the selected CCC is used for routing following AODV protocol. The AODV routing through disseminating route control messages (channel path selection) and CR co-operation exchanges in 902 MHz CCC which lessen aggregate network transmit power by reduced end-to-end channel-hop count. In the paper four things are addressed. It ensures energy efficient channel-route selection by reducing the hop count through long range control broadcast, it minimizes aggregate transmit power consumed by all CR nodes on the path, reduces end-to-end data transmission delay, efficient channel-route back-up to protect against spectrum mobility which save node transmit power with respect to retransmissions. Experimental results show that the performance of the proposed AODV protocol outperforms compared with existing CCC based CRAODV routing protocols. □□

The protocols measures the energy required to transmit a packet according to Friis model which assumes transmission as a free space. However, in reality the transmission environment is full of obstacles and hence other models like two ray ground propagation is of more realistic. But the paper does not give any proper justification to the working of their proposal in presence of obstacles. Although the paper claims that the hidden station problem could not affect the transmission due to long range transmission of low frequency CCC, no concrete proof is found in the work. Moreover, hidden station problem could be avoided only during control packet transmission but not during data transmission unless a special care is taken as explained in [10].

B. Spectrum Aware On-demand routing in CRN

There is one more protocol found proposed in [11] by Geng Chang and his associates. This protocol suggests routing mechanism for CRN which is based on how to dynamically switch the frequency band for either per flow throughput assurance or global spectrum utilization. In this paper, they propose approach to reactively route computing and frequency band selection. They focus on the scenario of multi-hop CRN, and assume that each node has a traditional wireless interface in addition to the spectrum agile transceiver to form a **Common Control Channel (CCC),** such that protocol messages received by nodes despite of inconsistency of Spectrum Opportunity (SOP). They further assume that nodes are able to provide routing protocol with their spectrum sensing information through cross layer designs, thus SOP information is shared between MAC and network layer.

Basics Concept: To smooth away the inconsistency of SOP, they modified AODV to form a implementation on the control channel for interchanging SOP detail among network nodes. The protocol should also recognize traversing flows at each node and calculate the frequency bands taken. The active flow information will be used for multi-flow multi-frequency scheduling.

Spectrum switching introduces switching delay while transmission on the same frequency band brings backoff delay, thus when facing multiple flows' relay demands, a node has to follow switching order to assure all the traversing flows while reducing the two delays. They propose a scheduling scheme that polling by the active frequency bands, the spectrum agile transceiver tunes to a particular frequency band once in a polling rotation, processing every correlated flows. Although the inconsistency of SOP can be solved by the proposed on-demand routing and the impact of other existing flows are mitigated by multi-flow multi-frequency scheduling, there is still delays of along the path left unknown. They apply interaction between on-demand routing and scheduling, let scheduling module adaptively select appropriate frequency band, and the selection result be piggybacked by the routing module. On the other hand, routing module provides SOP information, based on which the scheduling could establish queueing system for the traversing flows. In such a way, the delay of nodes amid the path are gathered and reused as feedback to compute the path-long delay.

Analysis: It also evaluates the side effects of existing flows to the route. Adding switching delay and backoff delay. They also derive cumulative delay based on path delay and node delay. It also evaluates the side effects of existing flows to the path. Adding switching delay and backoff delay. They also derive cumulative delay based on path delay and node delay. In this case only switching and backoff delay are taken into account while queuing delay is not considered.

C. Joint On-demand routing and spectrum Assignment in CRN

There is one protocol found proposed in [12], Geng Cheng and his associates propose a joint interaction between on-demand routing and spectrum scheduling. A node analytical model is suggested to narrate the scheduling-based channel assignment progress, which ease the inter-flow interference and frequent switching delay. They also use an on-demand interaction to obtain a cumulative delay based routing protocol.

Basic Concept: They present the Node Analytical Model (NAM) in CRN node, and suggest that nodes communicate under reactive routing protocol for SOP details dissemination.

The NAM adaptively choose legitimate frequency bands, and the result is piggybacked through the routing messages. Another point of view, routing messages contribute SOP detail, based on which the NAM could set up queueing system for the traversing flows. The delay of nodes amid the path are collected and reused as feedback to compute the path-long delay.

Analysis: The proposed On-demand Routing cooperates with node's Spectrum Assignment Module and execute Path Cumulative delay based choose frequency band. Which alleviates the impact of traversing flows on the path, it accounts backoff delay and switching delay, and choose appropriate frequency bands with minimum route wise cumulative delay. They assume that each node is equipped with a traditional wireless interface in addition to the Cognitive Radio transceiver. Also that every node is able to Provide the routing module with its SOP information. This can be carried out by addressing cross-layer design, sharing spectrum sensing result between network layer and MAC layer.

D. Minimum Weight Routing based on a Common Link Control Radio

There is one protocol found proposed in [13], Pyo and Hasegawa is to discover minimum weight paths in cognitive wireless ad hoc networks. For helping neighbor discovery and routing in the cognitive wireless ad hoc networks, they introduce a common link control radio (CLCR) so it is a standard active wireless system of cognitive terminals. Additionally they propose a novel cognitive ad hoc routing protocol based on a common link control radio (CLCR) said to be a minimum weight routing protocol. They show that the proposed routing protocol can greatly reduce communication overhead in cognitive wireless ad hoc networks.

Basic Concept: The operating system is responsible for selecting the wireless communication interface to be used at a given time. Different interfaces are used to access various Wireless Systems (WS) such as cellular (e.g., CDMA, TDMA and FDMA) or WLAN (i.e., IEEE 802.11 b/g). Each of the interfaces is associated with a different communication range, as well. The use of a **Common Control Channel (CCC)** plays a central role in the work. A dedicated interface, referred to as Common Link Control Radio (CLCR) is used for communication between CR terminals to sustain cognitive radio network related functions. The two main functions using CLCR interface are the neighbor discovery and path discovery and establishment. To discover a large neighborhood, CLCR uses a high transmission power to reach out all the potential neighbors. Nodes share with each other their connectivity over different radio interfaces when they exchange messages through the CLCR. The signaling to establish paths between two end points also happens over the CLCR. The weight of a link is defined as a function of the transmission power of the different WSs an SU may use to communicate with a neighbor node.

Analysis: The proposed routing protocol locally finds the path to minimize the routing weight between a source and a destination. The route discovery procedure is very similar to link state routing algorithms where this newly introduced weight is used. The model does not take into account the primary users, their behavior, or the interference caused by/to other CR nodes. However, such information is implicitly incorporated into routing decisions during neighbor discovery stage. The performance of the proposed system is highly dependent on the neighbor discovery procedure and its refresh rates as there are no other maintenance or recovery procedures defined in the routing protocol to react to PU activity. Furthermore, the power-level based cost metric is not sufficient to address challenges of multi-hop cognitive radio networks.

E. Optimal Spectrum Sharing for Multi-hop SDR Networks

This is one protocol proposed in [14], Hou et al. focus on the problem of designing efficient spectrum sharing techniques for multi-hop CRNs. give a formal mathematical formulation with the objective of minimizing the required network-wide radio spectrum resource for a set of user sessions. Since such problem formulation falls into mixed integer non-linear programming (MINLP), which is NP-hard in general, they develop a lower bound for the objective by

relaxing the integer variables and linearization. Subsequently, they develop a near optimal algorithm to this MINLP problem. This algorithm is based on a novel sequential fixing procedure, where the integer variables are determined iteratively via a sequence of linear programming. They use **Common Control Channel (CCC)** for all the nodes in the network to exchange local state information.

Basic Concept: They introduce a Mixed Integer Non-Linear Programming (MINLP) formulation whose objective is to maximize the spectrum reuse factor throughout the network, or equivalently, to minimize the overall bandwidth usage throughout the network. The proposed formulation captures all major aspects of multi-hop wireless networking, i.e., link capacity, interference, and routing. The authors start off by solving a linear relaxation of the MINLP formulation. Namely, the binary variables which bind each user to transmit over a given sub-band are relaxed to linear values. The resulting formulation is linear (Linear programming, LP), thus it can be easily and effectively solved in polynomial time. The result obtained solving the LP relaxed version of the original problem provides a lower bound on the overall bandwidth usage throughout the network. To complete the characterization of the MINLP solution, the authors further propose a centralized heuristic based on the concept of ‘‘sequential fixing”.

Analysis: The proposed framework is effective in capturing many aspects of networking over multi-hop networks and that the proposed solutions approaches are proved to provide nearly optimal solutions to the joint scheduling/routing problem for multi-hop CRNs. On the down side the proposed scheduling/routing algorithm has to run at a central entity which has perfect knowledge of the network topology (presence, position and traffic pattern of the primary users, presence and position of the secondary users). Moreover, traffic splitting is allowed throughout the secondary network. As expressed above, the assumption of having split traffic between secondary users may be unfeasible in practical secondary networks. Finally, the interference is modeled through the concept of interference range, which automatically excludes effects related to interference accumulation from multiple transmitters far away and the definition of link capacity is based on the assumption that the surrounding interference is Gaussian.

3) Non Common Control Channel Based Routing

A. SEARCH: A location based Routing

K. R. Chowdhury et. al proposes another routing protocol called SERACH in their work described in [15]. This protocol is based on the geographic routing paradigm. SEARCH is a completely distributed routing solution that accounts for PU activity, mobility of the CR users and jointly explores the path and channel choices towards minimizing the path latency. It reflects on the true channel delay by conducting the route exploration in the actual channels used for data transfer. **(Do not rely on CCC)**

Basic Concept: In the discussion the authors assume that the source and all forwarding nodes know the GPS position of the destination.

Analysis: However, the proposed protocol does not take the stochastic activity of PUs into account for the formation of route. So, in some times the algorithm select unstable routes from source to destination. In addition, route selection is performed at the destination, which introduces initial delay at route establishment.

B. SAMER:

There is one protocol found proposed in [16], I. Pefkianakis and his associates propose SAMER, a routing solution for cognitive radio mesh networks. SAMER opportunistically routes traffic across paths with higher spectrum availability and quality via a new routing metric. It balances between long-term route stability and short-term opportunistic performance. SAMER builds a runtime forwarding mesh that is updated periodically and offers a set of candidate routes to the destination.

A new routing solution for CRN that addresses both above issues. The design of SAMER seeks to utilize available spectrum blocks by routing data traffic over paths with higher spectrum availability. In SAMER, routes with highest spectrum availability are selected as candidates. Therefore, SAMER computes its

long-term routing metric based on spectrum availability and is more or less a "least-used spectrum first" routing protocol. Moreover, it tries to balance between long-term route stability and short-term route performance via building a runtime forwarding route mesh. Once a route mesh that offers a few candidate routes is computed, the runtime forwarding path is determined by instantaneous spectrum availability at a local node. This can lead to short term opportunistic performance gain. It does **not relay on CCC.**

Basic Concept: SAMER takes a two-tier routing approach and balances between long-term optimality (in terms of hop count) and shortest opportunistic gain (in terms of higher spectrum availability). SAMER has main two components:

1) Dynamic Candidate Mesh: Every node in the network computes a cost to the destination D (for each destination each node computes a different cost). This cost reflects the spectrum availability of the highest spectrum path whose length is less than H hops. Also every node builds a set of candidate forwarding nodes to D, by including all its neighboring nodes whose cost to D is less than a threshold C. So the mesh is built around the shortest in hop count path and is dynamically adapted to spectrum changes.

2) Opportunistic Forwarding: SAMER opportunistically forwards packets across the links with the highest spectrum availability. Upon a reception of a packet a forwarding node chooses from the links included in the candidate set, the one with the highest spectrum availability. For computing spectrum availability they use PSA metric.

Analysis: The routing metric of SAMER explicitly considers both route quality based and high spectrum availability. The ultimate goal is to provide optimal spectrum aware routing in the long term. Though SAMER avoids highly congested and unavailable links. However overhead associated with mesh establishment and maintenance have not been considered in depth. Details of channel access, deafness due to the separation of signaling and communication channel, and contention resolution among SUs have not been discussed.

C. SPEAR: SPEctrum Aware Routing

There is one protocol found proposed in [17], Ashwin Sampath and his associates proposed SPEctrum-Aware Routing Protocol (SPEAR), a robust and efficient distributed channel assignment and routing protocol for dynamic spectrum networks based on two principles: integrated spectrum and route discovery for robust multi-hop path formation, and distributed path reservations to minimize inter- and intra-flow interference. Through simulations and testbed measurements, They show that SPEAR establishes robust paths in diverse spectrum conditions and provides near-optimal throughput and end-to-end packet delivery latency. SPEAR performs extremely fast flow setup and teardowns, and can maintain interference-free flows in the presence of variance in channel availability. It does **not relay on CCC**

Basic Concept: They propose SPEctrum-Aware Routing (SPEAR), a new routing protocol for high-throughput multi-hop routing in dynamic spectrum systems. The unique properties of SPEAR include:

- Integrate spectrum discovery with route discovery to cope with spectrum heterogeneity, and obtain optimal usage of available channels.
- Coordinate channel usage explicitly across nodes to optimize channel assignment on a per-flow basis, and to minimize inter-flow interference and interference.
- Exploit local spectrum heterogeneity and assign different channels to links on the same flow to minimize intra-flow interference.

Analysis: SPEAR combines two simple yet powerful features: integration of spectrum and route discovery to establish communications across areas of varying spectrum availability, and distributed path reservation to minimize inter and intra-flow interference. Extensive simulations confirm the efficiency of SPEAR and demonstrate its capability to provide high-throughput, robust multi-hop communications. SPEAR is ideal for communications under unknown and dynamic spectrum conditions, i.e. disaster recovery or military operations. Though SPEAR assumes

each device has one dedicated control radio and one data radio and they assume a traffic model consisting of unidirectional UDP traffic.

G. Probabilistic Path selection in Opportunistic Cognitive Radio Networks

There is one protocol found proposed in [18], H. Khalife and his associates present a novel routing approach for multichannel cognitive radio networks (CRNs). Their approach is based on probabilistically estimating the available capacity of every channel over every CR-to-CR link, while taking into account primary radio (PR). Their routing design consists of two main phases. In the first phase, the source node attempts to compute the most probable path (MPP) to the destination (including the channel assignment along that path) whose bandwidth has the highest probability of satisfying a required demand D. In the second phase, they verify whether the capacity of the MPP is indeed sufficient to meet the demand at confidence level δ. If that is not the case, they judiciously add channels to the links of the MPP such that the augmented MPP satisfies the demand D at the confidence level δ.

Basic Concept: A probability-based routing metric is introduced; the metric definition relies on the probability distribution of the PU-to-SU interference at a given SU over a given channel. This distribution accounts for the activity of PUs and their random deployment. This routing metric is used to determine the most probable path to satisfy a given bandwidth demand D in a scenario with N nodes that operate on a maximum of M orthogonal frequency bands of respective bandwidths $W_1, \ldots, W_M$ (in Hz). A source-based routing protocol is proposed for the path selection. The source is able to compute the most probable path to the destination. A subsequence phase is dedicated to compute the available capacity over every link in the selected path and augmenting this capacity till the total capacity available on the path is greater than the demand D.

Analysis: However, the fully opportunistic approach makes sense if PUs are highly active, then the availability of SOPs to sustain a full communication session in a single SOP becomes impossible. A possible solution for SUs is to transmit over any available spectrum band during the short SOPs in a fully opportunistic way. In this case every packet of a given flow can be sent on a different channel by exploiting the intrinsic intermittent CRN channels availability. The selection of a channel to be opportunistically used can be made by tracing back the history of the channel itself, as sensed by a given node. It is to be noticed that, oppositely with respect to probabilistic approaches. Here a node first looks at the available channels and then selects on the basis of a history. On the contrary probabilistic approaches select a path composed by a set of channels on the basis of the history.

IV. Conclusion

From this paper, we have presented analytical comparisons of the existing cognitive radio routing protocols and categorized according its challenges and issues. We have also discussed advantages and limitations of the routing protocols. For the future research work this paper might be useful in current field of cognitive radio networks and also motivate them toward further design of cognitive radio networks.

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SURVEY ON MOBILITY MANAGEMENT PROTOCOLS FOR IPv6 BASED NETWORK

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Abstract

Many mobility management protocols for IPv6 have been proposed and successfully implemented so far. In this paper, a brief survey of existing protocols for both hosed-based and network-based mobility management. The discussion of this paper includes few protocol like Mobile IPv6, Hierarchical mobile IPv6, Fast handover in MIPv6, Proxy mobile IPv6 and Fast handover for Proxy mobile IPv6. We have also include few challenges of hosed-based mobility management and define some main parameter for mobility management protocol evaluation. This discussion will help to give new work in that area.

Index Terms—Mobility Management, Mobile IPv6, Proxy mobile IPv6.

I. INTRODUCTION

With the exponential growth of the Internet as well as the increasing demand for mobile services, mobile users require the ability to access their personal files or the Web through their laptop or PDA at any time and in any location. For communication, all mobile devices must be configured with an IP address in accordance with the IP protocol and its addressing scheme. The problem occurs when a user roams away from its home network and is no longer reachable using normal IP routing [5]. The traffic demand of mobile subscribers now is not only for voice and SMS service but also for high-speed internet access service. Most of the mobile node today are equipped with multiple interface using different access technology such as Wi-Fi, WiMAX, and LTE. Therefore the most challenging issue for all the networks is IP mobility management. Mobility management protocols provide facilitate uninterrupted communication to mobile nodes without changing their IP address. Mobile IP or MIP is most useful mobility management protocol for IPv4 based networks standardized through Internet Engineering Task Force (IETF) that assists communication on the move. The mobility management mechanism in IP protocol allows location-independent routing and successful scalable mechanism for roaming users on the Internet. The features of Mobile IP let mobile nodes to change their point-of-attachment without changing their Permanent home IP address [9].

A. An overview of IP based network

Submit The Internet Protocol (IP) is the superior internetworking protocol in operation today. The logical possibility for a networking protocol for wireless data networks is IP for several reasons. First, through using an IP-based network, applications written for wired data networks can work on wireless networks. Second, to settle cost, integrated wireless and wireline networks can be built and control. Third, advances on IP technology, such as IP telephony and Quality of Service (QoS), might be directly sued to the wireless networks. This will enable wireless networks based on IP to provide voice service as well as data services, hence suing them to tap into the huge subscriber base of cellular voice customers. All mobility-related functionality must be handled at the IP (network) layer. In the access network, we utilize the internet standard, Mobile IP, as the inter-domain protocol for supporting macro-mobility.

B. Mobility Management in IP based network

Mobility management is a major research issue for future IP wireless network. In general, mobility management protocols can be managed at different OSI layers. The IP mobility protocol manages mobility management at the network layer and produce network level transparency, therefor the upper layers do not have to be disturbed, about MN mobility or the consequences of the IP address change. In addition, different IP mobility protocols have been defined as global or local mobility management that are knowing to handle the MN's mobility within the same domain or across network domains, respectively. Moreover, the IP mobility protocol can be classified into two main categories; host-based and network-based. In the host-based grouping, the MN must participate in the mobility related signaling. Whereas, in the network-based, the network entities are the only entities that are complex in the mobility related signaling. We will describe them in this paper.

C. Challenges and Issue

As Major challenges of MIPv4 are triangular routing problem, long communication route delays, extra packet end to end delivery delay and mobility signaling delay [9]. To solve many issues in MIPv4 we extend by the MIPv6. Major challenges of MIPv6 are high handover latency, high packet loss and signaling overheads. FMIPv6 was proposed to reduce handover and decrease service disruption during handover related to the MIPv6. MIPv6 is not desirable in a local domain communication due to increased signaling overhead and high handover latency. HMIPv6 handle the mobile IP registration locally using a hierarchy of MAP, alternative of the global mobile IP communication handling in the MIPv6 domain. Therefore HMIPv6 is better for local domain communication, which will decrease overall handover latency and signaling overheads on the network. Such that all the host based mobility management protocol needs an IP stack modification of MN and change its IP address in order to assist MN mobility within or across network. Consequently, it incense the MN complexity and waste air resources and some drawbacks still remain in the host based mobility protocols such as long handover latency, high packet loss and signaling overhead. Another issues in IPv6 is location management. Therefore, issues is the location registration procedure, such as the security issues due to the MN's authentication process and delay restriction associated with static and dynamic updates in the location registration. The other issues is data packet delivery procedure, such as querying delay because the type of database architecture used-centralized or decentralized as well as the delay constraint and paging delay cost [9]. To solve all this problem network based mobility management.

II. PARAMETER FOR MOBILITY MANAGEMENT PROTOCOL EVALUATION

A. Signaling Cost

For all IP network based mobility protocol, the home network needs to maintain a database, wherein MN can change its location. To inform the home network about its new location, mobile nodes use some managerial packets. These messages are called binding related packets. Signaling overhead is the cost of exchanging these managerial packets over the network to complete the location update process of mobile node with the home network. It can be measured as the product of size of the binding related packets and distance traversed by them. So, producing less signaling overhead is another desirable property of the mobility management solutions [10].

B. Handover Latency

In a network, latency also called delay is a declaration of how much time a packet takes to get from one designated point to the other. In a wireless network where mobile nodes change their location over time, the term handoff latency is defined. It is measured as the difference in time between the reception of the last packet in the old service area and the first packet in the new service area in a current session during handover. Handover period MN cannot receive or send any data packet due to the link failure. All the mobility management protocol suffer for minimizing the handover latency [10].

C. Tunneling Cost

If the MN move away from its home network a special agent that is located in the home network not only keeps track of mobile nodes location but also take care of these packets. Basically, a

mechanism called tunneling is adopted by the agent to deliver the packet to actual location of the mobile node. In tunneling, the sender encapsulates the packet within another IP packet and sends it to the new location of the mobile node. In the receiver end the packet is DE capsulated from the tunneled packet and delivered to the actual recipient. So, tunneling cost is also referred as encapsulation and DE capsulation cost. It is measured in terms of bytes added to encapsulate the packet to the destination or the time required to encapsulate and DE capsulate the packets [10].

III. HOST-BASED MOBILITY PROTOCOL

Host-based mobility is category to solve the IP mobility challenge. Host-based mobility management protocol need to update IP stack modification and change IP address in order to support within or across the network. Mobile IPv6 (MIPv6), fast handover for IPv6 (FMIPv6), hierarchical mobile IPv6 (HMIPv6), and fast handover for hierarchical mobile IPv6 (F-HMIPv6) are typical host-based mobility protocols. In this section, these protocols are discussed.

A. Mobile IPV4

Mobile IP was proposed by the IETF, which generally focuses on MN mobility supports during its roaming across domains and redirects MN's packets to its ongoing domain location using typical Mobile IPv4 (MIPv4) protocol. MIPv4 allocate an MN with two different types of address: The Home Address (HoA) and the Care-of-Address (CoA). MN's home address, which is standing with its home network. Whereas, CoA address reflects the MN's address for the visited network the CoA of which changes as the MN go from one visited network to another. The MIPv4 protocol introduces new entities, which are Home Agent (HA), Foreign Agent (FA) and MN. MIPv4 supports mobility management using the following operation steps: Agent discovery, Registration and Data transfer. MN go away from its home network to a visited network, which is covered by FA (e.g., MN2), the MN start the Agent Discovery phase, which detects its movement in the new network utilize Agent Solicitation/Agent Advertisement messages towards FA. Then, the Registration phase takes place when the MN discovers its place in a foreign network and obtains a new CoA. In the last phase (i.e., Data transfer), all MN packets transfer from the MN's CN towards MN are intercepted by the MN's HA. When the HA receives any packets destined for a specific MN it will encapsulate these packets and tunnels them to the MN's CoA through the serving FA using tunnel close at the FA, which will DE capsulate these packets and forward them to the MN.

The MIPv4 support for MN's mobility, there are several limitation, such as a triangular routing problem that arises when the data packets sent from the MN's CN to the MN are routed in the HA and tunneled to the FA in order to reach the MN. This results in long communication route delays and puts a not needed burden on the networks and routers. Moreover, MIPv4 mobility routing incurs extra packet end-to-end delivery delay. Moreover, MIPv4 mobility routing incurs extra packet end-to-end delivery delay [9].

B. Mobile IPV6

MIPv6 is a standard for IPv6 global mobility support and solves many issues in MIPv4. MIPv6 allows a MN go within the Internet domain without losing current data connection directly with its CN, while in MIPv4 the CN transfer a data packet to the MN through the Home Address (HA) and FA by a longer route. To maintain ongoing connections while moving, the HA which is defined in MIPv6 uses a redirection function to deliver packets to the temporary location of MN. The HA redirects the packets destined to any mobile node which is away from its home network and acquired a temporary address in its visiting network. Mobile node always updates its location information with the home agent in order to receive packets from the HA in its current temporary location [11].

The MN is physically detect on the home link or not, packets are forwarded to the home link. If the MN is not at its home link, it's HA is responsible for tunneling packets to the MN's Care-of-address (CoA) (i.e., its real location). Since correspondent nodes try to connect to the MN's home address, hence sockets use the home address to record such connections. Therefore, it is necessary that applications see only the home address for the MN. Therefore, the IP layer is

liable of for presenting the home address to applications running on the MN as a source address regardless of the MN's actual location. The IP layer hides the mobility from upper layers to maintain ongoing connections while the MN changes its address. Mobile IPv6 is only invoked when the MN is located on a FN. When an MN moves from its home to a foreign network, it first forms a CoA based on the prefix of the FN. The CoA can be formed based on stateless or state full mechanisms. However, in this paper, a stateless address auto configuration is adopted as a mechanism to form CoA through the visiting MNs. After address configuration, the MN informs it's HA of such movement by sending a binding update message. The binding update message is one of several MIPv6 messages that are encoded as options in a new header called the mobility header. The HA needs to store the information contained in the binding update message in order to forward packets to the MN's current location. Main drawback are high handover latency, high packet loss and signaling overhead [9].

C. Hierarchical MIPV6

HMIPv6 is a local mobility management protocol for MIPv6 improvements to reduce handover latency and signaling overheads that occur because the periodic change of MN's point of attachment. It adds an indirection for locating the MN independent of where the CN and HA are detect in the Internet topology. It tunnels packets to a Mobility Anchor Point (MAP), which is addressed by a regional CoA (RCoA). The MAP rotate, tunnels these packets to the MN addressed beyond a local CoA (LCoA). Thus, the MN's local handover mobility signaling only needs to be signaled to the MAP, hence, avoiding high handover latency and binding updates overheads.

The MN is currently connected to oldAR and will do a handover to the newAR. Whenever the MN like to improve the CN or HA about its new CoA, it will send them a binding update (BU) message that will travel from the MN through a MAP to the CN/HA. The acknowledgement of the BU from the CN/HA will move the same way back. If the link into the CN/HA and MAP is a long way, it means that it would take some time for the BU to move from the MAP to the CN/HA and back. Therefore, it would make sense to have a kind of temporary HA on the MAP. Hence that the MN only needs to update the MAP as long as the same MAP is located between the MN and CN/HA, then, the MN's address in this case is LCoA. Hence, the more time for sending a BU interval CN/HA and MAP is spared. Moreover, the MN can discover the MAP address from the router advertisement and will then form a RCoA address from the MAP before updating the CN/HA with this RCoA. After that, the CN/HA transfer their packets to this RCoA, then, the MAP tunnels them to the MN's LCoA. In addition, the MAP may buffer the data packets destined to the MN and send them when the MN has sent the BU message through the newAR [13].

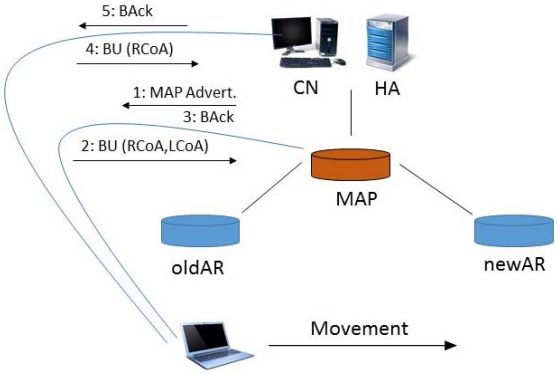

Fig 1. HMIPv6 Signaling flow

D. Fast Handover for MIPV6

Fast Handover in MIPv6 (FMIPv6) was proposed to reduce handover latency and minimize service disruption during handover related to the MIPv6. The goal of FMIPv6 is to allow a MN to configure a new CoA before it moves under the coverage of new cell or an access area. This mechanism is popularly known as make before break. The principle is to construct a new temporary address to MN and establish a new connection before the break down of the MN's ongoing connection with its old Access Router (OAR). In such a case, when the MN is attached to the new Access Router (NAR), it can continue its communications with its new already assigned address. While constructing the new CoA before the actual handover, the protocol takes help of the signal strength of the used signal and newly received signal during the movement of MN.

In general, FMIPv6 optimization is based on a reliable hand- over prediction that enables

predictive configuration of the MN involved in the mobility signaling [9]. All the host-based mobility management protocols require a protocol stack modification of the MN and change its IP addresses in order to support MN mobility within or across network domains. Consequently, it may increase the MN complexity and waste air resources [12].

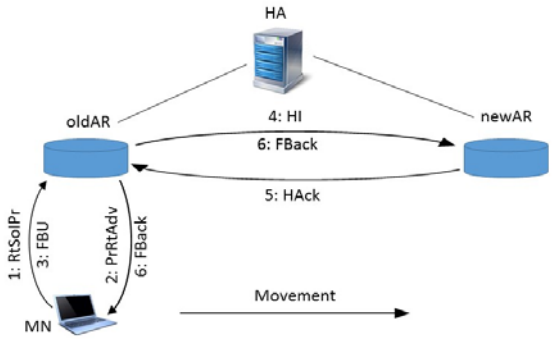

Fig 2. FMIPv6 handover signaling flow

IV. NETWORK-BASED MOBILITY PROTOCOL

Network-based mobility is second approach to solving the IP mobility challenge. It is possible to support mobility for IPv6 nodes without host participation by extending Mobile IPv6 signaling messages between a network node and a home agent. The network is responsible for managing IP mobility on behalf of the host. The mobility entities in the network are responsible for tracking the movement of the host. This specification called a network-based mobility management protocol. Proxy Mobile IPv6 (PMIPv6) and Fast Proxy Mobile IPv6 (FPMIPv6) are network-based mobility management protocols. In this section, these protocols are discussed.

A. Proxy Mobile IPv6 (PMIv6)

Proxy Mobile IPv6 protocol is intended for providing network-based IP mobility management support to a mobile node, without requiring the participation of the mobile node in any IP mobility related signaling. Hence, the proxy mobility entity performs all related signaling on behalf of the MN. Once an MN go into the PMIPv6 domain the serving network performs the MN's access authentication and assigns a unique home network prefix (HNP) to each MN using a new address model named Per-MN-Prefix model. This prefix conceptually always follows the MN wherever it transfer within a PMIPv6 domain, to ensure that the MN is always in its home network and can obtain its HoA on any access network [2].

The functional entities of PMIPv6 are local mobility anchor (LMA) and mobile access gateway (MAG). The LMA is similar to the HA in MIPv6. The mobile access gateway is the entity that performs the mobility management on behalf of a mobile node, and it resides on the access link where the mobile node is anchored. The mobile access gateway is responsible for detecting the mobile node's movements to and from the access link and for initiating binding registrations to the mobile node's local mobility anchor. The PMIPv6 signaling flow is described as follows:

Authors should consider the following points:

1) The MN initially attaches to the MAG1 in a PMIPv6 domain by present MN-ID to process an access authentication.
2) The MAG1 transfer a request message to the AAA server for the MN's access authentication.
3) The AAA server responds by sending the MN's profile (i.e., MN-ID, LMAA, address configuration mode, etc.) to MAG1 if this MN is successfully authenticated.
4) The MAG1 transfer a PBU message to the MN's LMA on behalf of the MN to update the MN's new location.
5) The LMA will reply by sending PBA message including the MN-HNP and creates BCE that binds the MN-HNP to the MAG1 address. In addition the LMA establishes a bidirectional tunnel towards the MAG1.
6) The MAG1 sets up a tunnel to the LMA and adds a default route over the tunnel to the LMA upon receiving the PBA message. It also generates a Binding Update List (BUL) that binds the MN-HNP and LMAA. In addition, MAG1 sends RtrAdv messages to the MN on the access link to a publicize MN-HNP as the hosted on-link-prefix. When the MN receives this RtrAdv message it will arrange its IP address using either a state full or stateless address configuration.
7) After successfully completing the address configuration process the MN is now able to use this address to continue the data session to/from CN [9].

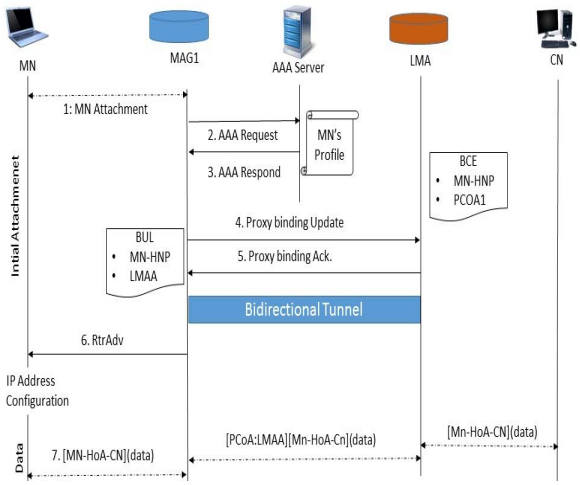

Fig 3. PMIv6 signaling flow phase

B. Fast Proxy Mobile IPv6 (FMIPv6)

Fast handover scheme in Proxy Mobile IPv6 called FPMIPv6, which combines Fast Mobile IPv6 operation and IEEE 802.21 link layer triggers with Proxy Mobile IPv6 protocol, and develops an analytic model for the handover performance analysis. Depending on whether layer 2 handover signaling is finished on a previous link, there are two modes of operation, that is, predictive and reactive mode. On consider the predictive mode because it shows shorter latency than the reactive one. Before the MN moves from PAP to NAP, negotiation occurs between the MN and PAP through layer 2 trigger messages as described in subsection 2.1. Link Going Down trigger from the link layer to IP layer in the MN informs the PAP that a link down event will be fired in the close future. The NAP ID information must be included. When the layer 2 handover decision is achieved, the PAP sends Link Going Down message to the PMAG. Once receiving Link Going Down message, the PMAG retrieves New MAG's (NMAGs) PCoA through [AP-ID, PCoA] tuple, and sends Handover Initiate (HI) message with the following information: the MN's NAI identifier option, the MN's IP address, the PMAG's PCoA, the MN's Link Layer Address (LLA). The NMAG creates a Neighbor Cache entry for the MN based on the information of the HI message. To reply the HI, the NMAG sends Handover Acknowledge (HAck) message to the PMAG. Once Hack is received by the PMAG, a bidirectional tunnel is established, and the PMAG's PCoA and the NMAG's PCoA are the tunnel's two ends. When a layer 2 link is established, the NAP sends a Link Up trigger message to the NMAG. Link Up trigger from the link layer to IP layer in the MN informs the NAP that an MN completes layer 2 connection establishment with the NAP. The NMAG sends Router Advertisement (RA) with the NMAG's information which facilitates the MN to send packets. The NMAG delivers the buffered packets to the MN [3].

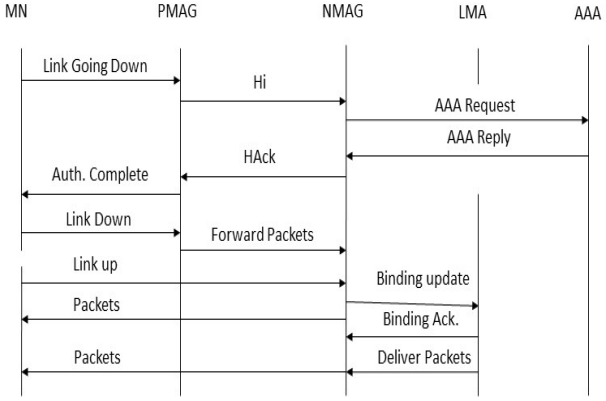

Fig 4. Predicative FMIPv6 protocol operation

C. Proxy mobile ipv6 (pmipv6) localized routing problem statement

The MIPv6 protocol has built-in mechanism for direct communication between an MN and CN. Mechanisms for route optimization in MIPv6 cannot be directly applied in PMIPv6. Therefor localized routing must consider functions in the network to discover whether or not a localized route is to be used and then control the setup and maintenance of localized routing states accordingly without some assistance from the MN and the CN. With localized routing, operators have the possibility of offloading traffic from LMAs and from the core network. By limiting the communication to the access nodes, the data traffic traversing the MAG - LMA path (network) can be reduced. There may be good performance for data flows between the MN and the CN in terms of delay and packet loss is reduce. Localized routing always using the default route through two communicating mobile nodes. Localized routing in a PMIPv6 network must counter unauthorized change of a routing path [1].

D. A new strategy for signaling overhead reduction in the proxy mobile ipv6 protocol

PMIPv6 has already been devoted to reduce the handoff latency and the packet loss ratio by pre-registering the mobile node to the new network. However, these researches have not been able to reduce the number of signals compulsory for authentication and registration processes which are frequently performed during the binding updates. Therefore, enhance PMIPv6 signaling strategy known as the I-PMIPv6 protocol is propose. The main idea of the proposed model is to minimize the redundant signaling in the authentication and registration processes of PMIPv6 and the involvement Of the Authentication, Authorization and Accounting (AAA) server in the registration process. In PMIPv6 when the MAG sends an AAA query to the AAA server; its consecutive operation is constrained by the mandatory wait of the AAA response before sending the PBU to the LMA. In the proposed I-PMIPv6, these signaling features are redesigned to achieve intended task with much reduce accumulated signaling. Thus main advantage of I-PMIPv6 protocol reduce signal of authentication and registration. But this protocol cannot work any single point of failure occur in mobility and authentication server such that information of mobility and authentication is lost [4].

E. A POINTER FORWARDING SCHEME FOR MINIMIZING SIGNALING COSTS IN PROXY MOBILE IPV6 NETWORKS

PMIPv6, the MAG suffer a high signaling cost to update the location of a MN to the remote LMA if the MN moves frequently. This incense network overhead on the LMA, wastes network resource and make longer delay time. Therefore we propose a new mobility management scheme for decreasing signaling cost using the pointer forwarding. In the pointer forwarding schema we extent the data structure. We define K and Kmax as the current pointer forwarding length and the maximum forwarding length respectively. The initial value of K is 0. The value of K is incense whenever an MN moves within the PMIPv6 domain. To reduce the signaling load of the total network however the length of the pointer forwarding chain is allowed to incense up to the maximum pointer forwarding length Kmax. We propose to extend the PUB message with an extra flag Forwarding Notification (F) taken from reserved filed. In an 'F' flag is set, it indicates that it request the receiving previous MAG (pMAG) to create a pointer forwarding by caching a new Proxy Care-of-Address (PCoA) of the new MAG (nMAG). In this case, the pMAG creates the Binding Cache Entry (BCE) and sets up its endpoint of the bi-direction tunnel to the nMAG. Thus our proposal can reduce signaling costs by registration with the neighbor MAGs instead of the remote LMA using the pointer forwarding [5].

F. ON MATHEMATICAL MODELLING OF HIERARCHICAL MOBILITY MANAGEMENT PROTOCOLS

The existing internet network identifier and host identifier consist of IP address. The host create socket using the IP address and port number of the transport layer and sets up a connection to another host using this socket address. If the host moves to another network the IP address must be change. Thus it is a disadvantage in that the exiting connection is failed and must be connect again. Therefor to solve this problem hierarchical structure protocol analyzed by the new random walk model minimize the inconvenience when each of the MN performs a binding update it shows the cost efficiency through the prediction of a fast handover structure. The efficient result of the new random walk model is camper with the fluid mobility model. The cost is analyzed according to the circumstances of each protocol using the fluid-flow model and 2D random walk model [6].

V. CONCLUSION

In this paper, we have presented comparative analysis on Host based and Network based mobility management protocol. After define the main advantage for network based mobility management. More over this paper has classify several mobility management protocol and their challenges. This survey work may help the research in this field by providing overview of Mobile IP and motivate them towards further design of Mobile IP based network.

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CONTENT BASED MESSAGE FILTERING IN ONLINE SOCIAL NETWORKS USING ONTOLOGY

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Abstract

The fundamental issue in today's Online Social Networks (OSNs) is to give users the ability to control the messages posted on their own private space to avoid that unwanted content is displayed. Up to now, OSNs provide little support to this requirement. To fill the gap, this paper propose a system allowing OSN users to have a direct control on the messages posted on their walls. Traditional content-based filtering methods usually utilize text extraction and classification techniques for building user profiles as well as for representations of contents, i.e. item profiles. These methods have some disadvantages e.g. mismatch between user profile terms and item profile terms, leading to low performance. The disadvantages are overcome by incorporating an ontology which enables the users to filter the content based on a set of pre-defined categories. The aim of this paper is to create an automated system, called Filtered Wall (FW), able to filter unwanted messages from OSN user walls using ontology.

Index Terms: Content Based Filtering, Online Social Network, Ontology, Text Classification.

I. INTRODUCTION

In content-based filtering, the representations of the content of items (e.g. documents, News), i.e. the items' profiles, are compared with the representation of the users, i.e. the users' profiles. In order to enable matching and measuring the similarity between the profiles, it is assumed that a user's profile and an item's profile share a common method of representation (e.g., by keywords). The output of the matching process can be expressed as a ranking score, indicating the similarity between the user's profile and each item.

A user profile can be generated in various ways, including explicit definition by the user, or implicit analysis of the user's behavior (e.g. by logging and analyzing what the user read). An item's profile too can be generated in various ways, e.g. explicitly, by asking the originator (author) to specify proper index terms, or automatically, using a text classification algorithm which extracts terms representing the item's content in the best way. At any rate, no matter which method is used for creating either type of profile, content-based filtering has drawbacks due to well-known problems of term ambiguity. For example, different terms may be used to represent the same content or the same user (synonymy); or, the same term may be used to represent different contents or different users (homonymy).

A possible way to overcome such problems of ambiguity might be through the use of ontology, i.e., a controlled vocabulary of terms or concepts, and semantic relationships among them. Ontology can bridge the gap between the terms in the users' profile and the terms representing the items. Ontology can be organized in various ways. For example, a taxonomy is a hierarchical structure with is-a relationships; in a thesaurus there are a few more types of relationships, e.g. BT/NT (broader-term; narrower terms) and general relatedness. Note that a thesaurus is a graph, not a hierarchy, because a term may have many NTs and more than one BT. In the Social Networks domain, which is exemplified in this study, there is an ontology specifically generated for classification of messages.

Assuming that there exists ontology of a specific domain, which is used for representing

users (user profiles), and contents of items (item profiles), the research question we deal with is how exactly to match and measure the similarity between a user's profile and an items' profile. Obviously, if a user's post includes exactly the same concept (terms) as an item's profile, there is some similarity between them; but the two profiles may include different concepts and still be similar to a certain degree – depending on if and how "close" the concepts are in the two profiles with respect to the common ontology. This research is conducted within the framework of a social networking website, which is aimed to provide a filtered wall able to filter out the unwanted messages from the user's wall. In this domain, instant filtering of messages is important.

The content-based filtering algorithm can perform the necessary matching with the users' profiles and determine the degree of relevancy of each item to the potential users.

The remaining of this paper is structured as follows: The next section provides a background on content-based filtering and on ontological modeling, and reviews related research on conceptual and ontological modeling employed in content-based filtering. Section 3, the main section of the paper, presents the proposed method for the ontology- content-based filtering, along with an example. Section 4 describes the evaluations conducted with the proposed method, and the last section summarizes and proposes further research and extensions to the proposed method.

II. RELATED WORK

In content-based systems, filtering is done by exploiting the information extracted from the text of documents. It has been investigated by exploiting ML techniques [2, 9, 10] as well as other strategies [8, 5]. However, the problem of applying content-based filtering on the contents exchanged by users of social networks has received up to now few attentions in the scientific community. A best example which focuses on this work is by Boykin and Roy chowdhury [3].The paper proposes an automated anti-spam tool that, exploiting the properties of social networks, can recognize unwanted commercial e-mail, spam and messages associated with people the user knows. However, it is important to note that the strategy just mentioned does not exploit content-based techniques.

The advantages of using Ontology based Content filtering strategies over other engineering approaches are a very good effectiveness, flexibility to changes in the domain and portability in differ applications. However difficulties arise in finding an appropriate set of features by which to represent short, grammatically ill formed sentences and in providing a consistent training set of manually classified text. Focusing on the OSN domain, interest in access control and privacy protection is quite recent. As far as privacy is concerned, current work is mainly focusing on privacy-preserving data mining techniques, that is, protecting information related to the network, i.e., relationships/nodes, while performing social network analysis? Work more related to our proposals is those in the field of access control. In this field, many different access control models and related mechanisms have been proposed so far (e.g., [4, 1, 6]), which mainly differ on the expressivity of the access control policy language and on the way access control is implemented. Most of these models express access control requirements in terms of relationships that the requestor should have with the resource owner. We use a similar idea to identify the users to which a filtering rule applies. However, the main goal of this paper is completely different, since this paper mainly focus with filtering of unwanted contents rather than with access control. The disadvantages with the other system are overcome by incorporating an ontology which enables the users to filter the content based on a set of pre-defined categories.

The application of content-based filtering on messages posted on OSN user walls poses additional challenges given the short length of these messages other than the wide range of topics that can be discussed. Short text classification has received up to now little attention in the scientific community. Recent work highlights difficulties in defining robust features, essentially due to the fact that the description of the short text is concise, with many misspellings, nonstandard terms, and noise. Zelikovitz and Hirsh[9] attempt to improve the classification of short text strings developing a semi-supervised learning strategy based on a combination of labeled training data

plus a secondary corpus of unlabeled but related longer documents.

This solution is inapplicable in the proposed domain in which short messages are not summary or part of longer semantically related documents. A different approach is proposed by Bobicev and Sokolova[5] that circumvent the problem of error-prone feature construction by adopting a statistical learning method that can perform reasonably well without feature engineering. However, this method, named Prediction by Partial Mapping, produces a language model that is used in probabilistic text classifiers which are hard classifiers in nature and do not easily integrate soft, multi membership paradigms

The aim of this paper is to create an automated system, called Filtered Wall (FW), able to filter unwanted messages from OSN user walls using ontology. The disadvantages with the other system are overcome by incorporating an ontology which enables the users to filter the content based on a set of pre-defined categories. The aim of this paper is to create an automated system, called Filtered Wall (FW), able to filter unwanted messages from OSN user walls using ontology.

III. CONTENT BASED FILTERING

Information filtering systems are designed to classify a stream of dynamically generated information dispatched asynchronously by an information producer and present to the user those information that are likely to satisfy his/her requirements.

In content-based filtering, each user is assumed to operate independently. As a result, a content-based filtering system selects information items based on the correlation between the content of the items and the user preferences as opposed to a collaborative filtering system that chooses items based on the correlation between people with similar preferences. While electronic mail was the original domain of early work on information filtering, subsequent papers have addressed diversified domains including newswire articles, Internet “news” articles, and broader network resources. Documents processed in content-based filtering are mostly textual in nature and this makes content-based filtering close to text classification. The activity of filtering can be modeled, in fact, as a case of single label, binary classification, partitioning incoming documents into relevant and non relevant categories. More complex filtering systems include multi label text categorization automatically labeling messages into partial thematic categories.

Content-based filtering is mainly based on the use of the ML paradigm according to which a classifier is automatically induced by learning from a set of pre-classified examples. A remarkable variety of related work has recently appeared which differ for the adopted feature extraction methods, model learning, and collection of samples. The feature extraction procedure maps text into a compact representation of its content and is uniformly applied to training and generalization phases. Several experiments prove that Bag-of-Words (BoW) approaches yield good performance and prevail in general over more sophisticated text representation that may have superior semantics but lower statistical quality. As far as the learning model is concerned, there are a number of major approaches in content-based filtering and text classification in general showing mutual advantages and disadvantages in function of application dependent issues.

. In this paper, blacklist content based filtering algorithm is proposed to filter unwanted user messages from the OSN user walls.

IV. FILTERED WALL ARCHITECTURE

The architecture in support of OSN services is a three-tier structure (Fig. 1). The first layer, called Applications Graphical User Interface, commonly aims to provide the basic OSN functionalities (i.e., profile and relationship management), whereas the second layer provides the support for external Social Network Applications (SNAs). The supported SNAs may in turn require an additional layer for their needed Graphical User Interfaces (GUIs). The third layer is the Social Network Manager (SNA) which contains the Filtered Wall GUI.

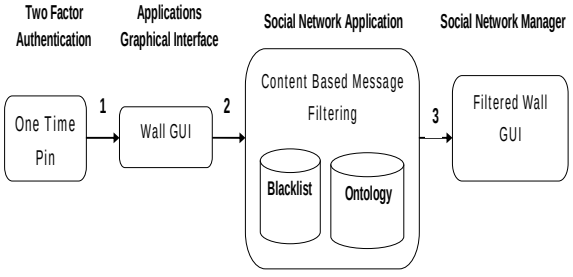

Fig.1 Filtered Wall Architecture

4.1 Two-factor Authentication

Social networks are unequivocally the most used application for communication and information sharing in the 21st century. As growth of this technology increases, there is a need to implement a more secure authentication mechanism to protect users as well as the platform providers from various social engineering attacks. This end-user security lapse often paves way for phishing and malware attacks and undermines the overall integrity of the system. In this study, we review the rise of social networks and the underlying concepts of two factor authentication. Furthermore, we propose a novel, feasible, cost effective and secure technique of applying an email based password tokenization as a second factor authentication in social networking sites.

Two factor authentication is an extra layer of authentication added to the conventional single factor authentication to an account login, which requires users to have additional information before access to a system is granted. The traditional method of authentication requires them user to enter only a username and password before being granted access to a closed software or application, whereas two factor authentication requires the user to have additional information known only to the user before access to the system is granted. Knowledge based i.e. a piece of information the user knows such as a Personal Identification Number (PIN) or password.

4.2 Blacklist

Blacklist rule is used to avoid unwanted messages created by the users. This is the mechanism which is managed by the system, such that the system may able to decide what type of messages can be present in the system. That is the wall owner must decide who are the users enter into his/her private wall and the kind of words that they can post in our user walls.

This algorithm is able to filter out the messages based on its content. The content is a short text where in the filtering is done based on the blacklist word count. A set of words which are considered as blacklist words, are stored. In the short text each word is checked for, if it appears in the blacklist and the count is incremented. If the word count exceeds the minimum threshold then the text is blocked, else it passes on for further filtering.

4.3 Ontological Modeling

Ontology is a specification of a conceptualization. It can be described by defining a set of representational concepts. These definitions are used to associate the names of entities in the universe (e.g., classes, relations, functions or other objects) with human-readable text, describing what the names mean, and formal axioms that constrain the interpretation and focus the well-formed use of these concepts. When constructing ontology, not only concepts and relationships are defined, but also the context in which the concept (relationship) applies. Therefore, ontology defines a set of representational terms which are called concepts, and the inter relationships among the concepts.

Linguistic ontology's (e.g., Word Net) and thesauri express various relationships between concepts (e.g. Synonyms, antonyms, is-a, contains-a), and have a hierarchical structure based on the relations between concepts. But they do not explicitly and formally describe what a concept means. Word Net, for example, is an electronic lexical database that contains nouns, verbs, adjectives and adverbs which are organized into synonym sets (synsets), each representing one underlying lexical concept. It is offering two distinct services: a vocabulary which describes the various word senses, and an ontology which describes the semantic relationships among senses.

This ontological modeling will help to increase the performance in the filtering process.

V. EXPERIMENTAL RESULTS

A prototype social network application emulates a personal wall where the user can apply a simple combination of the proposed FRs. Throughout the development of the prototype; this paper focused attention only on the FRs.

However, the implemented functionality is critical, since it permits the Ontology components to interact. Since this application is conceived as a wall and not as a group, the contextual information (from which CF are extracted) linked to the name of the group are not directly accessible. Contextual information that is currently used in the prototype is relative to the group name where the user that writes the message is most active.

It is important to stress that this type of contextual information is related to the environment preferred by the user who wants to post the message; thus, the experience that you can try using the prototype is consistent with what described and evaluated..

To summarize, the application permits to

1. view the list of users' FWs;
2. view messages and post a new one on a FW;
3. filter using ontology

When a user tries to post a message on a wall, he/she receives an alerting message (see Fig. 2) if it is blocked by FW.

Fig 2. Prototype

VI. CONCLUSION

In this paper, the proposed system can able to create a filtered wall overcoming the drawbacks of content based filtering. Traditional content-based filtering methods usually utilize text extraction and classification techniques for building user profiles as well as for representations of contents, i.e. item profiles. These methods have some disadvantages e.g. mismatch between user profile terms and item profile terms, leading to low performance. The disadvantages are overcome by incorporating a common ontology which enables representing both the users and the items profiles with concepts taken from the same vocabulary. The method can be enhanced in various aspects. One possible enhancement is to assign more importance to concepts co-occurring in items read in the past by the user.

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DRINA: AN ENHANCEDRELIABLE AND LIGHTWEIGHT ROUTINGAPPROACH WITH ROUTE REPAIR MECHANISM FOR IN-NETWORK AGGREGATION IN WIRELESS SENSOR NETWORKS

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Abstract

Large scale dense Wireless Sensor Networks (WSNs) will be increasingly deployed in different classes of applications for accurate monitoring. Due to the high density of nodes in these networks, it is likely that redundant data will be detected by nearby nodes when sensing an event. Since energy conservation is a key issue in WSNs, data fusion and aggregation should be exploited in order to save energy. In this case, redundant data can be aggregated at intermediate nodes reducing the size and number of exchanged messages and, thus, decreasing communication costs and energy consumption. In this work, we propose a novel Data Routing for In-Network Aggregation, called DRINA, that has some key aspects such as a reduced number of messages for setting up a routing tree, maximized number of overlapping routes, high aggregation rate, and reliable data aggregation and transmission. The proposed DRINA algorithm was extensively compared to two other known solutions: the Information Fusion-based Role Assignment (InFRA) and Shortest Path Tree (SPT) algorithms. Our results indicate clearly that the routing tree built by DRINA provides the best aggregation quality when compared to these other algorithms. The obtained results show that our proposed solution outperforms these solutions in different scenarios and in different key aspects required by WSNs.

Index Terms—Routing protocol, in-network aggregation, wireless sensor networks

INTRODUCTION

A Wireless Sensor Network (WSN) consists of spatially distributed autonomous devices that cooperatively sense physical or environmental conditions, such as temperature, sound, vibration, pressure, motion, or pollutants at different locations. WSNs have been used in applications such as environmental monitoring, homeland security, critical infrastructure systems, communications, manufacturing, and many other applications that can be critical to save lives and assets. Sensor nodes are energy-constrained devices and the energy consumption is generally associated with the amount of gathered data, since communication is often the most expensive activity in terms of energy. For that reason, algorithms and protocols designed for WSNs shouldconsider the energy consumption in their conception. Moreover, WSNs are data-driven networks that usually produce a large amount of information that needs to be routed, often in a multi-hop fashion, toward a sink node, which works as a gateway to a monitoring center. Given this scenario, routing plays an important role in the data gathering process.

A possible strategy to optimize the routing task is to use the available processing capacity provided by the intermediate sensor nodes along the routing paths. This is known as data-centric routing or in-network data aggregation. For more efficient and effective data gathering with a minimum use of the limited resources, sensor nodes should be configured to smartly report data by making local decisions. For this, data aggregation is an effective technique for saving

energy in WSNs. Due to the inherent redundancy in raw data gathered by the sensor nodes, in-networking aggregation can often be used to decrease the communication cost by
eliminating redundancy and forwarding only smaller aggregated information. Since minimal communication leads directly to energy savings, which extends the network lifetime, in-network data aggregation is a key technology to be supported by WSNs. In this work, the terms information fusion and data aggregation are used as synonyms. In this context, the use of information fusion is twofold: 1) to take advantage of data redundancy and increase data accuracy, and 2) to reduce communication load and save energy. One of the main challenges in routing algorithms for WSNs is how to guarantee the delivery of the sensed data even in the presence of nodes failures and interruptions in communications. These failures become even more criticalwhen data aggregation is performed along the routing paths since packets with aggregated data contain information from various sources and, whenever one of these packets is lost a considerable amount of information will also be lost. In the context of WSN, data aggregation awarerouting protocols should present some desirable characteristics such as: a reduced number of messages for setting up a routing tree, maximized number of overlapping routes, high aggregation rate, and also a reliable data transmission.

EXISTING SYSTEM

In most cases, tree-based protocols build a traditional shortest path routing tree. For instance, the Shortest Path Tree (SPT) algorithm uses a very simple strategy to build a routing tree in a distributed fashion. In this approach, every node that detects an event reports its collected information by using a shortest path to the sink node. Information fusion occurs whenever paths overlap (opportunistic information fusion).

SPT (Shortest Path Tree) is a commonly used topology in WSNs as each sensor node in a SPT reaches the root with the smallest number of hops. However, a randomly constructed SPT may not increase network lifetime. In new weighted path cost function improving the SPT approach, each link is assigned a weight according to its path length to the root, and a link closer to the root has a larger weight. By balancing load according to the links' weights, this approach increases network lifetime compared with those randomly constructed SPT. For the problem of finding a maximum lifetime tree from all the shortest path trees in a WSN, They first build a fat tree which contains all the shortest path trees. Then, they propose a method based on each node's number of children and its initial energy to find a minimum load shortest path tree to convert the problem into a semi-matching problem, and solve it by the min-cost maximum flow approach in polynomial time. Proposes an approximation algorithm for maximizing network lifetime by constructing a min-max-weight spanning tree, which guarantees thebottleneck nodes having the least number of descendants. The approximation algorithm iteratively transfers some of the descendants of the nodes with the largest weight to the nodes with smaller weights.
Similarly to the tree-based approaches, cluster-based schemes also consist of a hierarchical organization of the network.The Information Fusion-based Role Assignment (InFRA) algorithm builds a cluster for each event including only those nodes that were able to detect it. Then, cluster-heads merge the data within the cluster and send the result toward the sink node. The InFRA algorithm aims at building the shortest path tree that maximizes information fusion. Thus, once clusters are formed, cluster-heads choose the shortest path to the sink node that also maximizes information fusion by using the aggregated coordinators distance. A disadvantage of the InFRA algorithm is that for each new event that arises in the network, the information about the event must be flooded throughout the network to inform other nodes about its occurrence and to update the aggregated coordinators-distance. This procedure increases the communication cost of the algorithm and, thus, limits its scalability.

PROPOSED SYSTEM

The main goal of our proposed the DRINA algorithm is to build a routing tree with the shortest paths that connect all source nodes to the sink while maximizing data aggregation. The proposed algorithm considers the following roles in the routing infrastructure creation:

- Collaborator- A node that detects an event and reports the gathered data to a coordinator node.

- Coordinator- A node that also detects an event and is responsible for gathering all the gathered data sent by collaborator nodes, aggregating them and sending the result toward the sink node.
- Sink- A node interested in receiving data from a set of coordinator and collaborator nodes.
- Relay- A node that forwards data toward the sink.

The DRINA algorithm can be divided into three phases. In Phase 1, the hop tree from the sensor nodes to the sink node is built. In this phase, the sink node starts building the hop tree that will be used by Coordinators for data forwarding purposes. Phase 2 consists of cluster formation and cluster-head election among the nodes that detected the occurrence of a new event in the network. Finally, Phase 3 is responsible for both setting up a new route for the reliable delivering of packets and updating the hop tree.

Phase 1: Building the Hop Tree

In this phase, the distance from the sink to each node is computed in hops. This phase is started by the sink node sending, by means of a flooding, the Hop Configuration Message (HCM) to all network nodes. The HCM message contains two fields: ID and HopToTree, where ID is node identifier that started or retransmitted the HCM message and HopToTree is the distance, in hops, by which an HCM message has passed. The HopToTree value is started with value 1 at the sink, which forwards it to its neighbors (at the beginning, all nodes set the HopToTree as infinity). Each node, upon receiving the message HCM, verifies if the value of HopToTree in the HCM message is less than the value of HopToTree that it has stored and if the value of FirstSending is true. If that condition is true then the node updates the value of the NextHop variable with the value of the field ID of message HCM, as well as the value of the HopToTree variable, and the values in the fields ID and HopToTree of the HCM message. The node also relays the HCM message. Otherwise, if that condition is false, which means that the node already received the HCM by a shorted distance, then the node discards the received HCM message. The steps described above occur repeatedly until the whole network is configured.Before the first event takes place, there is no established route and the HopToTree variable stores the smallest distance to the sink. On the first event occurrence, HopToTree will still be the smallest distance; however, a new route will be established. After the first event, the HopToTree stores the smaller of two values: the distance to the sink or the distance to the closest already established route.

Algorithm 1:

Step1: Sink node sends a broadcast of HCM message with a value of HopToTree=1.

Step2: Check if HopToTree value of node is less than the value which it has stored and the value of FirstSending is TRUE.

Step3: If condition is true then the node updates the value of next hop variable with the value of the field ID of HCM message as well as the value of HopToTree variable and the values in the fields ID.

Step4: If that condition is false, then the node before the first event takes place, there is no established route and the HopToTree variable stores the smallest distance to the sink.

Step5: On the first event occurrence HopToTree will be the smallest distance.

Step6: After the first event the HopToTree stores the smallest of two values: the distance to the sink or the distance to the closest already established route.

Phase 2: Cluster Formation

When an event is detected by one or more nodes, the leaderelection algorithm starts and sensing nodes will be runningfor leadership (group coordinator); this process is describedin Algorithm 2. For this election, all sensing nodes areeligible. If this is the first event, the leader node will be theone that is closest to the sink node. Otherwise, the leaderwill be the node that is closest to an already establishedroute. In the case of a tie, i.e., twoor more concurrent nodes have the same distance in hops tothe sink (or to an established route), the node with thesmallest ID maintains eligibility. Another possibility is to use the energylevel as a tiebreak criterion.At the end of the election algorithm only one node inthe group will be declared as the leader (Coordinator). Theremaining nodes that detected the same event will be theCollaborators. The Coordinator gathers the informationcollected by the Collaborators and sends them to the sink.

Akey advantage of this algorithm is that all of the informationgathered by the nodes sensing the same event will beaggregated at a single node (the Coordinator), which ismore efficient than other aggregation mechanisms (e.g, opportunistic aggregation).

Algorithm 2:

Step1: If this is the first event, the leader node will be the one that is closest to the sink node otherwise the leader will be the node that is closest to an already established route.

Step2: If two or more concurrent nodes have the same distance in hop to the sink the node with the smallest ID maintaince eligibility.

Step3: If still there exists tie, then energy level of nodes is used as tie break.

Phase 3: Routing Formation and Hop Tree Updates

The elected group leader, as described in Algorithm 2, starts establishing the new route for the event dissemination. This process is described in Algorithm 3. For that, the Coordinator sends a route establishment message to its NextHop node. When the NextHop node receives a route establishment message, it retransmits the message to its NextHop and starts the hop tree updating process. These steps are repeated until either the sink is reached or a node that is part of an already established route is found. The routes are created by choosing the best neighbor at each hop. The choices for the best neighbor are twofold: 1) when the first event occurs, the node that leads to the shortest path to the sink is chosen; and 2) after the occurrence of subsequent events, the best neighbor is the one that leads to the closest node that is already part of an established route. This process tends to increase the aggregation points, ensuring that they occur as close as possible to the events. The resulting route is a tree that connects the Coordinator nodes to the sink. When the route is established, the hop tree updating phase is started. The main goal of this phase is to update the HopToTree value of all nodes so they can take into consideration the newly established route. This is done by the new relay nodes that are part of an established route. These nodes send an HCM message (by means of a controlled flooding) for the hop updating. The whole cost of this process is the same of a flooding, i.e., each node will send only one packet. This algorithm for the hop updating follows the same principles of the hop tree building algorithm.

Algorithm 3:

Step1: The Coordinator sends a route establishment message to its NextHop node. When the NextHop node receives a route establishment message, it retransmits the message to its NextHop and starts the hop tree updating process.

Step2: These steps are repeated until either the sink is reached or a node that is part of an already established route is found.

Step3: The routes are created by choosing the best neighbor at each hop. The choices for the best neighbor are twofold:

1) When the first event occurs, the node that leads to the shortest path to the sink is chosen and

2) After the occurrence of subsequent events, the best neighbor is the one that leads to the closest node that is already part of an established route.

Step4: When the route is established, the hop tree updating phase is started.

While the node has data to transmit,it verifies whether it has more than one descendant thatrelays its data. If it is the case, it waitsfor a period of time and aggregates all data received andsends the aggregated data to its NextHop. Otherwise, it forwards the data to its NextHop.For every packet transmission with aggregated data, theRoute Repair Mechanism is executed as shown in Algorithm 3. A route repair mechanism is used to sendinformation in a reliable way. Sender nodes wait a predefinedtime period to receive a packet delivery confirmation.When the confirmation is not received by the sendernode, a new destination node is selected and the message isretransmitted by that node.

ROUTE REPAIR MECHANISM

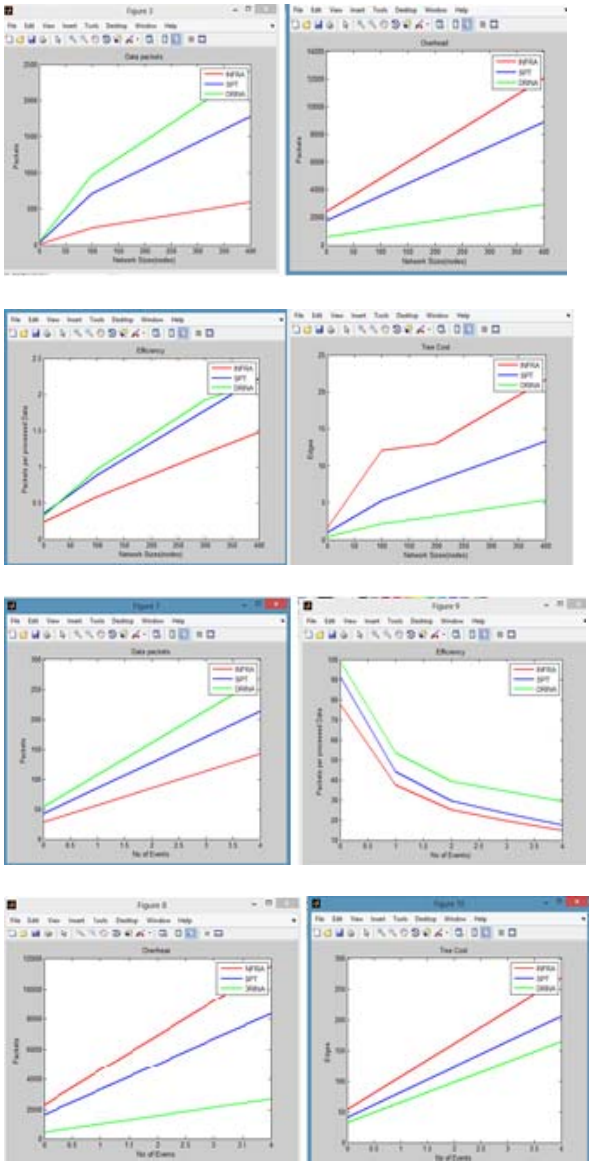
The route created to send the data toward the sink node is unique and efficient since it maximizes the points of aggregation and, consequently, the information fusion. However, because this route is unique, any failure in one of its nodes will cause disruption, preventing the delivery of several gathered event data. Possible causes of

failure include low energy, physical destruction, and communication blockage. Some fault-tolerant algorithms for WSNs have been proposed in the literature. Some are based on periodic flooding mechanisms and rooted at the sink, to repair broken paths and to discover new routes to forward traffic around faulty nodes. This mechanism is not satisfactory in terms of energy saving because it wastes a lot of energy with repairing messages. Furthermore, during the network flooding period, these algorithms are unable to route data around failed nodes, causing data losses. Our DRINA algorithm offers a piggybacked, ACK-based, route repair mechanism, which consists of two parts: failure detection at the NextHop node, and selection of a new NextHop. When a relay node needs to forward data to its NextHop node, it simply sends the data packet, sets a timeout, and waits for the retransmission of the data packet by its NextHop. This re-transmission is also considered an ACK message. If the sender receives its ACK from the NextHop node, it can infer that the NextHop node is alive and, for now, everything is ok. However, if the sender node does not receive the ACK from the NextHop node within the predetermined timeout, it considers this node as offline and another one should be selected as the new NextHop node. For this, the sender chooses the neighbor with the lowest hop-to-tree level to be its new NextHop; in case of a tie, it chooses the neighbor with the highest energy level. After that, the sender updates its routing table to facilitate the forwarding of subsequent packets. After the repairing mechanism is applied, a newly partial reconstructed path is created

PERFORMANCE EVALUATION

In this section, we evaluate the proposed DRINA algorithm and compare its performance to two other known routing protocols: the InFRA and SPT algorithms. These two algorithms were chosen for being well known in the literature and have the same goals that the proposed DRINA algorithm. Table 2 shows the basic characteristics of SPT, InFRA, and DRINA algorithms. We evaluate the DRINA performance under the following metrics:

1. Packet delivery rate.
2. Control overhead.
3. Efficiency (packets per processed data).
4. Routing tree cost.
5. Loss of raw data.
6. Loss of aggregated data.
7. Transmissions number.



METHODOLOGY

The performance evaluation is achieved through simulations using the SinalGo version v.0.75.3 network simulator. In all results, curves represent average values, while error bars represent confidence intervals for 95 percent of confidence from 33 different instances (seeds). The default simulation parameters are presented in Table 3. For each simulation set, a parameter shown in Table 3 will be varied as described in the evaluated scenario. The first event starts at time 1,000 s and all other events start at a uniformly

distributed random time between the interval ½1;000; 3;000_ seconds. Also, these events occur at random positions. The network density is considered as the relation $n\pi r^2_c=A$, where n is number of nodes, rc is the communication radius, and A is the area of the sensor field. For each simulation in which the number of nodes is varied, the sensor field dimension is adjusted accordingly in order to maintain the node density at the same value. Sensor nodes are uniformly and randomly deployed.

TABLE 3
Simulation Parameters

Parameter	Value
Sink node	1 (top left)
Network size	1024
Communication radius (m)	80
# of events	3
Event radius (m)	50
Event duration ($hours$)	3
Loss probability (%)	0
Simulation duration ($hours$)	4
Notification interval (sec)	60
Sensor field (m^2)	700×700
Node density ($node/m^2$)	21.7

To provide a lower bound to the packet transmissions, an aggregation function was used that receives p data packets and sends only a fixed size merged packet. However, any other aggregation function can be used to take advantage of DRINA features. This function is performed at the aggregation points whenever these nodes send a packet. The evaluated algorithms used periodic simple aggregation strategy in which the aggregator nodes transmit periodically the received and aggregated information. The following metrics were used for the performance evaluation:

Data packet delivery rate- Number of packets that reach the sink node. This metric indicates the quality of the routing tree built by the algorithms—the lower the packet delivery rate, the greater the aggregation rate of the built tree.

Control packet overhead- Number of control messages used to build the routing tree including the overhead to both create the clusters and set up all the routing parameters for each algorithm.

Efficiency- Packets per processed data. It is the rate between the total packets transmitted (data and control packets) and the number of data received by the sink.

Routing tree cost- Total number of edges in the routing tree structure built by the algorithm.

Loss of aggregated data- Number of aggregated data packets lost during the routing. In this metric, if a packet contains X aggregated packets and if this packet is lost, it is accounted the loss of X packets.

Number of transmissions- Sum of control overhead and data transmissions, i.e., the total packets transmitted.

Number of Steiner nodes- Number of Steiner nodes in the routing structure, i.e., the number of relay nodes.

CONCLUSION AND FUTURE WORK:

Aggregation aware routing algorithms play an important role in event-based WSNs. In this work, we presented the DRINA algorithm, a novel and reliable Data Aggregation Aware Routing Protocol for WSNs. Our proposed DRINA algorithm was extensively compared to two other known routing algorithms, the InFRA and SPT, regarding scalability, communication costs, delivery efficiency, aggregation rate, and aggregated data delivery rate. By maximizing the aggregation points and offering a fault tolerant mechanism to improve delivery rate, the obtained results clearly show that DRINA outperformed the InFRA and SPT algorithms for all evaluated scenarios. Also, we show that our proposed algorithm has some key aspects required by WSNs aggregation aware routing algorithms such as a reduced number of messages for setting up a routing tree, maximized number of overlapping routes, high aggregation rate, and reliable data aggregation and transmission.

As future work, spatial and temporal correlation of the aggregated data will also be taken into consideration as well as the construction of a routing tree that meets application needs. We also plan to modify the DRINA algorithm to stochastically select nodes that will be part of the communication structure. The goal is to find a balance between the overhead and the quality of the routing tree. In addition, new strategies will be devised to control the waiting time for

aggregator nodes based on two criteria: average distance of the event coordinators, and spatial and semantics-event-correlation

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RELAXATION INVESTIGATIONS AND THERMALLY STIMULATED POLARIZATION CURRENT (TSPC) STUDY IN PURE AND DOPED PVK SAMPLES

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Abstract
The temperature and electric field dependence of dielectric relaxation have been investigated in pure and malachite green doped PVK samples. Thermally stimulated polarization current of polyvinyl carbazole (PVK) thermoelectets prepared at the forming temperature Tp=70^{0}C and polarizing field 20 KV/cm. One sharp peak appears at around 90^{0}C. The peak obtained at lower temperature (i.e. β-peak) is associated with dipolar relaxation. Doping with malachite green is found to affect the magnitude and decrease in activation energy. The effect of malachite green is explained in terms of the formation of charge transfer complex.

Keywords: TSDC, space charge, activation energy, relaxation time

Introduction

During the last three decades, development in the field of electrets have continuously extended the fascinating world of micromechanics [1-5]. In early days, polymers in the form of plastics were regarded electrically as simply good insulators. But now, observations as substitutes in electrical response have shed a great deal of light on their molecular and charge particle dynamics. Such studies have enabled the development of materials which meet exacting electrical engineering requirements. Research along these lines has demonstrated the feasibility of obtaining materials with entirely novel set of properties. Also, such a research has led to the discovery of 'electret' displaying an unusual electrostatic phenomenon. Electrets made of different polymers have a very important use as transducers in electret microphones. Subsequent researches led to permanent electrification of electrets. Such electrets are utilised in xerographic reproduction techniques gas filters, relay switches medical appliances like radiation dosimeters, optoelectronic devices like video/TV cameras, maritime devices like hydrophones, electret motors, electret generators, tachometers, vibrational fans thin film transistors and thin film memory circuits and many other areas[6-8]. Even nature takes advantage of thin-film approaches: for example, seashells are built up of inorganic and organic components through a complex deposition chemistry. This deposition can be reproduced by a low-temperature biomimetic process in which directed nucleation and growth of inorganic layers on self-assembled organic templates produce continuous films of single-phase ceramics [9].

Experimental

For preparing the thermoelectrets, the polymer sample was kept inside the sample holder housed in a thermostat. The upper electrode of the sample holder was connected to a high voltage power supply giving the desired voltage as calculated above. The sample was heated to the desired temperature and kept for 30 mins. to attain thermal equilibrium. The power supply unit was then switched on and the positive polarising field was applied to the sample for 45

mins. Thereafter, the sample was cooled to the room temperature with the field still ON. The field was then switched OFF and the electret was short circuited for an arbitrary time of five mins. to remove any frictional or stray surface charges. For measuring the TSDC, the sample was discharged by heating at the linear rate of 3°C/min. upto 150°C to achieve complete depolarization. The current was measured by Keithley electrometer[10].

RESULTS AND DISCUSSION

The experimental conditions under which the thermally stimulated discharge currents were measured are summarized below –

Polarizing field strength -200, 300,400,500 volts
Polarizing temperature -30°C, 40°C, 50°C and 60°C
Heating Rate- 3°C/min.
Electrode Material - Aluminium

The thermally stimulated discharge current (TSDC) spectra for polyvinyl carbazole (PVK) samples polarized with poling fields 200, 300, 400 and 500 volts at constant temperatures 30°C, 40°C, 50°C and 60°C are illustrated in Figures 1 – 4.

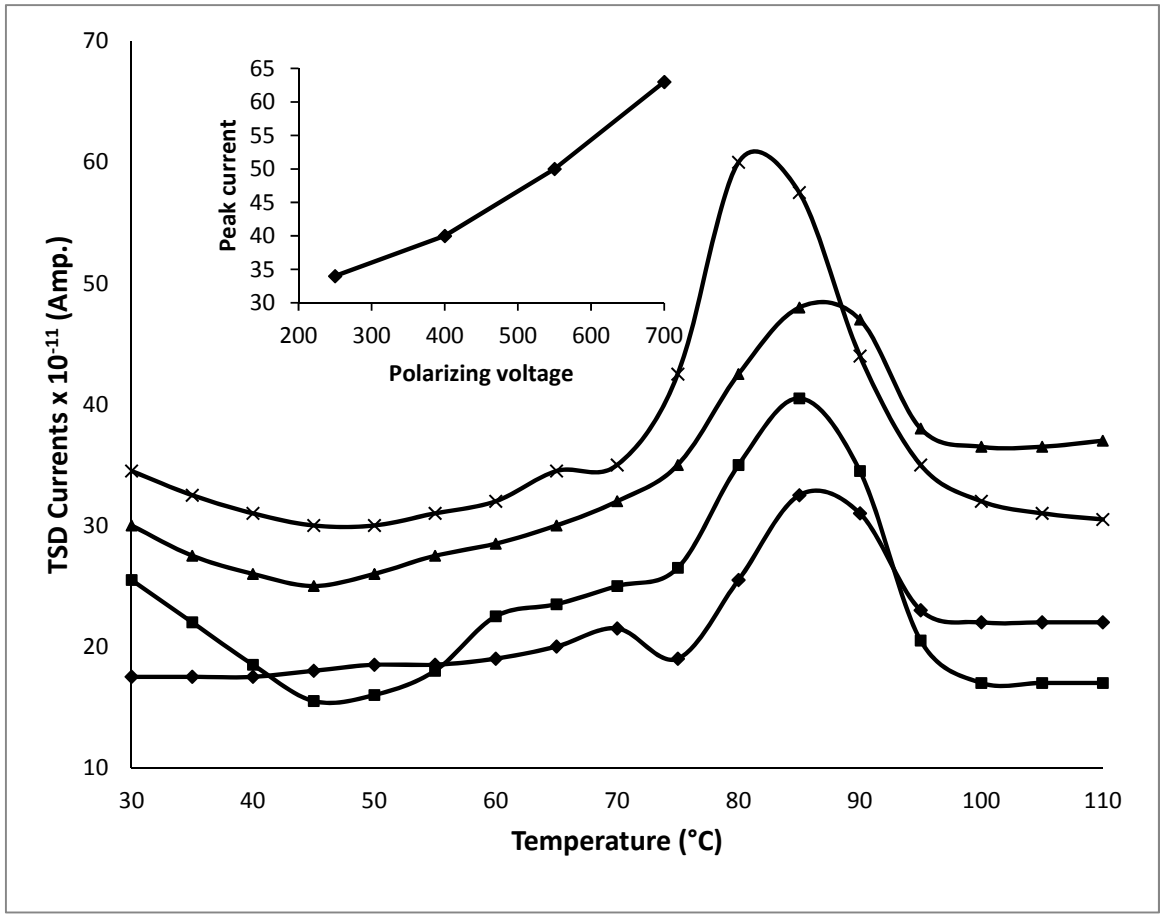

Figure 1: TSDC thermograme of pure PVK samples poled at 30°C with different polarizing fields (i.e. 200, 300, 400 and 500 volts).

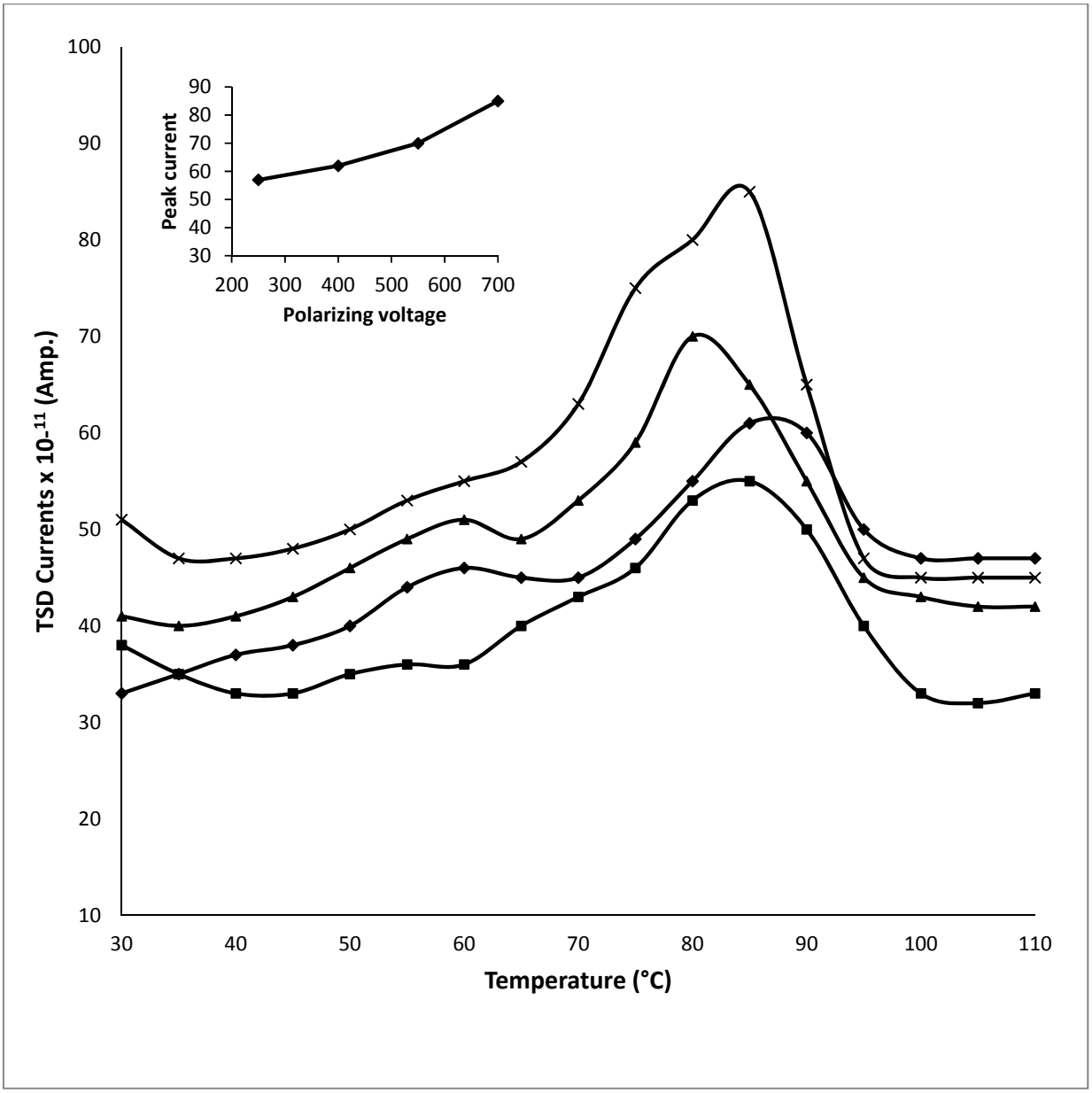

Figure 2: **TSDC thermograme of pure PVK samples poled at 40°C with different polarizing fields (i.e. 200, 300, 400 and 500 volts).**

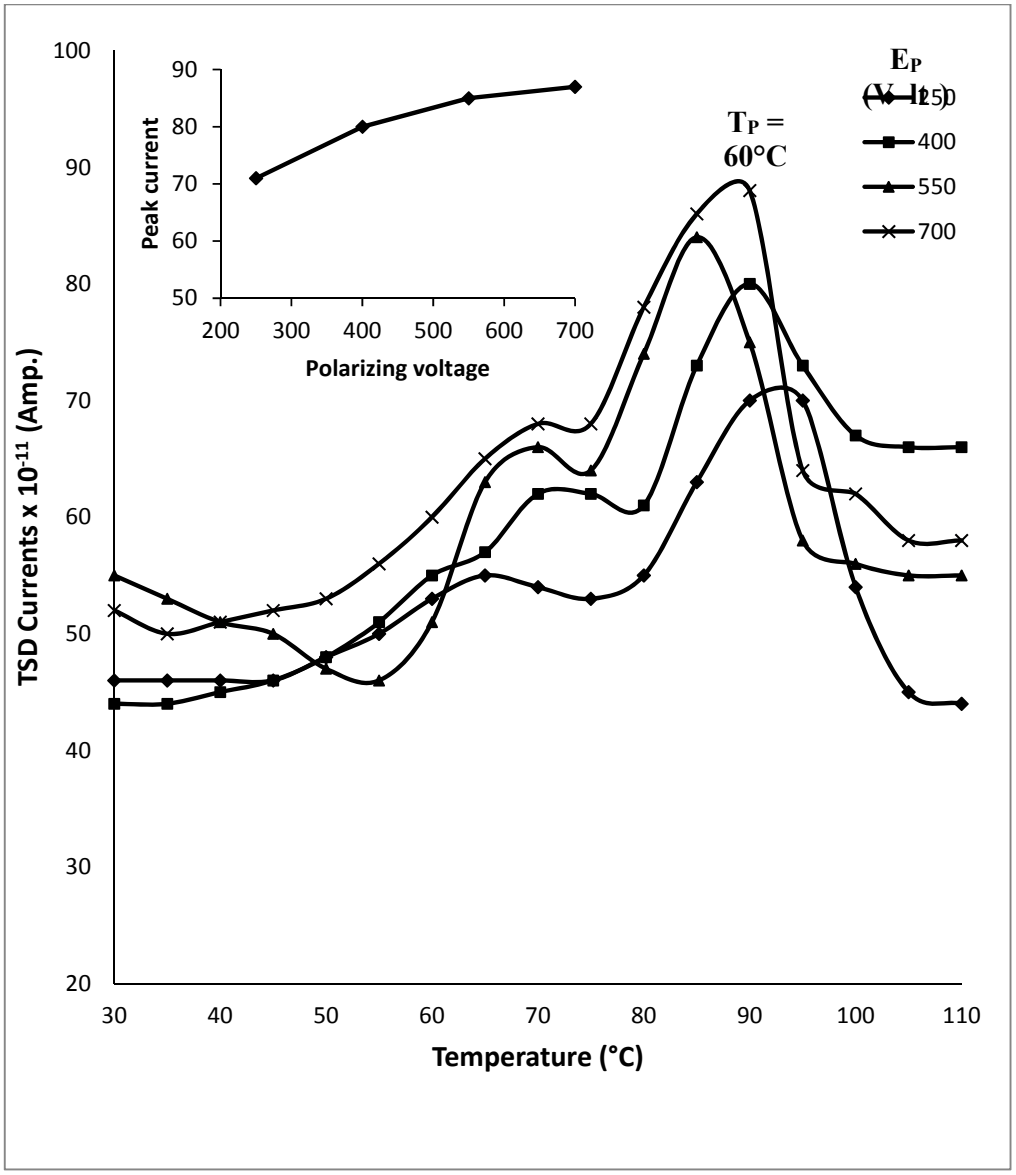

Figure 3: **TSDC thermograme of pure PVK samples poled at 50°C with different polarizing fields (i.e. 200, 300, 400 and 500 volts).**

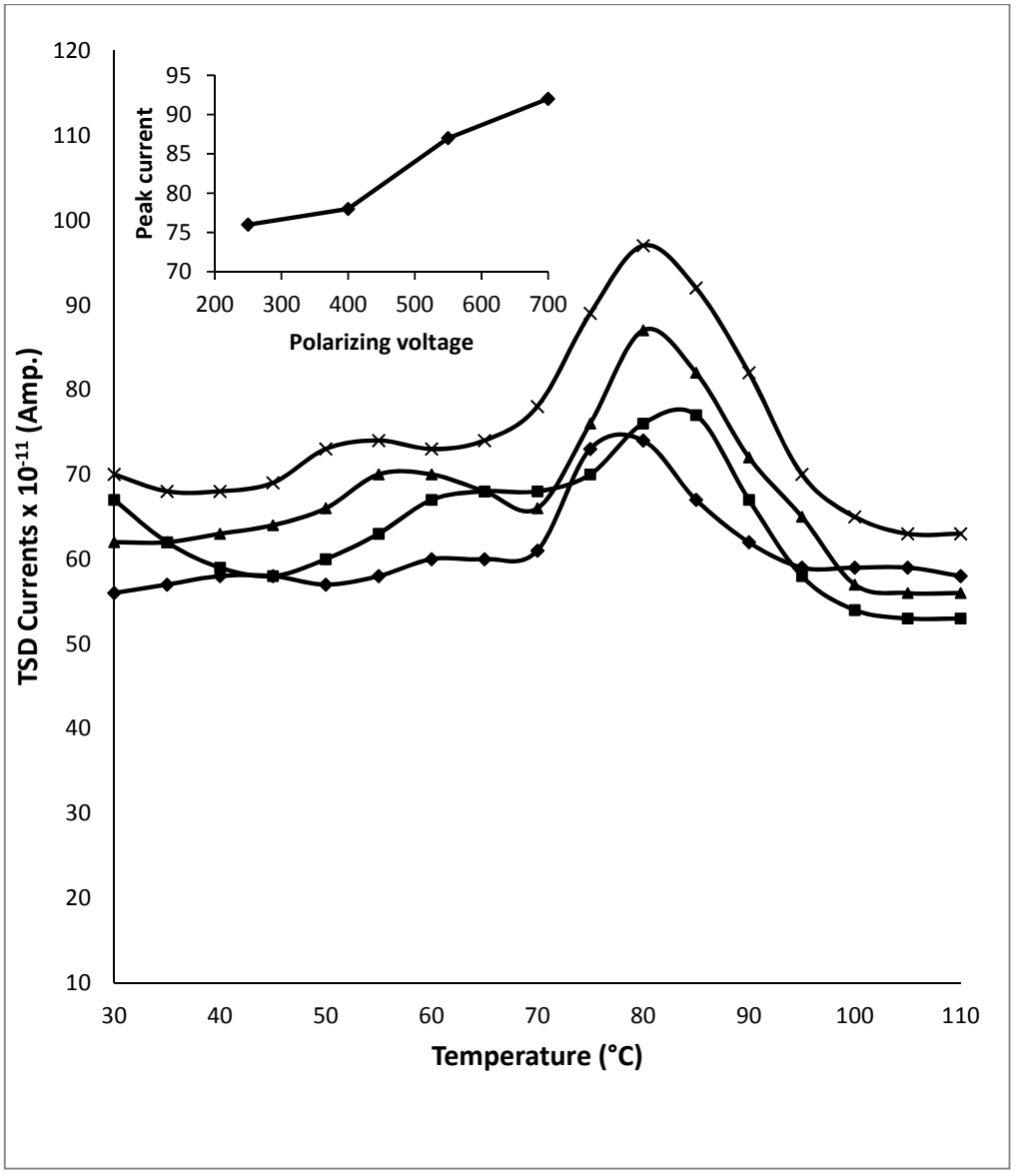

Figure 4: TSDC thermograme of pure PVK samples poled at 60°C with different polarizing fields (i.e. 200, 300, 400 and 500 volts).

In the present case, the appearance of peak in the high temperature region imply that the injection of ions may be significant in this polymer. It is also possible that PVK contains a high number of impurity molecules prior to field treatment and these molecules are dissociated into various ionic species by a combination of the high internal and external fields. The charge trapping in a polymer takes place at the molecular main chain, the side chain and at the interface of crystalline and amorphous regions of the polymer [11-14]. The high field applied during elected formation may also produce some additional trapping sites.

The charge released from these traps occurs because of the thermal excitation and motion of the molecular chain that causes the lowering of trap depth. The released charge can recombine, retrapped in trapping sites, or may get discharged at the electrodes. The chances of retrapping of the released charge are high in a polymer having a large number of trapping sites and it is expected that the discharge will give complex TSC spectra with broad peaks indicating a distribution of activation energies.

The results can be explained on the basis of formation of charge transfer complexes between

dopants and polymer matrix. Swan [15] proposed four mechanisms for the charge transfer complex processes involved between the strong electronegative acceptors present in the polymer molecular chain.

(i) The electron may go back to the polymer molecule from which it originates.

(ii) The electron may be retained by the dopant and may move as a stable negative ion.

(iii) The electron may transfer from the negative dopant into another polymer molecule without motion of the dopant molecule and

(iv) A charge exchange may occur between the negative dopant ion and a neutral dopant molecule.

The formation of CTC will result in the reduction of the crystalline amorphous interface and provide conducting paths through the amorphous regions and thus interconnect the crystallites. Due to the reduced barrier at the interfaces the mobility of the dipoles and/or charge carriers will increase[16].

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A HYBRID APPROACH TO PROVIDE ROBUSTNESS AND SECURITY IN VIDEO

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Abstract
In recent years, everything becomes digitized. Thus there must be some security needed for ownership identification of the transferred digital data over the internet. Digital image watermarking is the solution of that security problem which provides legal authentication of the transferred image over the internet. This paper includes the basic fundamentals of watermarking system, types of watermarking system, different techniques used for image watermarking and also literature survey on the some new work done in the field of digital image watermarking.

Keywords: Digital watermark, Discrete Wavelet Transform, Discrete Cosine Transform, Singular Value Decomposition, Spa-tial Domain, Frequency Domain

I. INTRODUCTION

Digital watermarking is the art of embedding secret infor-mation (which may exist in the form of text, image, audio or video) related to the actual content of the digital data within the original data itself. [13]

It is a two-step process namely embedding process and extracting process. In embedding process, watermark is added to the original image and resultant image which we get is known as watermarked image that will slightly modify after embedding. While in extraction process this embedded watermark is extracted from the watermarked image and recovers the original image back. Then that achieved extracted watermark is compared with the original watermark which we added at earlier stage, if both are same then we can say that the data we get is an authentic data.

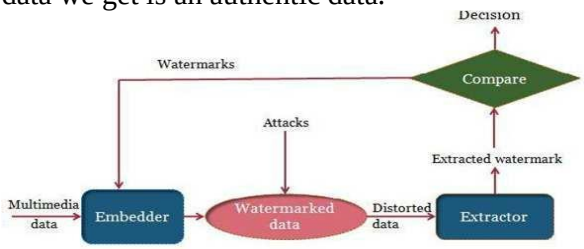

Fig. 1. Block diagram of watermarking system

Watermarking system must follow some properties such as imperceptibility, robustness, capacity and security. Impercep-tibility ensures the transparency. Imperceptibility: It confirms that there is not much degradation on the original image after embedding watermark [12]. Robustness: It defines as the capability of survival of watermark against different kinds of attacks [12]. Capacity: It describes how much data should be embedded as a watermark to successfully detect during extraction [11]. Security: Hacker should not be in the position to extract the watermark without having the knowledge of embedding algorithm.

This paper is structured as follow: Section 2 describes the types of digital watermarking system, section 3 discuss about the various techniques of the image watermarking system, section 4 contains literature review of different research papers related image watermarking and at last section 5 holds the limitation of current system and future scope in the field of digital image watermarking.

II. TYPES OF WATERMARKING SYSTEM

Watermarking system is mainly divided into following four types:

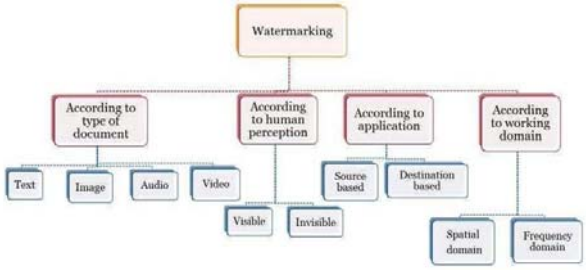

Fig. 2. Types of watermarking system

A. Based on types of documents:

There is four types of image watermarking based on types of documents on which watermark is embedded known as text image, audio and video watermarking.

1) Text watermarking.
2) Image watermarking.
3) Audio watermarking.
4) Vedio watermarking.

B. Based on human perception:

The image watermarking system is mainly classified in two categories based on human perception described as follow:

1) Visible watermarking: In this type of watermarking, the inserted watermark can be easily appears to the human eyes. This is very simple and easy technique for content authentication but the main drawback of this technique is that it is easily removed from the original host image.

2) Invisible watermarking: In this type of watermarking technique, the inserted watermark may not observed by human eyes. Most of the applications of digital image watermarking use this type of watermarking approach.

C. Based on application:

1) Source based watermarking: It is used for ownership authentication, where unique watermark is embedded to all copies of data.

2) Destination based watermarking: It is used in the application where there is need for tracing buyer for the purpose of illegal reselling.

D. Based on working domain:

1) Spatial domain watermarking: This category of water-marking is very simple and also easier to implement. It hides the watermark directly into original data by pixel modification. It has low complexity and high capacity for embedding more number of bits into host data. But these techniques are less resistant to different types of attacks. The techniques use in spatial domain is LSB (Least Significant Bit), ISB (Intermediate Significant Bits) and many more.

2) Frequency domain watermarking: This category of water-marking embeds the watermark in frequency values rather than intensity values. DFT (Discrete Fourier Transform), DCT (Discrete Cosine Transform) and DWT (Discrete Wavelet Trans-form) are the main methods for transformation in frequency domain watermarking. These are complex but having good imperceptibility and robustness. Most of the watermarking applications use frequency domain watermarking.

III. REVIEW OF WATERMARKING TECHNIQUES

LSB: LEAST SIGNIFICANT BITS

LSB technique is the 1st technique which is implemented under spatial domain technique. LSB technique is more im-perceptible but very less robust with different attacks. Water-marked image which is generated by using LSB technique can not detected by normal eyes. Sometimes histogram also not able to detect that any other image embedded in host image or not [9].

ISB: INTERMEDIATE SIGNIFICANT BITS

In these technique bits of watermark image pixel is inserted in the middle bit of the cover image pixel. ISB technique is less imperceptible but this technique success to enhance the robustness of spatial domain technique. ISB is more robust than LSB [10].

DWT: DISCRETE WAVELET TRANSFORM

The DWT separates an image into four sub-bands:

1. Approximate low frequency component (LL)
2. Horizontal middle frequency components (HL)

3. Vertical middle frequency components (LH)
4. Diagonal high frequency components (HH)

The LL sub-band is the result of low-pass filtering both the rows and columns and contains a rough description of the image. The HH sub-band is high-pass filtered in both directions and contains the high-frequency components along the diagonals. The HL and LH images are the results of low-pass filtering on one direction and high-pass filtering in other direction [6].

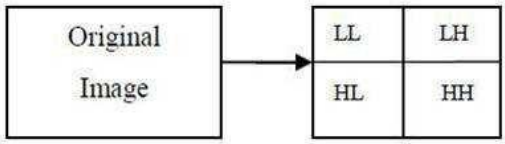

Fig. 3. Decomposition of DWT into sub-bands

DCT: DISCRETE COSINE TRANSFORM

DCT function is a transformation technique which trans-forms the input image from spatial domain to frequency domain. In DCT-based watermarking, the DCT coefficients are modified to embed watermark data. DCT is used in many standardized image, audio, and video compression methods. It has shown its superiority in reduction of the redundancy of a wide range of signals. In proposed method block DCT is used to increase the robustness [4].

DFT: DISCRETE FOURIER TRANSFORM

The Fourier transform implemented in different image pro-cessing applications. When we apply DFT on image low frequency band shifted in the corners of images. To embed watermark into DFT shifting operation is performs on the image to make low frequencies in center [2].

SVD: SINGULAR VALUE DECOMPOSITION

It can be seen as a method for transforming correlated variables into a set of uncorrelated ones that better expose the various relationships among the original data. In SVD, a given matrix A is decomposed into three matrices as

$$A = U\ S\ V^T$$

Where, U and V are orthogonal matrices and S is singular value.[7]

SVD provides good noise immunity property but major problem with SVD is that it is very complex task to embed the watermark using SVD alone.

IV. LITERATURE SURVEY

In research paper [1]authors used 4-level DWT and DCT independently for embedding and extraction of watermark.

And then both the DWT and DCT results are compared with respect to PSNR at different thresholds. And according to that comparison they concluded the better technique from these two based on image quality in terms of PSNR. It was clear from literature survey that at lower threshold values, performance of DCT is almost similar as DWT. But for higher thresholds, DWT gives better image quality than DCT. So authors highlighted on the fact that hybridization of DWT and DCT may overcome the drawbacks of both DWT and DCT method and also can be used to improve imperceptibility.

Fig. 4. Comparison of DCT and DWT

In research paper [2], Authors proposed a secure and non-blind digital image watermarking technique by hybridization of DWT and DCT. Imperceptibility, robustness and capacity were the main focus of authors for the system to be im-plemented. They used gray scale image as host image and binary image as watermark image of the size 512512 and 3232 respectively. They applied the same algorithm for various three host images having different extensions such as TIF, PNG and BMP. In proposed algorithm, host image was first decomposing by DWT and then apply DCT technique on LL sub band. After complete embedding process, they apply inverse process for extracting the watermark from transmitted image. Proposed algorithm was then tested on various attacks such as, intensity adjustment, speckle noise, Poisson noise, Gaussian noise, resizing, and many more in terms of PSNR and SR values. By implementing this algorithm, it is clear that proposed algorithm was very imperceptible and also robust against certain number of attacks.

In research paper [3], authors put emphasis on frequency domain techniques than spatial domain techniques due to robustness. They proposed DWT-SVD based watermarking

system which is robust and blind. They choose DWT for its property of multi scale representation of function and SVD for its good noise immunity property. They use one level Haar transformation for decomposition of host image into sub bands. They evaluated the performance of proposed algorithm by using PSNR measure and robustness has been tested against 20 kinds of attacks such as Blur, Motion blur, Gaussian blur, sharpening, rotation, contrast, JPEG compression, Mosaic, cropping, etc. They applied the watermark to the various sub-bands (LL, HH, HL or LH) and attempt different results in each case. They verified that watermark embedding in different bands are resistant to different attacks. Proposed approach has high degree of robustness against major attacks. Past research said that any modification in LL band cant possible because it can be easily perceived by human eye, but here in the proposed system the authors not face any such problems with that. They also concluded that if the watermark was inserted in any of the sub band, then it makes image resistive to only some of the attacks, but if it will be inserted into all the sub bands then it would be very difficult to remove from all the frequencies.

Fig. 5. Watermarking using DWT-SVD

In research paper [4], authors first enlisted the effects of the different removal watermark attacks in spatial and frequency domains. This analysis was carried out by using histogram and fourier spectrum tool. Authors compared the performance of the region adaptive approach with the original DWT-SVD based approach. This region adaptive approach embeds parts of the rectangular watermark image into selected regions of rectangular host image. This selection process matches the watermark and host image regions with same spectral distri-bution. For improving the speed of embedding and extraction process, they used non overlapping squares of different sizes. They used quad tree partitioning technique for division of host image but before that they use MRF (Markov Random Field) image segmentation algorithm on the host image. For the embedding and extraction process they use the hybrid concept of DWT and SVD after segmentation and partition algorithm. After that authors analyses the result of region based watermarking approach on the various attacks such as Gaussian noise attack, Salt and pepper noise attack, sharpen at-tack, rotation attack and GPEG compression attack. Proposed region based approach has higher image quality in almost all types of attacks. Thus by reviewing this research paper it is concluded that propose region based approach is more efficient and effective than original DWT-SVD algorithm.

In research paper [5], authors presented a novel approach for digital image watermarking algorithm named as NEA (New Embedding Algorithm). This new approach is non-blind and based on combination of DWT and DCT transforms. This algorithm was implemented for 2 level, 3 level and 4 level of DWT and also give comparative analysis for all levels. Authors also compared the performance of NEA with the coxs additive algorithm. For performance analysis, two parameters have been tested as imperceptibility and robustness. By performing this approach on image, authors concluded that NEA gives 3.04 dB and 9.33dB better PSNR compared to Coxs additive algorithm for 4 level DWT. It is 1.28dB and 2.44dB better in case of 3 level DWT, and 1.05dB and 1.94dB better PSNR in case of 2 level DWT with attacks and without attacks respectively. As well as, the NEA extracts the marked image 46 times better than Coxs additive algorithm in 2 level DWT and it is 7 times better for 4 level DWT and 2 times better in case of 3 level DWT

Authors of the paper [7] put emphasis on the security and capacity of the watermarking system. They proposed blind approach for image watermarking by hybridization of DWT and SVD. In which authors replaced the singular values of watermark image with the appropriate singular values of HH sub-band of original host image. They used gray scale image as host image. Moreover, in proposed system authors used key generation approach in embedding and extraction phase of watermark for security purpose. Then they tested the proposed approach against different types of attacks for check the robustness of the system.

In research paper [6], block based digital color image watermarking scheme was proposed using SVD in which authors divided an image into blocks which gives more space for embedding

multiple watermarks. The host color image was first divided into Red, Green and Blue color spaces. Each color space was further divided into four blocks, and then four watermark images were embedded in each of these color space. Thus one can embed the multiple watermarks in single host image by using this proposed skim. Here, authors divided host image into various sized blocks, thus it is possible to embed the watermark having different sizes. This proposed approach also works well for rectangular images as square images.

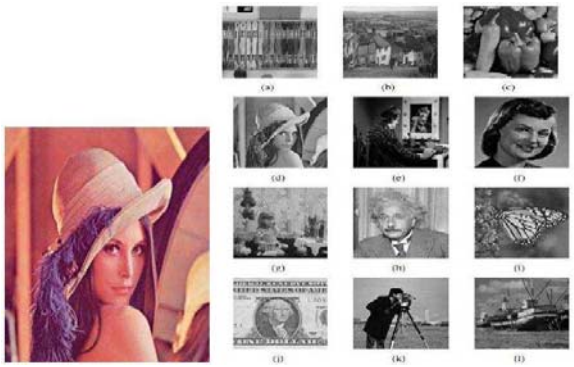

Fig. 6. Multiple watermarks of various size

Fig. 7. Multiple watermark embedding using SVD

Authors of the paper [8] highlighted on the fact that SVD provides much better robustness than DWT and DCT. They proposed blind watermarking approach in which they embeds the bits of singular values of watermark image into the wavelet coefficients of the original gray scale host image. They applied the proposed approach in block by block manner. After that, they tested the robustness of the proposed approach by applying various attacks on watermarked image.

Fig. 8. Watermarking using SVD

V. CONCLUSION

Digital image watermarking must be needed in todays digitized world where digital image is most widely transferred file over the internet. After reviewing the papers, we can say that there are so many techniques in spatial and frequency domain for image watermarking from which DCT, DWT and SVD are most widely used techniques. SVD provides better noise immunity but the main drawback is that it cannot be used alone because of its large computations requirements. DWT provides good robustness but the visibility is average. In case of DCT, we can attempt acceptable visibility and average robustness. Hybridization of DCT and DWT gives much better result than independent DCT or DWT because it overcomes the drawbacks of each other. In future work, we will use the combine approach of DCT, DWT and SVD to improve imperceptibility and robustness on color images

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CROSSTALK REDUCTION IN MULTI-CONDUCTOR TRANSMISSION LINES USING PERIODIC STRUCTURES OF COMPLEMENTARY SPLIT-RING RESONATORS

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Abstract

Crosstalk is a major concern in the printed circuit boards which degrades the operating performance of the system. Now-a-days the transmission lines are routed close to each other due to the technology advancement and miniaturisation in the physical sizes of the board. When these transmission lines are in close proximity energy couples to the neighboring lines to initiate the crosstalk. Crosstalk increases with the increase in the frequency. The two types of crosstalk are near-end crosstalk and far-end crosstalk. This article addresses the issues caused due to the crosstalk phenomena in the multi-conductor transmission lines and the way to reduce the crosstalk using periodic structures of metamaterial based complementary split-ring resonators (CSRRs). The CSRRs are etched in the ground plane beneath the transmission lines to reduce the crosstalk. S-parameters are simulated to measure the crosstalk parameters. Comparative measurements are carried out with solid ground plane, single unit cell of CSRR at centre, three and five unit cells of CSRRs for the frequency range of 5 to 10 GHz.

Index Terms: Near-end crosstalk, far-end crosstalk, transmission lines, CSRRs, printed circuit boards.

I. INTRODUCTION

Crosstalk is an electromagnetic interference phenomenon which occurs in a coupled parallel transmission lines when they are in close proximity to each other. Energy is coupled from one line adjacent line by means of mutual capacitance (C_M) and mutual inductance (L_M) exists among the lines which lead affects the performance the system. The two types of crosstalk are termed as near-end crosstalk (NEXT) and far-end crosstalk (FEXT). S-parameters are used to measure the NEXT and FEXT between the lines. Usually for a two conductor transmission lines S_{31} indicates the NEXT and S_{41} gives the FEXT. The crosstalk measured at near-end to the source is called as NEXT and far from the source end is termed as FEXT. The FEXT is a major concern in the PCBs which creates signal integrity problems. NEXT and FEXT are dependant on the frequency and increases with the increase in the frequency. Different methods have been proposed to reduce the crosstalk. Providing more spacing between the lines reduces the crosstalk but this leads to increase in the physical sizes of the board. Grounded vias and guard traces are placed in between the parallel lines to reduce the crosstalk. Addition of these materials complicates the design strategy and increases the cost. So a trades-off is needed between the crosstalk, design methods and physical sizes of the board.

Recently metamaterials are used to control the electromagnetic properties of the electronics a system operating on micrwave frequency. Metamaterials are created artificially to exhibit controllable electromagnetic properties not found in naturally available materials. They are frequency selective surfaces and possible to get defined properties by varying its physical

dimensions. Being the presence of inductance and capacitance between them they are treated as resonators. This article proposes a method to reduce the crosstalk between the lines using metamaterial based complementary split–ring resonators.

Additional crosstalk noise was produced to eliminate the initial crosstalk noise thereby cancelling the FEXT and NEXT effects [1]. An idle conductor bar terminated at both ends which is equal to the width of line was inserted between the transmission lines. Grounded vias were placed between the lines and makes the crosstalk potential to zero [2]. Metal filled via holes were inserted in between the Transmission lines to reduce the crosstalk phenomena and measurements were taken by varying the number of via holes [3]. Grounded vias were inserted in between the transmission lines of the board reduce the crosstalk [4].The concept of split rings to get desired performance in microwave regime was introduced. By varying the physical structures of the resonators the performance of the system can be modified [6] and CSRRs were introduced in the ground plane to minimize the NEXT and FEXT effects. The crosstalk reduction was also achieved when single and multiple combinations of CSRRs were designed in ground plane [7]. CSRRs can be etched by conventional etching technique and fabricated easily. So, introduction of metamaterial based CSRRs produces the necessary field in the ground plane to reduce the NEXT and FEXT effects by cancelling the electric and magnetic field produced by the transmission lines. In this paper the crosstalk effects were reduced by designing ring shaped CSRRs in the ground plane with outer diameter of 8mm and inner diameter of 5mm with a capacitive gap of 0.5mm.

II. CROSSTALK

Now-a-days electronics systems are operating on very high frequency interms of several GHz.In a coupled parallel line if one of the conductors is connected with a driver which operates on very high speed, digital pulses makes its variation and making change in the self and mutual impedance parameters. Electromagnetic energy is coupled from one of the line to other because these lines are in close proximity.

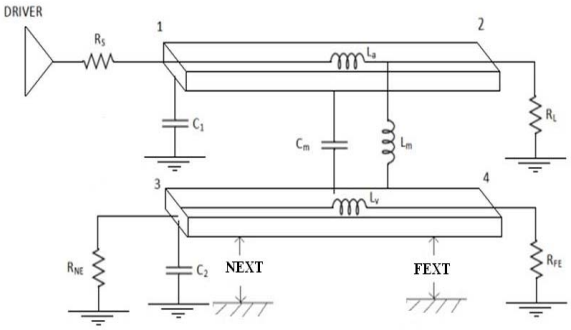

Fig.1 Concept of NEXT and FEXT

NEXT is measured at the near-end of the source and FEXT is measured at the far-end of the source as shown in Fig.1. In a three conductor transmission line the two values of NEXT are represented by S_{31} and S_{51} whereas FEXT are represented as S_{41} and S_{61}. All the ends of the multi conductor transmission lines are terminated with 50 ohms.

III CSRR

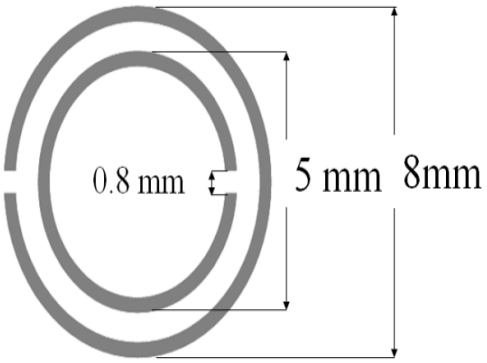

Fig.2 Physical Dimensions of CSRR

Metamaterials are artificial structures and can be tuned to any frequency to get desired performance. Split-ring resonators (SRRs) are one of the metamaterial structures to get the better response in high frequency region. The dual part of SRRs is complementary split-ring resonator which is created by etching the SRRs. The Fig.2 shows the design structure of CSRRs with the specifications which is used to reduce the crosstalk effects in the ground plane. The Fig.3 shows the five numbers of CSRRs in the ground plane and transmission lines in the conductor plane. The total length of the transmission line is taken as 100mm and five numbers of unit cells of CSRRs were placed with the following dimensions: 1st unit cell of CSRR

is placed at 12mm from the starting end and succeeding CSRR are placed with a distance of 25mm and 50mm.

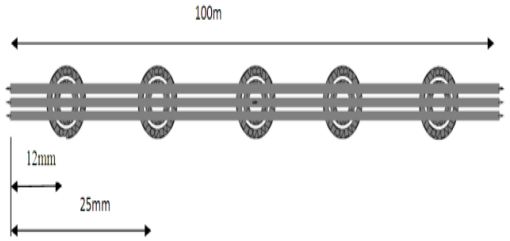

Fig.3 Multi-conductor transmission lines loaded with 5CSRRs

The simulations are carried out for the solid ground and with 1 CSRR placed at the centre, 3 CSRRs and 5 CSRRs.

IV. Measurement Analysis

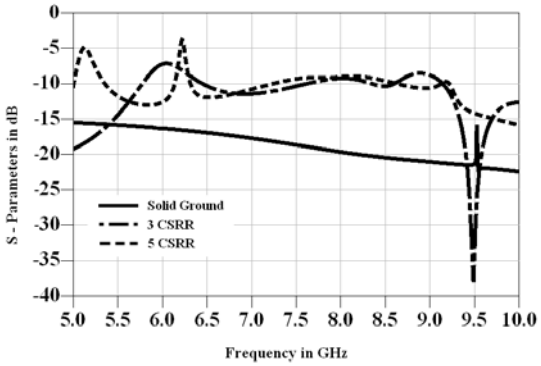

Fig.4 Near-end crosstalk – S (3, 1)

The Fig.4 shows the NEXT values measured at the near-end of the second conductor. By using solid ground plane the NEXT value is – 20 dB at 9.5 GHz and the NEXT were achieved as -38 dB by using 3 CSRRs in the ground plane which is -20 dB reduction compared with solid ground plane.

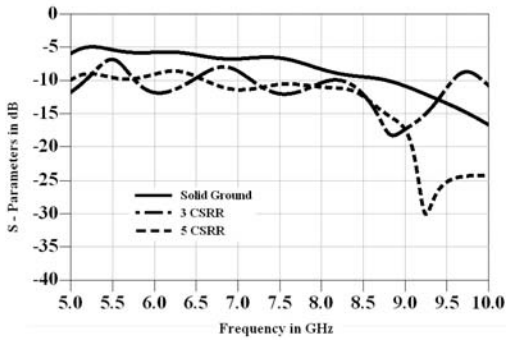

Fig.5 Far-end crosstalk – S (4.1)

Far-end crosstalk plays very important role in signal degradation due to its mutual inductance property. A strong magnetic mutual coupling is created between the transmission lines which enhance the FEXT especially in the high frequency of operation.The Fig.5 shows the FEXT for the solid ground plane, with 3 CSRRs and with 5 CSRRs. The S_{41} values are plotted for the frequency range of 5 to 10 GHz to the adjacent second conductor of the multiconductor lines and. The analysis is carried out for the three cases; first the solid ground gives -12 dB at 9.5 GHz and FEXT value improved for three CSRR configuration in which the 5 CSRRs in the ground plane gives a reduction of -30 dB. With the three CSRRs in the ground plane the FEXT is reduced -19 dB at a frequency of 8.75 GHz. The FEXT for the third conductor of the multi-conductor configuration is plotted in the Fig.6.

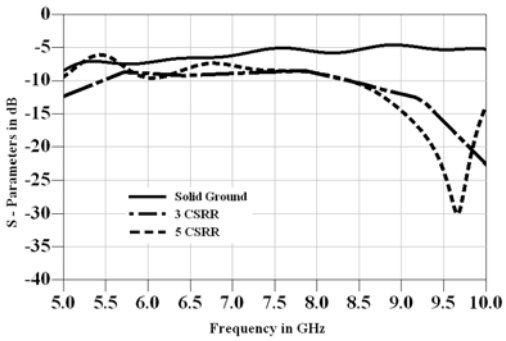

Fig.6 Far-end crosstalk – S (6, 1)

From the Fig.6, the FEXT value for the solid ground has an average of -5dB over the entire frequency range. The use of 3 CSRRs in the ground plane reduces the FEXT values to a of -25 dB at 10 GHz. The design of 5 CSRRs in the ground plane gives a reduction of -30 dB at 9.6 GHz. Based on the dimensions of CSRR the crosstalk value has been reduced to a determined value.

V. Conclusion

The behavior of two types of crosstalk for the solid ground, with 3 CSRRs and 5 CSRRs beneath the multiconductor lines configuration were analysed in this work. From the results the reduction of crosstalk parameters were achieved by designing the periodic structures of CSRRs in the ground plane.

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