SOME INVESTIGATIONS ON IMPROVING PERFORMANCE OF FADING CANNELS IN MANETS

Thesis submitted to College of Engineering and Technology of Srinivas University in fulfillment of the requirements for the Degree of

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BONAFIDE CERTIFICATE

This is to certify that the Thesis Entitled "**SOME INVESTIGATIONS ON IMPROVING PERFORMANCE OF FADING CHANNELS IN MANETS**" Submitted to Srinivas University, Mukka, Mangaluru, Karnataka State, India by **ANBU KARUPPUSAMY. S** for the Award of the Degree **Doctor of Science** in Electronics and Communication Engineering is a bonafide research work carried out by him. The Thesis has reached the Standard of the regulation for the degree and it has not been formed the basis for the award of any Degree, Diploma, Associate ship, fellowship are any other similar title to the candidate or any other Person(s).

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ANBU KARUPPUSAMY S

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3GPP	-	Third Generation Partnership Project
ABER	-	Average Bit Error Rate
AF	-	Amplify-and-Forward
AFD	-	Average Fade Duration
AOF	-	amount of fading
ASEP	-	average symbol error probability
AWGN	-	Additive White Gaussian Noise
BER	-	Bit Error Rate
CC	-	Cooperative Communications
CDF	-	Cumulative Distribution Function
CDMA	-	Code Division Multiple Access
CMDP	-	Constrained Markov Decision Process
CR	-	Cooperative Relay
CSI	-	Channel State Information
CSI	-	Channel Side Information
CSS	-	cooperative spectrum sensing
DF	-	Decode-and-Forward
DF	-	decode and forward
DFH	-	Dynamic Frequency Hopping
DoS	-	Denial of Service
DPLL	-	Digital Phase Locked Loop
ECO	-	Energy-aware Co-Operative
EMW	-	Electro Magnetic Wave
ESI	-	Energy Side Information
FANET	-	Flying ad hoc network

FDD	-	Fade Duration Distribution
FDMA	-	Frequency Division Multiple Access
FDST-TR	-	fully distributed space time two-way relaying
FER	-	Frame Error Rate
FSC	-	Feasible Solution Construction
FSOK	-	Frequency-Shift Orthogonal Keying
GPS	-	Global Positioning System
HF	-	high-frequency
IC	-	interference cancellation
IID	-	independent and identically distributed
IMANET	-	Internet Based Mobile Ad hoc Networks
IND	-	independent and non-identically distributed
INVANET	-	Intelligent vehicular ad hoc networks
ISI	-	Inter-symbol interference
ISI	-	Intersymbol interference
LCR	-	Level Crossing Rate
LOS	-	Line of sight
LP	-	Linear Programming
LTE	-	Long-Term Evolution
MANET	-	Mobile Adhoc Network
MC-SS	-	Multi-Carrier Spread Spectrum
MGF	-	Moment Generating Function
ML	-	Maximum Likelihood
MnEP	-	minimum energy path
M-QAM	-	Mary Quadrature Amplitude Modulation
MRC	-	maximal ratio combining
MxRE	-	maximum residual energy path
OSI	-	Open System Integration

O-TR	-	Opportunistic Two-way Relaying
PAN	-	Personal Area Network
PAPR	-	Peak-to Average Power Ratio
PDF	-	probability distribution function
PIC	-	Parallel Interference Cancellation
PL	-	Piecewise-Linear
PM	-	probability of missed detection
QPSK	-	quantum phase-shift-keying
REU	-	Relative Energy Usage
RSD	-	robust Soliton distribution
SER	-	Symbol Error Rate
SHF	-	super-high frequency
SI	-	Side Information
SIC	-	Successive Interference Cancellation
SINR	-	Signal-to-Interference Noise Ratio
SISO	-	single-input single-output
SISO	-	single input single output
SM	-	spatially multiplexed
SNR	-	Signal - to- Noise Ratio
SS	-	Spread Spectrum
TAS	-	Transmit Antenna Selection
TDMA	-	Time Division Multiple Access
TRSC	-	Threshold based Relay Selection Cooperation
TWDP	-	Two Wave Diffuse Power Fading
UHF	-	ultra-high-frequency
UWB	-	ultra-wideband
VANET	-	Vehicular ad hoc network

ABSTRACT

A novel method to reducing the fading problems by implementing the improved fading channel model in the MANET. This efficient model is developed to reduce the fading problems in MANET. The effect of speed of nodes on key network performance matrices i.e. average delay, throughput, jitter, and PDR as these parameters play very important role in the performance analysis & design of the mobile Ad-hoc network over the multipath fading environment for network performance of MANET . This can provide the best fit for fading problems. By using this novel method we generally reduce network communication problems. A novel approach QPSK based Grover searching algorithm using to upgrade the fading channel performance in MANET. In our second stage of research work , for enhancing the fading channel used to prove the efficiency of the optimal routing and Network lifetime maximization in mobile ad hoc network. Thus it deals with to reduce Path loss, Total Energy consumption, Average Bit error Rate, and improve Packet Delivery Ratio, Probability Density Function, Data Transmission Rate. The main aim is to achieve the fading channel performance is to improve efficiency and well-organized network communication.

Generally Channel modeling is an important issue before establishing high speed communication link. Bit error rate is an important performance parameter of a fading channel is more practical model because it considers both line of sight and non-line of sight components. At receiving end signal get faded due to vector addition of multi-path components. The received signal strength also fluctuated with respect of time due to mobility in environment. Received signals sometime go into deep fading which is more prone to errors. Such errors are sometime difficult to remove with the help of channel coding if

signals remain in deep fade for a long time. In such situation space diversity is an effective method for improving signal quality. Link quality can be improved with the help of space diversity techniques. Hence later on we have analyzed outage performance of a link having single transmitting antenna and two receiving antennas. In some application installation of large number of receiving antennas are not possible.

CHAPTER 1

INTRODUCTION

1.1 OBJECTIVE

This chapter furnishes a bird's eye view of Fading Channels, Nakagami Model, weigh bull model and their applications, need for minimizing the fading problems and also about their uses. This chapter helps us to understand the proposed research work in a better way. Also it presents the detailing about the Hybrid N.W.Gamma scheme for reducing the Fading problems. The fore most intention of this research work is to design and evolve the Anti-fading network and also to improve its performance for reducing the Fading problems in MANET.

1.2 MOBILE AD HOC NETWORK (MANET)

MANET is a network of mobile routers interconnected by wireless contacts that subsequently incorporate to configure arbitrary topologies. Due to its mobility nature, the wireless topology seemed to be dynamic in nature. Owing to the absence of defined configuration in the links, it emerges as intricate to emprise the existing routing methodologies for system services and depicts critical issues in communication security system. As the mobile devices are less power consumption equipments in nature and substandard performance in progressing loads, the demands in system security dispute with mobile network demands. Searching for a right paradigm, Ad-hoc wireless networks are found to be an apt one in multi-hop wireless networking that is progressively prevalent in this technological world. Therefore, it plays a vital role in calculating circumstances that comprises of infra-structured and infrastructure-less mobile networks.

It is an automation technology which has been designed in order to plan, configure, manage optimize the networks in a simple and rapid way. Nodes communicate with the other nodes either directly or through the intermediary nodes. Each and every node in a MANET primarily exercise as mobile routers involving in routing protocol that is needed for decision making of routers and managing the routes. Because of the property of infrastructure less and automatic organizing of MANETS, they are specifically appropriate for several applications that leads to distinct outdoor events such as emergency cases, during natural calamities, military side operations, exigent business meeting, to communicate in the areas where wireless infrastructure is absent.

Multiple hops are incorporated in the MANET since it is found to be suitable for forming the multi-hop wireless networks. On the basis of wireless topology, the routers are accessible for random movement and arrange themselves. Hence it can function in standalone approach else it may be tied to the Internet. Some of the significant concerns in the designing of routing protocols are Huge network size that are Interconnected with heterogeneity equipments, Multi-hop, bandwidth, mobility and stipulations in battery power. In such cases , it is mandatory to devise a routing algorithm in such a way that the two host mobile utilizers communicate with each other where there is no need of permanent wired setup is attainable.

Various applications such as academic researchers would like to connect with the wide area networks for their research work, connecting with the ambulance during an emergency period and students to listen to a video conference. To establish these kind of connections, a group of mobile hosts could be formed into a network without any intervention from the central part.

The Mobile Ad hoc Network (MANET) is created in IETF. Main intention of this group is to emerge and emanate MANET specifications. In addition, the specifications have to be revealed to the Internet standard track. When the networks comprise of hundreds of routers, then it is a challenging task.

Some of the general issues that are addressed by ad hoc network are :

- disguised terminal issues,
- Packet losses owing to transmitting errors,
- Battery constraints.
- Limited transmission range

The working area of network access could be emphasized more and thus through this process; the wireless connection could be provided to those areas that has very less or zero coverage. Integration to wired infrastructure will be endowed via multiple gateways with feasibly disparate efficiency and practice. In order to enhance the level of performance, the mobile host must have the capability of adopting variations in performance, scope to switch gateways when it is advantageous. Ad hoc networks convey characteristic such as simple connection to network accessibility, multi-hop creation which is dynamic in nature and straight peer to peer communication. Pervasive networks provide benefits to the consumers. Due to the nature of the mobility, customers might switch from one network to another, session transfer might happen. Inspite of these switch over, the customers would not face any difficulties and therefore they receive the same customized services. MANET refers to the concept of connecting “anywhere and at any time" into reality. Disaster recovery and applications in military could be incorporated and it could be stated as an example. Apart from that, these networks outperforms in other areas.

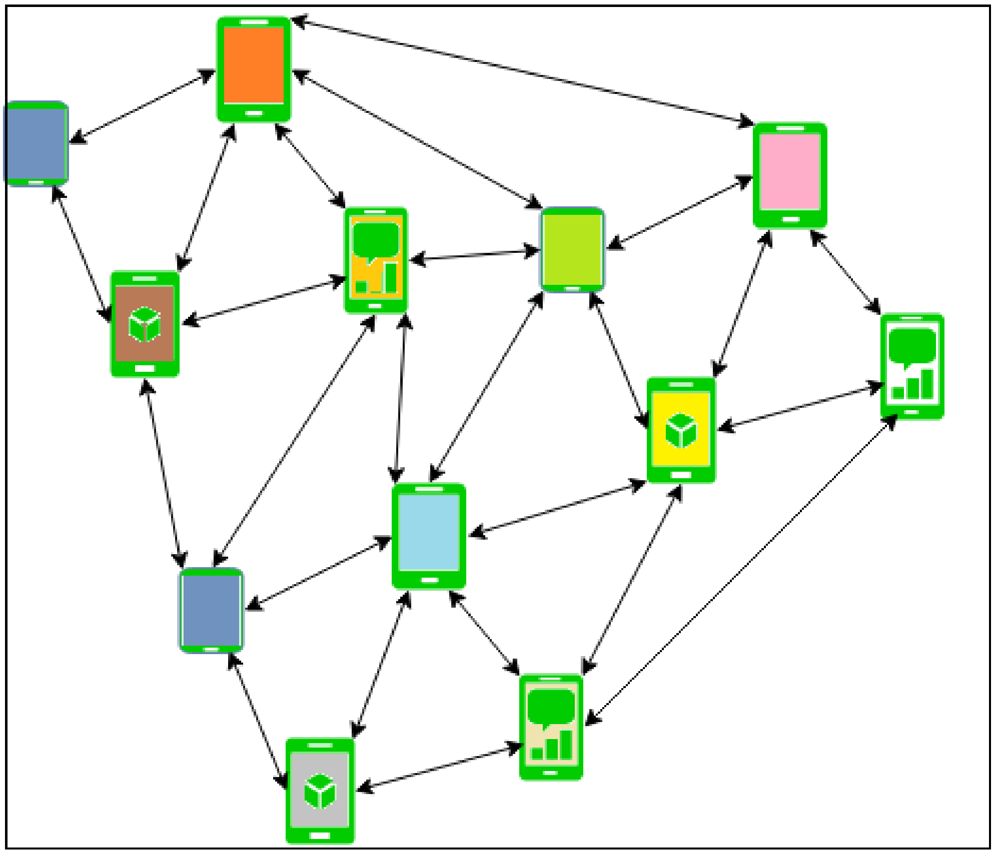

Figure 1.1 MANET

Figure 1.1 illustrates the physical structure of MANET. One special characteristics of an ad hoc network is the inevitable connection of gateway to the wired backbone. Moreover, the gateway is used to connect two different types of networks through the global and local routing procedure.

MANET does not rely on conventional configuration or base-station. Usually, nodes in this network are supposed to move anywhere due to its mobility nature. On account of this, the network topology of MANET may alter instantly at random. The nodes themselves must accomplish all network actions such as ascertaining the topology and distributing data packets either independently or as a group. Deployment of MANET may be like a small constant network with an emphasis on power constraint on a large scale or a dynamic network. The network comprises of a group of self-governing mobile nodes linked through wireless links and the communication between the nodes gets established. Dynamic nature of topology leads to the rearrangement of the nodes so that communication between the nodes could be facilitated through the broadcasting messages from one another i.e multi-hop when the nodes are beyond the transmission range. MANET power depends on contribution of the participating nodes. When nodes are situated neared, then MANET is found to be more powerful. However, to support the network it has been observed that the MANET is very expensive. Consumption of CPU time, memory, network bandwidth uses energy. Consequently, nodes distribute packets of data to other nodes. Meanwhile the nodes have the ability to retain their own data. MANET has numerous potential applications that are normally set up in the events of temporary operations for urgency or if resources are unavailable to set up complex networks. Some traditional examples are exigency rescue-search functions, Traditional events, conferences and battlefield communication in between moving vehicles and militaries. It could be stated that the MANET could satisfy the current needs of mobile computing field due to its several promising features.

1.3 FEATURES OF MANET

- **Dynamic Topology:** This network does not follow a static topology. Due to its mobility, nodes might come in or leave the network at any time.

- **Bandwidth constrained variable capacity links:** Wireless connections customarily have inferior consistency, efficacy, strength and ability. It has a very low power when compared with the radio transmission rate. In addition, it is found to less accountable in certain parameters such as inference situations, multiple access, noise and fading.

- **Self- governing Behavior:** A node could behave as an autonomous node by acting as either as a router or as a host.
- **Energy Constrained Function:** Mostly all the nodes depend on batteries or extra sources for their energy. Certain characteristics of the mobile node are light weight, power and memory.
- **Bounded security**: It is observed that the wireless network is likely to be exposed for security threats. Since the network is distributed in nature for functions such as security, routing and alignment of host, the centralized firewall could not be implemented.
- **Human Intervention:** To create the network, human pry is not much needed. Therefore, the network is dynamic in nature.

1.4 ERENT TYPES OF MANET

The two categories of MANETs are presented beneath:

- Vehicular ad hoc network (VANET): The objective of the network is to enable an efficient communication with an extra mobile or devices situated in roadside.
- Internet Based Mobile Ad hoc Networks (IMANET): A few Internet protocols - TCP/UDP and IP are used in wireless ad hoc network. A network routing protocol is deployed so that mobile nodes and routes that exist between the source and destination

- Numerous ad hoc network consent Internet protocols like TCP/UDP and IP. A network-layer routing protocol connect mobile nodes and incorporate routes in IMANET systematically.
- Intelligent vehicular ad hoc networks (INVANET):AI is implemented in such a way that when there is an unexpected vehicle collision and accidents, these could be handled.
- Flying ad hoc network (FANET): FANETs comprises of automated vehicle that enables the facility of connecting to the remote regions and mobility nature of vehicle. MANETs could be deployed based on the application need.

1.5 MANET APPLICATIONS

MANETs could be deployed in disaster recovery situations, civil administration and rescue operations in military fields. Due to the deficiency of the infrastructure in wired network, the establishing cost of network is reduced and hence it makes the MANET as a remarkable technology. A few applications of MANET technology might comprises of both commercial and industrial applications which involves the data exchange in a cooperative manner.

The most common MANET applications are as follows:

1. **Personal Area Network (PAN):** In general, a PAN covers very limited area. MANETs serve appropriately in such type of coverage areas. A PAN network can be formed by using Laptops, PDA‟s (Personal Digital Assistants), communication devices, etc.

2. **Vehicle Network**: The drivers of vehicles in a traffic stream can pass information regarding traffic conditions, jams, obstructions etc to other drivers-thus forming a vehicle networks.

3. **Other applications**: MANETs find large scale usage in transport service networks airways, waterways, highways and railways for exchange of information. Also in meeting centre's, business establishments, market places, city centre's etc where speedy services are the criteria. MANETs are the ideal means of communication for civil administration in disaster management and during relief and rescue operations. During military conflicts also MANETs find wide spread usage for locating targets, forecasting threats and passing information about enemy positions, formations etc.

Main issue in a MANET is the identification of optimal path from the source node to the target node. MANETs are highly susceptible to link failures because of node mobility and dynamic environment. As the nodes have the freedom of moving from one location to another location, link failure does exist. Therefore, from various investigations, it has been observed that the feature mobility contributes much in evaluation of routing protocols. The aspect of mobility as proposed by Larsson and Hedman, is based on relative nodes movement, and same has been represented by considering a parameter known as mobility factor; which depends on speed and movement pattern (directions).

Under mobility modeling, tracking the user's location could be identified and it could be defined through simulation and analytical models. The main reason behind the simulation models is due to the realistic nature so that it could help out in solving the problems. There are several mobility models which is used to explain the transit form of the mobile users which in turn represents the dynamic behavior for a certain extent. There exists various mobility models such as Random Waypoint, Group, File based, Pedestrian, Manhattan, Freeway, Random Gauss-Markov etc.

The Random Waypoint model is found to be extensively implemented in performance comparison studies of routing protocols. As mobility models stipulate mobility, the same could be used to contend the evolution pattern in the scenario. Hence, the mobility models are helpful in recording the observations and drawing conclusions from the simulation studies. Hence, there is a real need for investigating the effect of mobility and its effect on MANET routing protocol performance. The QualNet simulator is allowed to a user to deploy the four mobility models - Random Waypoint, Group, Pedestrian and File based model. Among these, in the present study, the researcher has used three mobility models namely Random Waypoint, Group and File based. However, the Pedestrian mobility model has not been considered in this work, due to technical flaws encountered during simulation. The detailed description of the mobility models considered in this thesis is to stimulate the mobility effect during the performance estimation of routing protocols has been represented.

In MANET, there are many issues which need attention of a researcher like routing, mobility, security, Ad-hoc network deployment, energy consumption etc. Among the several issues, routing is a critical issue that needs to be taken care of more accurately since the topology varies from time to time. Moreover, each node in the system operates both as a mobile node and router to store and forward data packet from supplementary nodes. The lack of a backbone infrastructure in MANET allows entire network to change its topology frequently and without prior information.

The main function of the routing is to discover and retain the identified routes that exist between source and destination in a dynamic topology with the identified connections between the devices that use less resources. In MANET, a mechanism is required for routing the data packets from the starting place to the destinations. In MANET, every node participates in the communication and therefore the identification of the nodes that does the forwarding action is done. Hence for effective communication and passage of information; it is of paramount importance to identify and maintain all the routing protocol. Routing is termed as the interchange of information (packets) amid two nodes. The routing protocol provides a mechanism to reduce route loops and guarantee reliable message exchanges. There are many techniques to classify the MANETs routing protocols depending on packet delivery mechanism from pivot to target like unicast routing, multicast routing and broad cast routing. Nonetheless, the most widely used routing protocols are broadly categorized as under three groups as Proactive, Reactive and Hybrid protocols,

1.6 LIMITATIONS IN MANET

- The operation of the various mobile nodes could not be done effectively due to the absence of the centralized control.
- Dynamic topology: Random movement of the nodes due to its mobility leads to the link failure.
- Device discovery: Dynamic updates about the node is needed in order to involve those nodes in the routing process.
- Bandwidth optimization: When compared with the wired links, wireless networks possess very less power.

- Limited resources: The power and storage capacity of the node differs since the mobiles nodes depends on the battery power.
- Scalability: It refers to the adequate level of service by involving the resources that a network could be able to operate smoothly
- Limited physical security: Owed to the mobility nature, the network is likely to be affected by security threats and therefore there might be a chance for both the illegitimate users and attackers to access the medium which leads to diverse attacks such as IP spoofing, eavesdropping and denial-of services.
- Self-organization: Rearrangement of nodes could be done when the nodes move out of the coverage area.

1.6.1 Poor Transmission Quality

The most essential issue that arises due to the several error sources results in the deprivation of the received signal. Challenges in standard addressing scheme are to be implemented in Ad hoc addressing.

Network configuration: Dynamic nature of the MANET is the predominant cause for the active connection and disruption in the variable links.

1.6.2 Topology Maintenance

Location updates of the nodes in MANET needs more prominence. Hence, this has attracted various researchers to discover solutions. There are multiple routes for the radio signals to reach the receiving antenna and this is termed as propagation. Those routes definitely involve certain attributes such as meteorological conduit, ionospheric reflection and refraction, mirroring from worldly substance. Certain impacts that might be caused due to the multipath are phase shift of the signal, productive and damaging intrusion. Hence, this leads to the effect of fading which is defined as Rayleigh fading. The distribution that is caused due to the typical mathematical model is defined as the Rayleigh distribution. It is stated that existence of sturdy line of sight content with Rayleigh fading and this possess Rician distribution. Due to the multipath transmission in facsimile and television, jitter and ghosting occurs and thus it leads to the distressed replica of the image. Transmission bounds off due to the presence of any huge object and therefore the antenna at the receiving side might receive two signals that would be alienated by the delay. During the radar processing, there is a chance for the occurrence of the ghosts that might deceive the radar receiver. The special characteristic of these ghosts are that they act like the usual targets which might lead to the complexity of identification of the exact target echo. Aforesaid issues could be resolved by the integration of the ground map of the radar's background. In addition, it must reject all echoes that instigate below the ground or above the specific altitude. Inaccuracy and the superiority of the communications could be affected in the digital radio communications. Equalizers are used to balance certain errors. Contrarily, methods such as orthogonal frequency division modulation and rake receivers might be utilized.

1.7 SECURITY ISSUES IN MANETS

The following sub section describes about threats, vulnerabilities and attacks in any network that must be taken for consideration in order to devise several security measures.

1. Threat

When there is a chance for the network to get affected by an agent's attentiveness, then it is termed as the threat. The weakness of a system, operation could be exploited by following certain methods or techniques by the threat agents. Instances of threats consists of attackers, intellect services etc. The reasons for threat are listed below:

- Lack of infrastructure — The facility of certification/ authentication author capabilities are not found.
- Dynamically fluctuating network topology.
- Routing protocols subject to threat.
- Employ of complicated encryption algorithms.

2. Vulnerability

Vulnerability is a hardware or software weakness that provides an information system that could be exposed for the latent deployment. Certain operations such as attaining unauthorized admittance to data or disintegrate perilous processing could be done. Channel exposure wireless channels empower:

- Message eavesdropping and inclusion efficiently.
- Safe and secured places, they simply drop underneath the attack.

3. Attack

An effort to circumvent the safety measures on a system network could be considered as an attack. Hence, this might alter, alleviate or deny information. A few samples of attacks are such as identification of illegitimate rights, interpolating information deceptively, altering data, investigating network traffic, procuring illegal provision to the system or interrupt the network function that employs the malevolent software.

These attacks can be categorized as:

1. External Attacks

Any repugnant activity caused by an external or illegal source is classified as an external attack. It might include certain actions such as incorrect routing data, traffic congestion or lack of certain services.

2.Internal Attacks

Any legitimate user of the organization might attack the network. The organizational assets or operations could be disrupted. The attacker uses a substantial amount of resources, tools to deploy an attack and possibly eliminate the evidence of that attack. Attacks are of two kinds (i) Passive attacks and (ii) Active attacks

a. Passive Attack

When the attacker involves in illegal monitoring of the transmission in order to gather the information which is termed as eaves dropping is treated as a passive attack. The attacker simply perceives the content in the packet without the knowledge of both the sender and receiver. The focus of the attacker is to break the confidentiality of the message and does not do any damage to the system.

1. Eavesdropping

Eavesdropping is one type of attack which takes place in the MANET. Wireless medium is used for the transmission in Adhoc networks. The medium is shared and hence there is a possibility for the nodes in the network to overhear the transmission without any extra efforts. The goal is to identify the confidential information that has to be maintained in a secured way during the communication process.

2. Syn Flooding

The attacker keeps on passing the request in a repetitive manner in order to establish the link until the resources needed for a single connection gets exhausted or the count of request to reach a threshold value. It generates simple resource limitations for legitimate nodes. This attack is Denial of Service (DoS) type.

b. Active Attack

Information gathered during the passive attack in such a way that the user is compromised or network gets damaged. The node must possess the energy costs in order to perform certain harmful functions such as shuffling of the data. These attacks have the intention of damaging the system and are very crucial. It is considered as the threat since it tampers the information. Hence, these type of attacks could be either from the external or internal source.

Generic Attacks against Routing

The most important operation is the routing operation in MANET. There are chances of misuse of information during the routing process and therefore it leads to several types of attacks. From the various inferences, it is observed that the routing protocols are subject to bother from the malicious nodes. Protocols intended are exposed to the security threats and vulnerable to the misbehavior of the node. MANET routing protocols' design reduces the overhead and allows all the nodes to take part in the routing process. The design of a routing protocol should overcome the security risks and to ban the node which might have a significant impact on the operation of the protocol. Attacks that arises during the implementation of MANET routing protocols are described below.

1. Black Hole Attack

While the attacker node tries to broadcast the false message to existing supplementary nodes or to the node which has post the request for determining the route, then this attack is considered as the black hole attack. Furthermore, all the routing tables gets revised and therefore the information is been passed on to the malicious node which in turn rejects all the incoming packets.

2. Wormhole Attack

A wormhole is an out-of-band link between two nodes via wired or wireless links. Wormholes can be employed to forward packets quicker than via normal ways. A wormhole erected by an attacker and interconnected with another attacks like sinkhole, is a vital security threat.

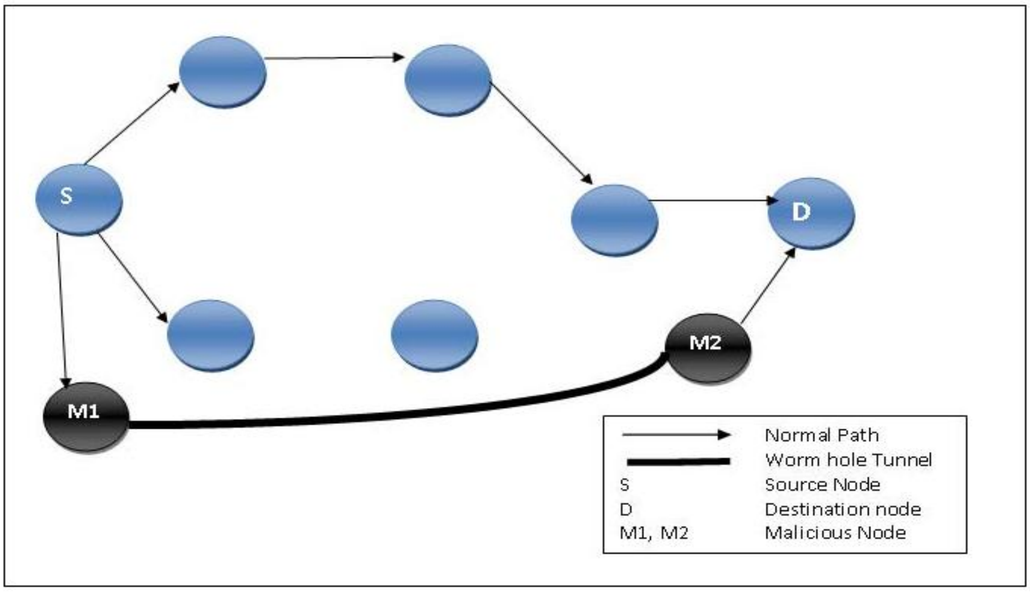

Figure 1.2 Worm Hole attack

Figure 1.2 illustrates wormhole attack. A malicious node entangles the packets and it is passed on to one more malicious node in the network which is located in a far off distance. Here, attackers have direct connection with the other attackers. Communication speed between the attackers' node are very fast when compared with the normal nodes in the WSN.

3. Gray Hole Attack

Packets get completely dropped during the routing and forwarding of packets. Attack is implanted by publicly spreading the false routes so that the legitimate nodes get to connect with the attacker node through this route. When the attacker node obtains the request packet, it in turn replies by providing the incorrect data to the destination knob. Therefore, the source node might not be in a position to identify the false route and therefore initiates the data transmission process which results in the gray hole attack. The packets thus transmitted gets dropped due to the presence of the attacker nodes in the route.

4. Location disclosure Attack

This kind of attack is a division of the data leak attack. The malicious node(s) emerges data with respect to the spot or the configuration of the network. The location findings for the sequential attack have been deployed independently. The information about the data location is gathered in the form of road map to facilitate for the nodes to understand easily about the position located on the target path.

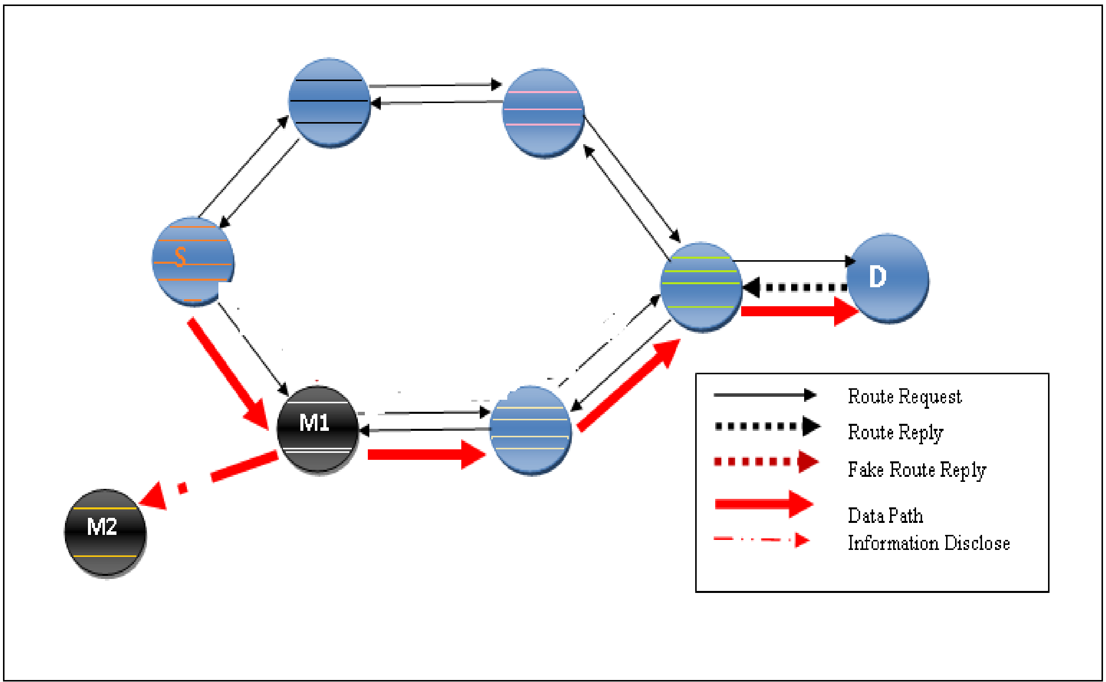

Figure 1.3 Locality disclosure Attack

As displayed in figure 1.3, node M_1 assemble whole topology information and either formulates it to furthermore malicious node M_2 or in its own exploits for attack on some other node. In this scenario, the node M_1will send a bogus message to the node S. Here, attacker (malicious) node(s) conveys the fabricated packets or ghost packets that comprises of routing information and thus it leads to the drain in the resources such as processing power, battery and bandwidth. The network traffic is appeared to be tightened due to the regular functioning of nodes and performance of the network.

5. Denial of Service (DoS) attack

This is similar to the flooding category of attacks. When the network capacity is reduced due to the presence of any event, then it is identified as DoS attack. Normally the main objective of this attack is to focus on server resources or the bandwidth of a network in order to divest the legitimate users to acquire the resources.

To be precise, the goal of the attack is crashing the network by mutilating the resources which leads to the clattering of the network. Moreover, the resources such as battery and computing power could be saved.

6. Man-in-the-Middle attack

An attacker node(s) fluctuates all data packets that is transmitted in between sender and receiver node. There are certain situations in which the misinterpretation of sender as receiver and vice versa has been done.

Figure 1.4 exhibits Man-in-the-Middle Attack, information transmissions going on through nodes S to D, malicious node M deviates all packets on the way it by sending incorrect reply messages. In imitation attack, malicious node behaves a normal node by resembling the node through the IP or MAC address.

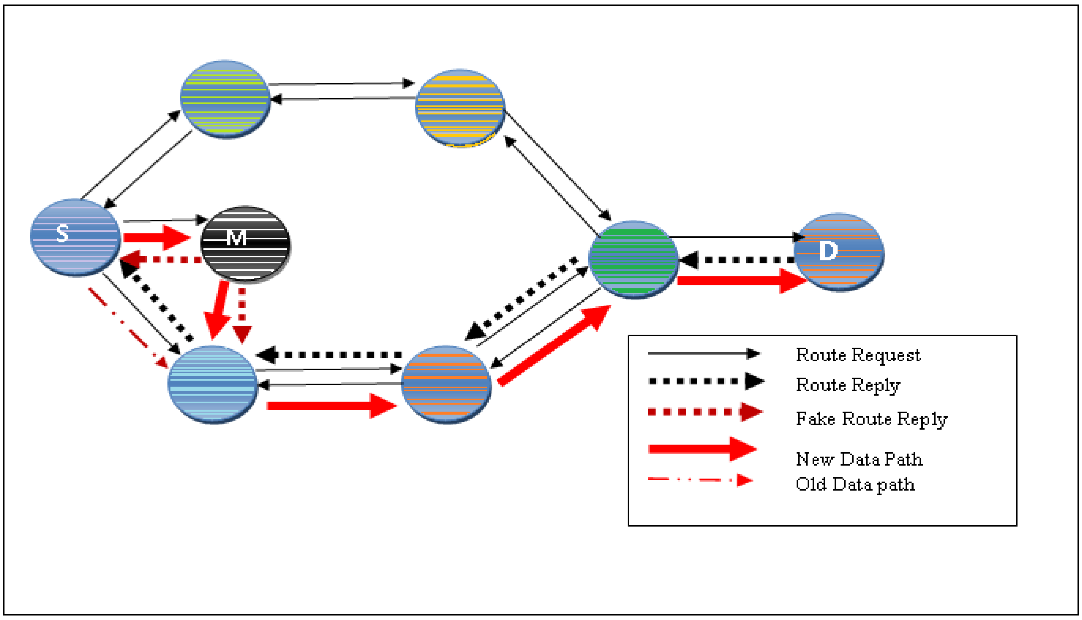

Figure 1.4 Man-in-the-Middle Attack

7. Sybil attack

In this category, malicious node operates like other disparate nodes with their similarities rather its own similarity. Therefore, the result of a voting employed for marginal security approaches would be overlooked.

1.8 WIRELESS NETWORKING

Customers in the near future would be able to communicate with everyone, at any time everywhere due to the mobility services. Wireless technology includes cellular and wireless telecoms, wireless LANs and extensive area data services, and global satellite life networks. Tremendous growth in the cellular telephone networks and the development of the laptop and palmtop computers leads to the great augmentation in the networking infrastructure. Today several industries adopt the wireless technology to establish the communication. Wired networks gets replaced with the wireless technologies due to the performance metrics.

Wired networks are primarily planned as per the stratum of the Open System Integration (OSI) model. Layers design are independent of each other but with a standard framework to interact among the layers. Therefore, the design of the network is simplified and thus it leads to the degradation in the performance. This seems to be very divergent in the wireless network. To augment the performance of the network, more technical issues could be addressed and solutions must be identified.

1.9 CONTROVERSIES IN WIRELESS CHANNEL

Switching strategies such as Time Division Multiple Access (TDMA) and Frequency Division Multiple Access (FDMA) were used for the communication purpose. On account of different categories of services, FDMA postulates bandwidth limit and TDMA demands high speed stipulation and channels fading.

Code Division Multiple Access (CDMA) methodology is used for wireless data transmission so that the bandwidth utilization and the deployment of the maximum spectrum could be adopted so that the number of services that are offered to the consumers could be more in number. Data streams are passed on in the same frequency by disseminating with the virtual noise sequence. Therefore, the wireless transmission could adopt the CDMA method in order to launch the transmission process for better empowerment.

The main factor that has to be focused is the medium that is been adopted for the communication process. The medium is exposed for certain attributes such as external noise, obstruction, meddling and multipath because there might be a chance for channel impairments which would not be expected due to the fluctuation in the consumer movement. The features of the radio channel enforce certain basic restrictions on the data rate and consistency of the communication. Restrictions have been driven by the aspects like mobility of the user and the transmission environment. For example, the consumer who resides in an indoor environment is facilitated by higher data rates with dependability when compared with the consumers who were in the terrestrial buildings.

The transmission is liable to the variations in time when the sender or receiver progresses because of the alterations in the reflections and attenuation. Hence, this leads to the complexity in designing a system with the ensured performance. The user connection, network topology is seen to be dynamic in nature which brings down the degradation in the performance. Therefore, to conclude with, it is necessity to design a method that proves to show a high performance must be planned and in addition it must conform to the certain factors.

1.10 MULTIPATH FLAT FADING

During the designing of a radio communication system, one has to consider the most important factor i.e multipath fading. Signals during transmission in any earthly radio communication system, the receiver receives the signal in two ways. One is through the direct path and the other is indirect path that results due to the obstruction of worldly matters like tall constructions, ground water and hills etc which are near main path. Due to this, there are two noteworthy channel impairments namely flat fading and inter symbol interference.

1.10.1 Flat- Fading

This fading affects the frequencies in the given channel. When the signal gets encountered, the amplitude is modified, signal rise and fall over a period of time. The bandwidth of the channel is more than the bandwidth of the signal. Hence, the occurrence components of the signal get varied. Due to the narrow behavior of the signal with reference to the channel bandwidth, the flat fading channels are claimed as narrowband channels. Therefore, this ends in the huge rise in Bit Error Rate (BER) with respect to certain factors that has been described.

1.10.2 Inter Symbol Interference

This is a predominant issue which is raised due to the multipath. Deviations in the frequency variations of the channel leads to this interference. Self- interference occurs due to the multipath reflection that carries a bit transmission might reach the receiver accordingly to the delayed multipath reflection that carries the previous bit transmission. Distortion in the transmitted signal happens due to the multiplication of signal components by several complex scale factors and hence it is known as frequency selective fading. A high bit error rate is raised by cause of ISI which could not be condensed by augmenting the signal power which in turn amplify the self-interference also. Due to this, the wireless medium gets collapsed. Hence, a necessity is raised for the regular transmission so that the issues that are raised could be solved.

1.10.3 Path Loss

For a given path, the loss could be computed as the relation of the received power with the transmitted power for the propagation path. It is observed that there is a power gain in both the transmitting and receiving aerials and in addition it is inversely relative to the square of the signal carrier frequency and the propagation distance. Several complex models for the path loss exists in WSN. In the exponential model, the received signal power is related with the transmitted power. Therefore, the association among the received power and the distance is found out from the expression in which γ is called as the path loss exponent. The values of γ are defined as $P_r \alpha\ d^{-\gamma}$.

The Signal to Noise Ratio(SNR) is derived by the equation P_R/N where 'N' is defined as the noise power. The SNR needed to encounter the Bit Error Rate (BER) depends on the data rate, characteristics and the communication methodologies that are used. Due to the reduction in SNR due to the path loss, the data rate or the signal range is restricted over the transmission. Path loss exponent identifies the measure of the signal power falls off related to the distance. Therefore, it could be stated that the wireless channels with less path loss exponents would be able to cover huge areas when compared with the large path loss exponents.

1.10.4 Shadow Fading

Due to the presence of terrestrial buildings, the signal gets blocked. Henceforth, the signal power acknowledged could be represented by a random variable. This variable is defined based on the count of the attenuating objects and as well as the dielectric properties from transmitter to receiver. Signal variations which are random because of these obnoxious matter are denoted as shadow fading. The received signal power at that particular distance based on the path loss must be constant. The signal power at same distances that has been received would be different because the shadow fading would be more in some locations when compared with the others. Hence, to assure that, the SNR requirements must be experienced at a specified distance, the power of transmission must be augmented so that the shadow fading could be compromised at various locations. This increase in the power results in the overhead of the battery which might be the source for the extra interference to the several other users who are located in the same band.

1.10.5 Interference

Several reasons could be identified for the interference to be encountered in the wireless channels. Among the available sources, the significant factor is the frequency reuse. It is identification of reuse of the frequencies in various locations that are separated geographically in order to ensure spectral efficiency. Inference that arise from the frequency reuse could be brought down by several factors such as dynamic channel allocation, directional antennas. But, this leads to the hue complexity in the system. Several other sources are contiguous channel interference that raised in adjacent channels and narrow band intervention who are located in the same band.

1.10.6 Fading Channel

Fading channels mechanisms got evolved in the year 1960 and in order to facilitate the over the range of vision which covers the extensive range of frequency bands. The 3-30MHz High-Frequency (HF) band is utilzed for ionospheric communications, and the 300MHz-3GHz Ultra-High-Frequency (UHF) and 3-30GHz Super-High Frequency (SHF) bands are implemented for tropospheric scatter. Illustration of fading effects in mobile digital communication system could be done with the early models of fading effects that were deployed in the mobile radio system.

Utilization of the Rayleigh fading in UHF band damages the mobile during the designing of networks. The next phase is that the band restricting filters has to be introduced. The objective of the filter is to serve like the typical matched filter. The features of filters contribute in framing the approaches which are needed in order to mitigate the filter-induced ISI. Free space model considers the area among the transmitter and receiver antennas as it is able to captivate or reproduce the Radio Frequency (RF) energy. The inverse square law is the principle that works behind the free space model for the diminution of RF energy.

Signal's random fluctuations or fading due to the multipath propagation is denoted as fading and scintillation. The challenging task is in the end-to-end modeling and design of systems which decrease the fading effects.

There are two types of fading effects namely large scale fading and small scale fading. Signal attenuation results in the large scale fading. The average signal power attenuation are characterized by the large scale fading. Mean –path loss could be computed through the statistics of large scale fading. When there are any geographical changes between the transmitter and receiver, they might be considerably small and it is denoted as small-scale fading. Aforesaid fading is also termed as Rayleigh fading as it is observed that there are huge number of reflective paths and signal coverage is explained through the Rayleigh pdf. If line-of-sight takes place, then the small scale fading coverage is defined as Rician pdf.

Both types of fading occur in mobile radio. Signal time spreading and the time nature of the channel are the indicators of the small scale fading. In signal dispersion, the fading degradation is categorized into frequency-nonselective and frequency-selective. Fast and slow fading are the two kinds of fading degradation.

1.11 HYBRID N.W GAMMA SCHEME MODELS

Nagagami model is considered as the radio propagation model and from previous studies, it is found that, this model possesses more parameters that could be configured. Moderation of fading channel on highway to the perfect free space channel could be done. The shape factor 'm' value is varied and therefore this results in the various highly fading scenarios such as city,urban or the highway. Usually, this model is suitable for the implementation of the performance of the protocol in MANETs. The non-monotone failure rates could be demonstrated the improvement in the distribution. Therefore, the exponentiated forms of distribution is appropriate for the real life problems. The author gupta made a thorough analysis and stated that the models lead to both monotonic and non-monotonic failure rates irrespective of monotonic feature of baseline distribution.

An extended work done by Weibull and the Gupta family, is found to be the extension of the Mudholkar. In addition, a detailed analysis and a comprehensive survey has been done by the author.

1.12 SUMMARY

The introduction and various challenging issues are addressed in this chapter. The main factor in fading is the various issues in Networking This chapter implicitly explains the necessity of anti-fading remedies. This chapter gives a clear idea about the whole thesis in a better way.

CHAPTER 2

LITERATURE SURVEY

2.1 INTRODUCTION

In wireless medium, when the transmitter transmits the data to the receiver, the signal might get reflected, diffracted and scattered due to presence of clutters. Hence, receiver is more liable to collect huge copies of signals. Several path of the signals eventually constructively collated and sometimes destructively collated. In addition, the mobility nature in the environment position leads to clutters which in turn results in the construction of the signals which could be combined at the later stages. The transmission rate relies on the movement of the environment. As a consequence, the fading environment receives signal erratically that fluctuates with respect to time. On occasion, received signal strength fall thousand times beneath its average value that makes out error at the time of detecting receiver signal.

In this case, high energetic transmission will not be supportive for lowering the error probability. In low mobility situations, if signal is in deep fade then it will stay in deep fade for a long period. This depicts the collapse nature of the channel. In this issue, channel coding will not so effectual to diminish bit error rate as channel codes will flop most of time. Diversity is a very powerful approach for decreasing error probability in wireless channel. Several variant of diversity approaches are available in recent times but space diversity is most prominent as there is noconcern of bandwidth expansion of the signal. Therefore people are exploring space diversity regularity. The wireless channel is a very complex network in both time fluctuating and time distributive. Such channel can be executed by statistical method.

2.1.1 Fading

Received signal power variation with respect to time due to variations in the communication path is known as fading. Various factors that supports fading are discussed earlier. It relies upon encompassing atmosphere including rain, lightning etc. Normally in the mobile environment, when there are obstacles in the path, then fading occurs and thus it leads to more intricacies in the transmission process.

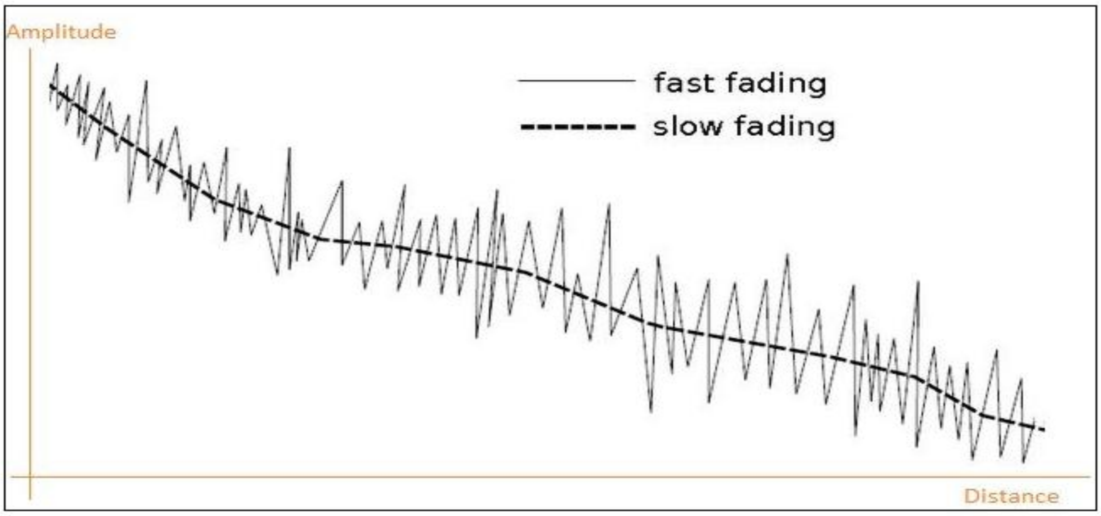

Figure 2.1 Fading

Figure 2.1 illustrates two fading techniques. (i) Large scale and (ii) small scale fading.

- ➢**Large Scale Fading:** Loss of pathway and shadowing could be classified under large scale fading.
- ➢**Small Scale Fading:** It is classified under two categories:

(i) multipath delay spread as well as

(ii) doppler spread.

The multipath delay spread is categorized still into frequency selective fading and flat selective fading. Doppler spread is classified as fast and slow fading.

➢**Fading module**: These types are executed as discrete models or distributions that comprises Rayleigh, Rician, Nakagami, Weibull etc.

This is mainly due to the signals that reflects due to the terrestrial constructions whereas the scattered signals are caused due to the presence of objects such as tress and towers.

Certain instances of fading models for the dissemination of the attenuation are:

- Disseminative fading types with numerous echoes, each exhibited to desperate delay, gain and phase shift frequently constant.
- Nakagami fading.
- Log-normal shadow fading.
- Rayleigh fading.
- Rician fading.
- Binary Wave with Diffuse Power (TWDP) fading.
- Weibull fading.

2.2 AN AUGUMENT MODEL OF HYBRID N.W GAMMA SCHEME FORENHANCING THE FADING CHANNELS PERFORMANCE AND UPGRADING ITS PERFORMANCE IN MANETS THROUGH QPSK BASED GROVER SEARCHING ALGORITHM

Juan M. Romero-Jerez et al (2006) highlighted the precise computations from the SNR values and error rates which has been computed on an average for a network which has deployed Transmit Antenna Selection (TAS) and a multichannel receiver employing MRCD or post-detection EGCD in Nakagami fading. Variety of modulation approaches that includes Mary Quadrature Amplitude Modulation (M-QAM) have been reasoned with rectangular array and QPSK. From the transmit aerial, SNR outcomes are noticed for a certain period of time.

Min-Kuan Chang et al (2009) investigated the performance of 4/16 Quadrature Amplitude Modulation (QAM) hierarchical modulation which has deployed gray code mapping in the network over Rayleigh fading channels that are independent. Distance parameters in the source and the relay are selected and has been analyzed. This mainly improves the BER of the refinement bits. In addition, the combined communication systems' ease is displayed and it could be compared with the traditional systems.

Yifan Chen et al (2010) recommended about the correlation factor, with respect to series illustration of the correlated Nakagami-m distribution. The correlation in the fading resulted in the great impact on the interruption capacity. Reduction in the ineffable area of correlation is due to the orthogonal frequencies that has been assigned to the two forward links. In addition, it has been identified that a rigorous extension of this investigation to a N-relay network is very complex due to the boundless series illustration of multivariate Nakagami-m distributions are arithmetically contrary.

Toyserkani et al (2010) suggested a specific parameter that does the logical estimation in the block error rate in flat fading Nakagami-m channels which results in the mathematical overhead. The precision of the BER approx is inspected in various circumstances with disparate measurements of chunk lengths, error rectification techniques, and variation in distinct fading circumstances. The illustrations of the computations show a compliance among the BER calculation and simulation outcomes in Rayleigh block fading channels. The precision computed thus reduced with an augmentation in the Nagami channels. However, the accuracy obtained through this implementation is acceptable for a certain series of values of ‘m’.

Vladeta Milentijevi et al (2011) recommended the method to compare the error analysis in two ways. One that includes MRC diversity and the other case that excludes MRC diversity collected at the receiver. The consequences obtained are represented graphically so that the metrics such as diversity order and the critical nature of the fading on the relative dimensions’ of error limits are denoted. From the representation, it is understood that the fading metric is achieved in a better manner when the diversity level is high and in higher order moments.

Abu Sayed Md et al (2011) projects the method for attainment of the two-hop wireless networks considered based on the Rayleigh and Nakagami-m fading channels for two widely utilized modulation schemes of 8-Phase Shift Keying (PSK) and 16-QAM of wireless communication systems. In their analysis, it was observed that the efficiency of the Rayleigh fading channel is poor when compared with the Nakagami-m.

Yogender Singh Gill et al (2011) advanvced Rayleigh fading model for NLOS communication where the signal is received after assorted reflections and scattering. This thesis comprises of the Rician fading consisting of LOS and found to be more employable for satellite communication. In that work Nakagami fading model is widely suitable for urban multipath propagation and it is desired to be the most 33 practical model especially employed in mobile communication where single bit data transmission was attained by assuming the channel to be Rayleigh faded which has a variance of value 1 and mean value as 0.At last it has been accomplished that Block bit transmission is more effectual than single bit transmission over Rician, Rayleigh and Nakagami fading channel with various modulation approaches.

Fawaz S. Al-Qahtani et al (2011) discussed the efficiency of the dual-hop Amplify-and-Forward (AF) transmitting network with interference that could be on relay and the sink nodes. Even though the Rayleigh fading is a prominent arithmetic model, a universal model which consists of a wide range of fading developments is the Nakagami-fading model. As the main factor the efficiency of the interference-restricted dual-hop CSI-assisted magnify-and-forward communication that is handled in Nakagami- fading channels has been implemented initially. Derivations for the Cumulative Distribution Function (CDF) of the end-to-end Signal-to-Interference Noise Ratio (SINR) have been obtained and the accurate closed-form expression for the outage possibility of system has been discussed.

Barua et al (2011) considered the AF transmission over the separate and dissimilar Nakagami-m fading channels so as to evaluate the accurate representation of error probability for cooperative diversity networks. Analytical derivations for the PDF and the and Moment Generating Function (MGF) of a cooperative connection has been derived. The M-array Phase Shift

Keying (MPSK) signals have been given as the input and the computations were based on the MGF based scheme. The significant factor over here is the diversity link in the relay system is been monitored.

Basab B Purkayastha et al (2012) determined the proficiency of the 34 Digital Phase Locked Loop (DPLL) concerned with BER. In this work, the input signals are considered based on the fading conditions with particular variations that are propagated via Nakagami-m channels. The process of distribution in the demonstration of physical fading radio channels has been represented. From the results, it could be stated that the Nakagami-m fading model is suitable for experimental fading information. The performance of the BER is improved by the augmentation of sampling frequency values. Hence this DPLL offers reasonable performance in Nakagami –m fading channel with QPSK signal on an input of 900 MHz carrier frequency with 9 GHz sampling frequency.

Nuwan S. Ferdinand et al (2012) discussed about the implications of the response delay based on the competence of AF transmission over the Nakagami-m fading channel. The study aims for, the solutions to disrupt the probability, estimation of the SNR value for the channel state information and constant gain delay is focused. The depth of the range gain contrast is understood by measuring the system interpretation in high SNR. Moreover, the asymptotic computations are also derived.

Ahmet Faruk Co et al (2012) proposed the multi-antenna network that utilized both Maximal-Ratio Transmission and Receive Antenna Selection (MRT&RAS) in independent and indistinguishable distributed Nakagami-m flat fading channels. The response quantization errors, feedback delay and channel computation errors are computed. The post processing SNR involves certain metrics such as cumulative distribution function, moment generating function, PDF and n^{th} order moments are evaluated.

In this work, it was identified that the outage probability and BER/SER performances can easily acquire high developments owing to superiorrange orders contributed by the growth in the number of transmit antennas employed for either for MRT or the number of receive antennas accessible for RAS in the MRT&RAS approach.

Agubor et al (2013) recommended the classifications of diversity approaches inured in wireless communications. These methodologies are utilized in wireless communications to conflict the effects of multipath fading and other forms of interference and thus increase network performance. The physical diversity approaches of this work include time, space, frequency and polarization have been very much useful in the execution of MIMO wireless communication networks.

Zoran Kostic et al (2002) proposed the results of a simulation of the performance on Dynamic Frequency Hopping (DFH) for a cellular network with a restricted cumulative data rate that facilitates 12 carriers, frequency reuse 1/1 and 3-sector antenna sectors. Due to this method, there is a 100% rise in the capability over the static channel allocation. A 50% increase in the capacity above the random frequency hopping is also noted when there is 0.02-word error rates experienced by 90% of consumers. However, through this method, robustness is obtained due to the certain factors such as channel consistency and the number of available carriers.

Erik G. Strom et al (2005) proposed the issues in the multistage Parallel Interference Cancellation (PIC) approach in a DS-CDMA network with orthogonal modulation and long scrambling codes. This thesis is based on the network that operates in the rear link for a period of time by altering the values of multipath Rayleigh fading channel. So for completing the work, the BER expression is computed for both the synchronous and asynchronous networks over the multipath channels that might be equal and unequal. As a result, the analytical outcomes can be operated to investigate the characteristics, multipath diversity gains and near-far resistance of the PIC approach.

George P. Efthymoglou et al (2006) commended the performance of networks with dual polarized antennas in correlated Nakagami-m fading channels as a role of envelope associated with the cross polarization perception through the deployment of the typical function of the instant post MRC so that the SNR would be obtained. This work was based on a closed-form expression for the PDF of the SINR at the output of an MRCD system functioning in an AWGN, Rayleigh and Nakagami-m fading environment. The disruption and the BER performances of a 1-D and 2-D RAKE receiver is also examined. Hence, the job of the network designer becomes easy so that the performance of a RAKE receiver in an asynchronous CDMA becomes easier.

Haichang Sui & Zeidler (2009) proposed the transmission range with respect to maximizing information efficiency for MANETs with FH-CDMA and multiple antennas. In this case, the mobility and FH serves as the factors in affecting the shadowing and fading through time-varying with dissimilar time-scales. Distributions of the numerous access intrusion power and the signal to interference ratio contributed in deriving the receiver decoding error probability. This work finally examines the data efficiency and transmission range in an elaborate manner and certain factors such as feedback length, Doppler frequency, modulation, time variation of the shadowing and coding methods.

Yung-Ping Tu et al (2011) proposed an interchanging methodology of soft information-support iterative MUD for the heterogeneous signaling MIMO CDMA networks. This work designed at effectually reducing the interference where as mitigating the calculations, the MUD first group consumers as per their transmission signaling and then continues to group wise identification alternatively with the ejection of the iteratively refined soft interference in between. It is practiced to mitigate the complexity in burden. Consumers in every group are further partitioned into subgroups with respect to their effective channel correlations. The simulation outcomes illustrate that the MUD possesses increased interference suppression ability and so entailing higher performance as compared with prior works specifically in highly loaded scenarios.

Bin Cao et al (2011) proposed polarization data research and developed a polar modulation in wireless network that illustrates the advantages of polarization and its benefits. To elongate the acquirable resource in wireless communications specifically for LOS setup, an impending multiple access and modulation methodology with respect to polarization information of Electro Magnetic Wave (EMW) is deeply presented in this work. Since this work reasoned the polarization independent of the waveform, bandwidth and data rate with the exponentially rising demand of consumers, the multiple access approaches are randomly mixed to polarization known as polarization division multiple accesses. Polarization modulation is predicted to enhance the spectrum efficiency. Moreover, this work has been explained and investigated the depolarization effect in NLOS. This work not only addresses the demodulation approach for polarization division multiple accesses and there must be other better approach which is still an open problem.

Mazzali et al (2012) proposed a Spread Spectrum (SS) network derived from Continuous-Phase Modulations (CPMs). The primary goalof this work is to denote the arrangement of the modulation keys of a multi-h CPM as an FH sequence which results in high efficiency when compared with the single user single-h CPM transmission.

Ming Jiang et al (2007) proposed a methodology on multicarrier OFDM arrangements with MIMO networks having numerous advantages which are explained elaborately in this treatise. This work suggested the restrictions of traditional finding and channel evaluation approaches devised for multiuser MIMO, OFDM networks that could be deployed in rank-deficient instances. However, the count of customers promoted or the sum of transmit antennas engaged surpasses the count of receiver antennas.

Volker Jungnickel et al (2009) discussed that the interference was the diminishing factor in wireless communication networks. This work presented the downlink of the Third Generation Partnership Project (3GPP) Long-Term Evolution (LTE) that is based on the OFDM. It possesses the capability for the augmented interference reduction in comparison to existing systems based on CDMA. This OFDM spectrum consumer is simultaneously desired whereas the signal was very tough and the interference was weak. Due to the presence of several antennas, the mobile nodes would be able to find out the frequency-selective intervention and the resource sharing between the number of users is increased.

Neetu Sood et al (2010) presented the performance analysis of OFDM system with generalized fading model of α-μ distribution with and without estimation. Nakagami-m and Weibull variants are used. But, the One Sided Gaussian, Rayleigh and Negative Exponential distributions are considered as the special instances. Generalized fading model is implanted which used attributes such as gamma distribution which is used to represent shadowing and fading for analysis and it is observed that there is a considerable increase due to the phase approximation with the help of trained symbols.

Mukesh Kumar Mishra et al (2011) proposed a closed form integral PDF, which is obtained with the help of characteristics functional method. The average error rate performance of OFDM system over Nakagami-m fading channel with the fading intensity of the index is also computed. From the numerical results obtained, evaluation of efficiency of numerous fading channels is examined and it is observed that the count of channels drives the performance of the BER to the lower mode due to the presence of Nakagami–m parameters.

Hun Seok Kim & Daneshrad (2011) proposed MIMO-OFDM system to focus on the optimization of power amplifier clipping. Optimization of clipping level for a MIMO-OFDM system must be done so that the BER value must be achieved. The power decrease could be achieved with the help of selection of clipping level and its parameters.

Xiantao Sun et al (2012) explained that OFDM system leads to the deprivation in the performance if the length of the cyclic preface is minimum when compared with the channel impulse reaction. Reasons behind it is due to the presence of the ICI and ISI through the extreme multipath delay. To address the issues due to the ICI/ISI , the multipath features of the channel is considered. Therefore, the block error rate is brought down to minimum and the performance of the channel interval profiles is improved which would lead to the disruption in the conservative links since during the expansion of the indoor wireless LAN designs to support the outdoor facilities, it plays a vital role.

Hamdi (2012) proposed an arithmetical analysis for the efficacy of OFDM signals over multipath Nakagami-m fading channels. The authors focused on the impacts that have been created due to the uneven phase dissemination on the performance of error rate. An integrated derivation of MGF of the frequency-domain channel gained on Nakagami-m channels is required. This work was adopted to attain precise error rate derivations for various modulation values in order to achieve good results.

Daniel Sacristan-Murga et al (2012) considered a MIMO OFDM based multiuser broadcast network by prior coding in the transmitter side and as well as at the response of the channel status information. The transceiver designs and the feedback link which depends on the quantization of the users' MIMO channel matrices is shown. The framework depends on the linear values that took a change which has been applied at the receiver. The work is compared with the various methods that has employed MIMO.

Khairi Ashour Hamdi (2012) described the result of uneven phase disseminations which would be carried out on the error rate performance of OFDM on frequency selective Nakagami-m fading channels. The frequency domain power gain with respect to the specific functions of the intricate numerous channel gains is derived as the expression. The precise error rate results for the range of modulation formats and random range orders of multichannel are computed.

Perez-Neira et al (2013) have taken the issue of margin flexible development in the downlink of an OFDM-MIMO network. This issue is not a convex one and its computation becomes consequently obstinate for a small group of utilizers and subcarriers. To mitigate this computational burden of the issue, a new experimental approach that splits the users in various sets as per their usual channel quality and focuses the innovative concern through solving a sequence of lower-complexity sharing problems. This work has been used to lessen the complication by introducing a linear programming system articulation along with a water filling-based policy to allot channels and in addition, the users' group is allotted some power.

Krishna et al (2013) proposed that though a large group of utilizers in one cell, high dimension gains could be achieved by sending the data streams that are not dependent to the group of users those who share the resources all at a time. This approach is mentioned as to MU-MIMO-OFDM. Spectral efficacy could be improved by this technique. In this MU-MIMO operation, more than two utilizes free environments or mobiles share the frequency resources at the same time.

Chang et al (2013) proposed about a dynamic fractional frequency reuse framework for multi-cell OFDM network. This dynamic characteristic is identified with the help of the rearrangement of the spectral resource according to the variation in the cell loads. The cell throughput and service rate is increased. This is effective method and it could be deployed in the other generation cellular systems.

Yawpo Yang et al (2003) recommended about the effectiveness of MC-CDMA network in uplink Nakagami fading channel that is theoretically investigated and validated by exhaustive simulations in which the effect of carrier frequency offset and imperfect channel fading evaluation are taken into consideration. This result exhibits that the competence level of MC-CDMA system is subtler to even minor values of carrier frequency offset. In this article, to acquire perfect evaluation on the MRC and EGC, the whole competency of MRC is to be higher to EGC. Moreover, the impact of imperfect channel fading evaluation on the MRC is more severe than that on EGC. Besides, EGC becomes superior to MRC. Also the results display that the deprivation in an MC-CDMA system due to carrier frequency offset is a role of frequency offset, the number of subcarriers and the number of utilizers. Even the most of the multicarrier networks are designed today by assuming a perfect channel and the results exhibited that the precision in carrier frequency offset and channel estimation should indeed be taken into consideration when designing these systems.

Tao Luo et al (2008) proposed about the DS-CDMA and MC-CDMA approaches for great rate of wireless communication. This work considered a linear Per User Minimum Mean Square Error (PU-MMSE) detection scheme for DS-CDMA with Frequency Domain Equalization (FDE) based upon the MMSE criterion that has been implemented for a consumer has been depicted. It is illustrated by simulation that PU-MMSE outperforms traditional per carrier MMSE for DS-CDMA with FDE in frequency selective block fading channel. From the results, it is seen that the efficacy is high when compared with the conventional MMSE for both full load DS-CDMA with FDE and non-full load DS-CDMA. Successive Interference Cancellation (SIC) has been recommended for the efficiency of DS-CDMA with PU-MMSE FDE. Finally, it is observed that there is no loss and the Peak-to Average Power Ratio (PAPR) is very less.

Saralees Nadarajah (2008) highlighted the BER performance of synchronous MC-CDMA over Nakagami-m-fading channels. Framing of the MGF of the output variable at the receiving side is done and this leads to the limited sum of fundamental operations which could be computed.

Haitham J. Taha et al (2009) projected, analyzed and studied the Multicarrier Modulation, at the initial phase so that the multipath dissemination could be resolved. Then the computation efficiency us high than that of the single carrier transmission. At last, the scheme offers assist to numerous access schemes (TDMA, FDMA and MC-CDMA) as well as several modulation approaches.

Juinn-Horng Deng et al (2011) presented and explained about a differential MPSK Frequency-Shift Orthogonal Keying (FSOK) Multi-Carrier Spread Spectrum (MC-SS) system that is appropriate for diminutive PAPR transmission over the rapid modification in the multipath fading channels. The data sub stream is associated to the MPSK-FSOK symbol and spread by the frequency-shift orthogonal series in the transmitted side initially. Later , the sub stream is variably determined via a chunk feedback delay working in which the transmitted MC-SS signal should be with a low PAPR. At this receiving side, the post-FFT acknowledged data are initially made stable utilizing the MRC equalizer and then de-spreader by the pair of frequency-shift orthogonal series. This simulation outcome totally confirms that the low PAPR differential MC-SS system through the support of full frequency range gain which could perform better than the theoretical QPSK network and the traditional MC-SS network.

Giannetti et al (2011) proposed an estimated analytical expression for the PAPR of a MC-CDMA signal derived. Walsh- Hadamard codes help explain MC-CDMA by which the PAPR is decreased by choosing another method for allocating the signature codes. Assessment is done based on the peak signal occurrence and sturdiness across the distortions.

Hema Kale et al (2012) interpreted that the MC-CDMA attracted many researchers due to the importance of the downlink manifold access approach for high-rate data transmission in the future generation networks. This work has estimated the competence level of group allocation principles utilized in downlink transmission which leads to the throughput maximization. This altered technique is a sub channel distribution in the downlink communication of MC-CDMA systems. This work has evaluated the method of sub channel allocation to the consumer for the given transmit power in the downlink transmission. This observed result in further saving of the power and achieving higher throughput is compared with the original true algorithm and the outcomes display that for the specified power and BER proposed, the algorithm reasonably generates far better results.

Aria Nosratinia et al (2004) introduced and investigated a tutorial that presents the wireless cooperative communication. This scheme permits the sharing of solitary antenna mobiles to enjoy few merits of the numerous antenna systems. Besides, numerous signaling approaches for supportive communication that includes perceive and forward, expand, forward and coded cooperation are exposed. Practical inferences and their requirements for network design are presented along with the developments of the fundamental idea. The author desires that this work helps to irradiate the subject for a broader audience, and quicken the development in the conventional technology.

Ahmed S Ibrahim et al (2008) put forth a new etiquette that acquires high efficiency in bandwidth and in addition, the diversity order is also guaranteed as in a traditional cooperative approach. The relay choice is taken into account. Then the consequences are presented in which arbitrary N relay nodes are accessible. The sources determine the need of collaboration either with one relay and in turn enables the relay node to conjoin. The relay that possess high harmonic mean function of its source relay is optimal one. Based on this instance, the estimated design of data rate efficacy is determined and utilized as an upper bound, the competence level of the Symbol Error Rate (SER) is computed. From the experimental results, there is a considerable improvement in the data rate. In addition, the balance between the bandwidth efficiency and the equivalent SER is obtained.

Marjan Baghaie et al (2011) have articulated a NP complete problem, where a delay constrained energy-efficient broadcast in cooperative multi-hop wireless networks. It has three segments namely: ordering, scheduling and power control. Joint scheduling and power control issue can be resolved by the combination of dynamic and linear programming so that the energy broadcast for the delay constraint would be minimum. Ordering is done in the heuristic manner and it is combined with the Dijkstra's short path algorithm so that the optimal performance is obtained. The establishment among the delay and power-efficiency is analyzed and therefore the performance is compared.

Sushant Sharma et al (2011) have proposed the advantages of using Cooperative Communications (CC) in multi-hop wireless networks. This is implemented by the optimization of the multi-hop routing and cooperative relay node allotment. Certain issues such as huge space and mixed integer problem arises. It could be resolved through the branch and cut framework together with the numerous new tools so that the speed of the computation is increased. In addition, a Feasible Solution Construction (FSC) algorithm is also proposed which could be deployed in three stages. Path has to be identified in the first phase and the allocation of cooperative relay must be done. At the last phase, recomputation of flow must be done. Determination, Cooperative Relay (CR) Assignment, and Flow Recalculation. From the results, it is inferred that substantial rate gains could be obtained by the amalgamation of CC in multi-hop networks.

Furuzan Atay Onat et al (2008) have introduced a Threshold based Relay Selection Cooperation (TRSC) protocol that induces the threshold digital relaying to several relay nodes. Only the relay nodes that establishes SNRs that are huger than a limit are contemplated as reliable relay nodes and are permitted to retransmit. They exploit the selection by mapping the destination with the relay destination and source destination link SNRs. Relay transmission could be made still prior during the data rate bounded instances. Later, the retransmission of the selected relay leads to the reduction in the bandwidth evolution. In this protocol, the data transmission from the relay node to sink node in connection with the first hop is exposed nearer to the reliability of the relay node and it can be illustrated by a single bit.

Shahen Shah et al (2014) presented an outline of cooperative communication in wireless systems. The cooperative routing strategies in distinct networks are analyzed in detail. The cooperative routing in systems such as wireless mesh and sensor networks are investigated along with the merits and applications them.

Ishal K Shah et al (201l) highlighted the variety of relay selection approaches in cooperative communication. Representation of the cooperative transmission protocols that are deployed in the relay station consists of magnify and forward or detect and forward. The cooperative transmission protocols employed in the relay station include magnify and forward or detect and forward are depicted. The association among the network elements and relay choosing methods contributed much for the techniques that were used for separation of cooperative relay selection and relay discretion. The major opportunistic relay selection technique is categorized and it depends on local measurements such as measurement-based, efficiency-based and threshold-based relay selection. Relay selection could be done effectively in such a way that the complete throughput of the network regarding with the high data rate, low power consumption and enhanced bit error rate performance.

Yifan Li et al (2011) recommended the compromise between advancement and equivalent cost of cooperative communication by seeing the relay selection. They consider the demanding scenario that takes utilizers mobility into remarks. Based upon user movement pattern, a dynamic relay chosen scheme lowers the long-term average cost while satisfying the QoS requirement. An optimization model derived from the Constrained Markov Decision Process (CMDP) is articulated for relay selection to attain maximal performance. This can be resolved by engaging the Linear Programming (LP) methodology. Although extensive simulations, superior effectiveness and flexibility in balancing the price and the QoS performance of this technique is proved and effective.

Nam et al (2008) discussed the issue of relay choosing in a wireless cooperative network. By dissembling a single source, destination and N evenly scattered candidate relay nodes, a pair of cooperating relay nodes is chosen to lower the entire transmission period for a constant amount of information. Two selection approaches, namely best expectation and best-m is suggested. Best expectation adaptively chooses the relay nodes whereas best-m selects an pre-determined optimal number of relay nodes. Every technique is executed with a plain and best algorithm. The optimal number of cooperating relay nodes provided the relay nodes are uniformly spread and the source simply correlates with all the relay nodes enclosed by a radius of a constant proportion of the source-destination distance is done in an easy way. Simulation results evidenced that there is trade-off among this correspondence and the numerical customs. Howsoever, there occurs a path loss in this technique.

Beibei Wang et al (2007) projected a distributed buyer/seller game hypothetical framework over multi-user cooperative communication networks. The main intention of this work is to incite the cooperation so that the performance could be enhanced. The two level game is used to commonly evaluate the benefits of certain nodes that behaves as buyers and sellers. The source is assisted in a smart manner and the relay nodes are identified in better locations and therefore the optimal quantity of power could be bought. They can also help the challenging relay nodes by maximizing their self-utilities at reasonable cost. The game is proven to congregate to a single optimum equilibrium. From the results, it is identified that the nodes located at the good locations played an important role so that the node's utility is augmented. As a result, the source wishes to acquire more power from these favored relay nodes. The relay nodes have to set suitable costs to induce the source to buy due to the competition form the other relay nodes and as well as collections from the source node. In addition, the disseminated game resource allocation could accomplish an equivalent performance.

Rui Cao et al (2012) depicted a decomposed LT codes for cooperative relay communications that has dual level of arbitrary encoding nevertheless has a single layer of decoding. Through the usage of these dual layers at the resource and the relay nodes, the network ensures source to relay and as well as relay to destination. A general decomposition approach is developed for DLT code construction. This approach is customized for LT codes with robust Soliton distribution (RSD). This methodology can omit calculation cost and large end-to-end latency. The aggregate hybrid DLT (h-DLT) codes accelerate malleable calculation cost allocation. The establishment and investigation of h-DLT codes based cooperative relay communication protocol is based on the transmission latency and energy depletion.

Bravo et al (2009) projected a cooperative relay communication in mesh networks. They focused these networks employ a decode-and forward relay nodes for which the ideal node decision rules are drawn for the binary communication. The articulation for the global bit error probability is determined. These networks are compared with the multi hop networks. They illustrated the development in terms of the performance that is acquired with them once both the networks have the identical amount of nodes and possess the equivalent number of hops.

Wei Sang et al (2011) advanced an overview of literature review of capacity for cooperative relay systems. Initially, the architecture, basic and working model is discussed. Then, the ability of AF dual-hop fading channel is pointed. Then the mutual AF single-relay fading channel capacity and power allocation criterions are conveyed. At last, the main research outcomes the efficacy of the relay selection algorithms in the dual multiple relay is declared for the wireless communication.

Tanoli et al (2012) have proposed and simulated a three-time slot TDMA based transmission protocol with an additional periodic interval for inter-relay correlation. The cooperative network is investigated for different relay nodes location over Nakagami-m and Rician fading channels. Transmission is done in these three-time interval with the inter-relay. The network performance is observed in terms of Bit Error Rate (BER) and Cooperation Gain. Relaying schemes i.e. AF will be considered at the relay nodes. Relay optimization is also measured in this work with disparate positions of the relay nodes. BE efficacy is improved when compared with the two time-periodic interval protocol. The results obtained through this work shows a better performance. Comparatively, BER and Gain cooperation for optimization have been investigated for different positions of the relay nodes. Identically the mathematical modeling of this network is not performed as well as the assumptions made in the protocol can lowers the BER performance.

Shan Chu et al (2011) discussed the implementation of the cooperative relay transmission in MIMO-based ad hoc network so that it could overcome the situations that arise in the channel. The centralized and distributed scheduling algorithms facilitates the utilization of cooperative relay when it observes that there is no chance for successful transmission. Through the multiplexing gain and diversity gain, this algorithm experiences higher bandwidth and the reliability even in different channel conditions. In addition, the overhead would be decreased and the integration of the relay transmission with multiplexed MIMO transmission is done. Throughput is enhanced in various instances such as the packet arrival rate, threshold of the retransmission, modification of node density due to the execution of the MAC protocol.

Aggelos Bletsas et al (2005) scheduled an easy opportunistic relaying with Decode-and-Forward (DF) and Amplify-and-Forward (AF) strategies under an aggregate power constraint. Specifically distributed relay selection algorithms are examined to collect the confined channel knowledge. Cooperation behavior leads to the benefits of diversity even during the situations when the cooperative relay nodes are not ready to disseminate. During this operation, these nodes behave as passive relay nodes and thus the significance of the single opportunistic relay is provided.

Tuan Do et al (2009) proposed a cooperative communication strategy that depicts the availability of the spectrum holes in space and as well as in time by combining the cooperative relaying with the shared spatial-temporal spectrum. Temporal sensing makes use of the direct communication while the primary transmitter is off and the spatial sensing use the relay channel. Therefore, the results showed that the error probability is decreased when compared and contrasted with the pure temporal or spatial sensing.

Shirish Nagaraj et al (2012) highlighted an uplink co-operative receiver for a dense Pico-cell cluster deployment. User-oriented group and less-complexity Interference Cancellation (IC) scheme is adopted. The key factor related to the decoding latency is also discussed. The ideal quantity of the antennas for the customer to receive and the consumers those who reside in the dense areas are allowed to use the antennas in the overlapping group. Computations are reduced by not considering the evaluation of the invader channel and the matrix inversion computation due to the low involution receiver. Delay in the decoding part has been concentrated by the examination of the HARQ status of the IC receiver. Moreover, a method has been devised in such a way that the prediction errors are to be solved by the prevailing HARQ and resource distribution signaling methodology of LTE. The low complexity single stream intrusion method is exhibited and also it is observed that the efficacy loss is decreased.

Yindi Jing et al (2005) suggested and extended the notion of scattered space period coding to wireless relay systems with numerous antenna nodes and fading channels. The distributed space-period coding acquires same diversity as decode-and-forward without any rate constraint on the transmission. For a fixed amount of transmission power over the whole system, the transmitter is allotted to devote only the half of the power and the other half to the relay nodes which must be shared to all the relay according to the number of aerial it possesses. In this case, the receiver is aware of the information of the channel and this is trained by both the relay nodes and the transmitter. The network comprises of one transmitter and receiver. There is a chance for intrusion when there are more number of transmitters and receivers. Therefore, it is necessary to follow the smart detection or cancellation methods. This method focused on the fading impact on the channel.

Helmut Adam et al (2008) discussed an adaptive relay selection technique in cooperative wireless system. Adopting relay selection on demand with retreat protocol, relay nodes are only chosen if required by the destination. Every potential relay estimates the channel state and establishes whether to participate in the relay selection procedure or not. Through simulation outcome, it is emerged that these improvements deplete the overall energy consumption considerably. They did not exhibit any performance loss in terms of outage rate.

Gubong Lim et al (2012) contemplated an investigation of a best-select relaying technique and related the efficiency with the other transmission methods. The best-select relaying approach offers the substantial gain in energy efficiency in spite of the consumption of more circuit power. It is noticed that the straight communication surpasses the ideal chosen transmitting in circuit power prevailing area. Through this observation, the finest switching threshold amid the direct communication and the ideal chosen transmitting is reviewed. At last it is shown that the energy efficiency can still be enhanced through the principal constellation size and transmission bandwidth. Moreover, there is no remarkable enhancement in energy efficiency.

Themistoklis Charalambous et al (2012) submitted the buffer aided relay nodes. The linking between receiving and transmitting relay nodes is broken as different relay nodes can be chosen for transmission and receiving. This permits the raised degrees of freedom. A single phase slot is employed in which either the Source-Relay or the Relay Destination link is activated, or both that are provided with specific conditions. This scheme opens a new avenue for research and design relay selection policies and transmission schemes that facilitate increased throughput and multiplexing gains.

Elzbieta Beres et al (2010) scheduled and developed an optimal choice of a relaying subset and allotment of communication period. Resource allotment have been identified by the maximization of the rates that are attained for individual subset of energetic relay nodes and in turn the ideal time allotted for all subsets is computed through the linear system of equations. The constraint followed over is the relay numbering. The complex load of the identification of the needed matrix inverse is reduced and as well the repetitions. Optimization of the transmission period augments the feasible rate. In addition, optimization of the channel resources also demands more relay nodes to be energetic. The linear network arrangements perform better when compared with the grid arrangement. Yet, there is a little progress in the sensitivity and it is not given much importance.

Rajesh Palit et al (2008) proposed Energy-aware Co-Operative (ECO) relaying for choosing relay nodes to onward packets. Relative Energy Usage (REU)is the principle behind it and the amount of energy saved by the node is been displayed by increasing its packets via relay nodes. The node with more amount of energy acts as the relay node. The nodes usually approve the relay nodes in association with the amount of energy they could spend as relay nodes. From the results it is observed that, the ECO could transfer %0% additional data by using less energy when compared with the direct communication. It is observed that MnEP and MxRE disseminate more data when compared with the direct communication but the energy cost is more which leads to the increase in the energy utilization. Therefore, it is advisable to not to use in commercial networks. In addition, the mobility service is also lacking in this method.

Zhengguo Sheng et al (2009) have intended the cooperative wireless networks specifically on the performance of network layer. The performance of end-to-end quality, energy consumption, turnover and delay of wireless cooperative communication is executed and compared. It is observed that these networks perform well in the case of contesting in the radio unreliability and briefing the needs of high quality, speed and efficacy for the applications. Due to the new perceptions which has been focused on the performance, the outcomes of this method have achieved a great impact.

Quan Zhang et al (2012) projected a strong relay selection technique known as RRS for cooperative communication system. This work focuses about the robust relay selection issue in which the active transceivers nodes are dynamic. The capacity gain parameter is employed for relay choice and for stating the strong relay chosen concern. RRS aims to make best use of the transmission capacity gain in the worst case. Simulation outcomes illustrates that through the RRS scheme, 50% minimum capacity gain has been obtained when compared with the random selection algorithm.

Zhong Zhou et al (2012) have advanced an energy-efficient cooperative communication which depends on the power control and selective single-relay in wireless sensor systems. This innovative discerning single-relay cooperative approach inter connects the selective-relay cooperative communication with physical-layer power control. A group of probable relay nodes could be computed separately in order to take part in the cooperative communication and challenge in a window of the preset length. The outstanding relay is selected based on the disseminated manner with less signaling overhead. The power-control solutions simulates to twofold policies, vis a vis first policy downsizes the energy depletion of per data packet, and the next policy prolong the lifetime of the network. Simulation outcomes approve that this approach acquires substantial energy savings and extends the lifetime of the network remarkably.

Yaming Luo et al (2012) highlighted the learning approach to employ cooperative relay selection, so as to enhance the short-term performance of EH communication networks. The primary motivations being check effectually and adopt the existing Side Information (SI) such as Channel Side Information (CSI) and Energy Side Information (ESI). The relay selection concerns with either non-causal or causal SI with a priority on the more useful case are articulated. The casual SO case introduces a low complex relay selection method regarding to the relative throughput. For each block, the attributes such as the maximum instant throughput is related with the standard throughput. The so-called rule apprehends the strategic features of EH networks like the relay must get an opportunity for selection so that the captured energy can be proficiently employed and be chosen only if its throughput is nearer to its own peak. Simulation outcomes have illustrated that the relay selection approach offers major throughput gain over the traditional technique.

Tauseef Jamal et al (2008) proposed an investigation of relay selection methodologies since the deprivation in the selection might remarkably worsen the performance of the overall system. Taxonomy for the execution of the choice of the relay and an investigation of their proficiency is analyzed. Based upon such investigation, some interpretations are offered oriented to the topics that are required to be further executed so that the formulation of the cooperative relaying networks are able to enhance the contemporary communications in huge networks comprises of mobile nodes. With respect to organized investigation of relay selection schemes, preliminary conclusions are three-fold.

Iker Alustiza et al (2015) suggested decode and forward (DF) relaying technique for multi hop transmission in wireless networks in which the data produced through a self-determining pivot has to be sent to a long objective based upon multiple relay cooperation. The recommended technique mergers along with the convolution channel coding with direct combination of blocks for a finite field using very dumpy block lengths. The manners of the presented technique are better in comparison to other referenced techniques through much larger block lengths via Monte Carlo simulations. This method is preferred for large multi-hop systems since and performance degradation obtained due to the summation of additional hops in the network is negligible.

Ioannis Chatzigeorgiou et al (2009) exhibited the cooperative networks of consumers that execute a selfish protocol to decipher and advance packets. A threshold-based technique is employed to compute a logical expression for the end-to-end packet error probability. Than this technique is theoretically compared with the simulation results. Additionally, the interaction and influence of network parameters include number of consumers, the communication technique and the quality of the interconnecting channels on the overall performance are discussed. This protocol is employed to preciously characterize the end-to-end PEP of DF cooperative systems on quasi-static fading channels. Threshold-based model arbitrarily defines the SNR threshold that calculates the accurate SNR threshold of the adopted transmission approach. Hence, they closely explain the PEP of networks comprising of two to sixteen consumers, each adopting either iterative or non-iterative approaches. Moreover, an execution of the packet error probability of cooperative networks is not presented.

Jian Zhao et al (2007) depicted a low mobility cellular relaying network downlink in which two mobile consumers are furnished by consecutive neighboring decode-and-forward relay nodes simultaneously via the same frequency channel. Two cooperative relaying transmission approaches are introduced in which each relay can select appropriate precoding vectors as per to its local channel knowledge to propagate data in the second hop. Every consumer can receive their self-data without interference that makes simpler the consumer receiver design. The diversity of each consumer’s received information signal can be enhanced by receiving information from multiple relay nodes. Furthermore, higher array gain can be acquired through the first approach at the cost of higher synchronization precision requirements. Moreover, two transmission approaches attain higher transmission rate than serving distinct consumers in separate channels. Furthermore, the cooperative Alamouti approach was not suitable if phase synchronization is available.

Tairan Wang et al (2005) introduced a proficient demodulator at the destination in the form of a weighted combiner for essentially attractive Decode-and-Forward (DF) relay approach. The weights are chosen as per aspect of both source-relay-destination and source-destination connections. The novel demodulator can acquire highest feasible diversity, irrespective of the essential constellation. Its error performance limits the Maximum Likelihood (ML) demodulation that probably assesses the diversity gain of ML identification with DF relaying. They correlated the superiroty of the ideal decoder with the available diversity-achieving methodologies that includes equivalent amplify-and-forward and selective-relaying approach.

Ha X Nguyen et al (2013) proposed the Bit Error Rate (BER) performance of an adaptive Decode-and-Forward (DF) relaying scheme for a cooperative wireless network operating on independent and separately distributed (IID) or independent and non-identically distributed (IND) Rayleigh fading channels. The system has been one source, K relay nodes, and one destination where the binary frequency-shift keying modulation is utilized to ease non-coherent communications. A relay interprets and re-propagates the received signal to the destination if its decision variable is higher than the simultaneous threshold. With respect to the accessibility of the data about a specific relay retransmitting or retaining silent, the destination mixes the received signals from the relay nodes and the received signal from the source or the received signals from the retransmitting relay nodes and the received signal from the source to identify the propagated data. The average end-to-end delay BERs are calculated in the closed-form expressions. The limits at the relay nodes have been executed to diminish the end-to-end BERs. Outcomes are offered to confirm the theoretical investigation. The obtained results illustrate that the studied approach enhances the BER performance significantly in comparison to the Piecewise-Linear (PL) approach.

Qing F Zhou et al (2010) depicted an Opportunistic Two-way Relaying (O-TR) methodology based upon combined network coding and opportunistic relaying. It is derived from the modular networking coding methodology and the opportunistic relay selection. Here, one particular best relay is chosen by Max, Min principle to do network coding on two decrypted symbols obtained from dual sources and at that time to transmit the network-coded symbols back to the two sources. The upper-bound of the Frame Error Rate (FER) of the approach is derived. This can finish the full diversity sequence. This approach attains better performance in comparison to the completely scattered space time two-way relaying (FDST-TR)which is considered as the best decode-and-forward dual relaying approach so far. Furthermore, the length of the frame changes with respect to the parameters.

Young po Lee et al (2011) presented an innovative Alamouti coding methodology for asynchronous cooperative communication networks over the frequency selective fading channels. This methodology attains a sophisticated order cooperative diversity rather than that of the traditional approach which means that the contemporary scheme in which every information symbol goes through the disparate channel. This procedure is related with the traditional approach in terms of the BER and frequency of the selective fading channels. It also demonstrates that the recommended methodology offers a complex order cooperative diversity, and presents well improved BER performance than the traditional approach.

CHAPTER 3

AN AUGUMENT MODEL OF HYBRID N.W GAMMA SCHEME FOR IMPROVING THE FADING CHANNELS PERFORMANCE IMPLEMENTED IN MANET

3.1 OBJECTIVE

A novel technique limits the fading issues by implementing the enhanced fading channel model in the MANET. This chapter addresses the hybrid N.W Gamma scheme and also analyzes its effective performance. This efficient model is implemented to diminish the fading problems in MANET. The outcome of speed of nodes on main network performance matrices i.e., average delay, throughput, jitter, and PDR. These parameters participate critically in analyzing the performance & design of the mobile Ad-hoc network over the multipath fading environment for network performance of MANET. This offers the best fit for fading issues. Network communication problems can be limited through this approach.

3.2 INTRODUCTION

MANET is an ad hoc network that does not necessitate any infrastructure support between two nodes to carry information packets. MANET is an ad hoc mobile network that is permanently self-ordered, infrastructure-free network of wirelessly connected mobile equipment. MANETs retain a horizontal network configuration. The shared medium supports radio communication. Every system or node in MANET architecture implies that any device is a router apart from the end user. The equipments in the MANET design are independent in common. MANET has an active topology arrangement that exceedingly supports mobility. Each and every node operates as a router in MANET setup as they route packets to other nodes.

3.2.1 Features of MANET

There are variety of characteristics of MANET as scheduled underneath:

- Operations Partitioning
- Autonomous terminal
- Multi hop routing
- Dynamic network configuration
- Varying link capacity
- Compact weight terminals

1. **Operation Partitioning**

The nodes used in a MANET would actively work with each other. Every node operate as a relay.

2. Autonomous Terminal

Each portable terminal in MANET structure is an autonomous and can function as a host. It is hence impossible to find ending points and switches.

3. Multi Hop routing

In multi-hop, MANET is to propagate packets of data from the pivot to target from the immediate wireless transmission spectrum by means of one or more intermediate nodes.

4. Dynamic network topology

The network's mobile nodes dynamically generate their own routing as they practice pushing own network forward.

5. Fluctuating link capacity

In MANET, multiple sessions collate one communication route. The channel the nodes interact on endures noise, fading, interference and lacks bandwidth than a directed network. In certain instances, the track inbetween any set of consumers may cross various wireless connections thus making it heterogeneous.

6. Light weight terminals

MANET nodes are primarily mobile devices with low potential for CPU processing, less memory capacity with limited storage for power. The architectural design for MANET sustains for the integrity of the IP architecture by allowing for MANET characteristics.

MANETs are initially self-organizing and adaptive networks that can be created and deformed on the fly without any related administration being compelled.

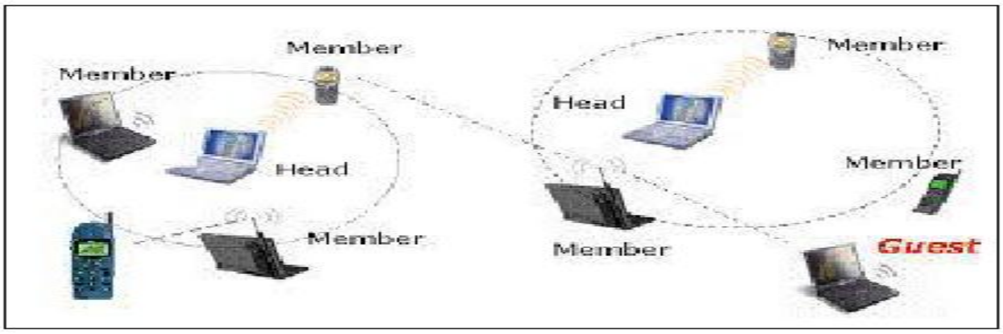

Figure 3.1 Architectural view of MANET

Figure: 3.1 illustrates the term MANET (Mobile Ad hoc Network). It is known as a multi hop packet-based wireless network. It is a couple of mobile nodes that can interact and move at the same time, without any fixed wired scheme being used. This elegant characteristic offers the use of MANETs in several specific civilian and military circumstances as well as in the emerging sensor networks technology.

3.2.2 FADING

In wireless communication, fading is fluctuations in the attenuation of a signal with mixed variables. These variables are time, geographical position, and radio frequency. Fading is often modeled as a random measure. A fading channel is a communication channel that experiences fading. Fading may occur in wireless networks owing to multi-path transmission called multi-path induced fading, climate (especially rain), or shadowing from barriers that stimulate the wave propagation granted by shadow fading. The presence of reflectors in the environment encompassing a transmitter and receiver induce multiple paths that a propagated signal can go across. Hence, the receiver displays the superposition of numerous copies of the propagated signal, each traversing a different track. Each copy of the signal will have variations in attenuation, delay and phase change, irrespective of spreading from source to receiver. This results in either constructive or harmful interference, amplification or attenuation of the receiver signal. Strong destructive interference is often referred to as a profound fade and can lead to temporary communication failure due to severe drop in the channel signal-to-noise ratio.

A common example of deep fade is the familiarity of stopping in a traffic light and hearing an FM broadcast corrupt into stationary whereas the signal is re-attained if and only if the vehicle moves a fraction of second. The broadcast loss is due to the car stopping at a stage where serious destructive interference was encountered by the signal. Mobiles may also show comparable temporary fades.

Models of fading channels are often adopted to model the results of electromagnetic airborne data transmission in cellular networks and propagation of broadcasting. Models of fading channels are also implemented to model the deformation in underwater acoustic communications.

3.2.2.1 Multipath Fading

Multipath fading is a characteristic that must be considered during the growth or execution of a network of radio communications. In any terrestrial radio communication network, the signal will not only reach the receiver through the immediate route, but also as the result of reflections from objects such as structures, mountains, floor, water, etc. next to the primary route.

The general signal is the summation of the accumulation of the received signal on the radio receiver. Because they have different path lengths, depending on their relative stages, the signals will add and subtract from the total.

Sometimes there will be fluctuations in the relative path lengths.This could lead either from shifting the radio transmitter or receiver, or from any of the objects offering a moving reflective surface. This will lead in the stages of the signals arriving at the variation of the receiver and thus the signal strength will change as a consequence of the separate summation of the signals.

The wireless environment is eminently unstable and fading due to multipath propagation. Multipath propagation brings in quick fluctuations of the phase and amplitude of the signal. The existence of reflectors in a transmitter and receiver setting generates various routes that can be denied by a transmitted signal. The receiver then sees multiple copies of the transmitted signal being superimposed, each traveling in a separate route. Each signal will show differences in attenuation, delay and phase change during the journey from source to receiver.

Multipath Fading Channel Modeling

This can result in either constructive or destructive interference, amplifying or attenuating the signal seen at the receiver. Fading can be a enormous decline in scale or a tiny decline in scale. With regard to multi-track time, small-scale delay fading is split into flat fading and selective frequency fading. If the signal bandwidth is less than the channel bandwidth and the delay spread is less than the relative symbol period, flat fading happens whereas if the signal bandwidth is greater than the channel bandwidth and the delay spread is greater than the relative symbol span, selective frequency fading happens. Small-scale fading may be rapid fading or slow fading based on the spread of Doppler. Slow fading happens when the channel's consistency time is greater relative to the channel's delay constraint. The channel's magnitude and phase change can be evaluated approximately constantly over the period of use. Slow fading can be attributed to occurrences including shadowing in which the primary signal route between the transmitter and the receiver enters a big obstacle such as a mountain or big building. Fast fading occurs when the channel's consistency time is less close to the channel's delay limit.

During the period of use, the magnitude and phase change induced by the channel changes significantly. The transmitter can take advantage of the changes in channel circumstances through time diversity in a fast-fading channel to help improve communication robustness. Nakagami fading model estimates the example with comparatively large delay-time spreads for multipath scattering, with disparate clusters of reflected waves. The stages of individual reflected waves are random, but the delay times for all waves are roughly equal. As a result, rayleigh is distributed in the envelope of each cumulated cluster signal. It is presumed that the average time delay varies considerably between clusters. If the delay times also considerably exceed a digital link's bit time, the separate clusters produce severe inter-symbol interference, so that multi-path self-interference approximates the situation of multiple co-channel interference rayleigh-fading signals.

Rayleigh fading model takes into account the fading induced by the reception of multipaths. Rayleigh fading model assumes that the amplitude of a transmitted signal will differ randomly or disappear as per the Rayleigh distribution. Rayleigh fading is a sensible model when there are many objects in the setting scattering the radio signal at the receiver before it occurs. Rayleigh fading is most suitable when there is no predominant line of view between the transmitter and the receiver. Rician model believes that a phasor can add two or more dominant signals, e.g. line-of-sight, plus surface reflection, to the dominant wave. This linked signal is then mostly regarded as a deterministic (completely predictable) operation and may also be subject to shadow attenuation for the dominant wave. This is a well-known hypothesis in satellite channel modeling. Besides the dominant equipment, a enormous amount of reflected and scattered waves are received by the mobile antenna.

3.3 PROBLEM STATEMENT

Fading in a communication network can cause bad efficiency as it can result in a loss of signal power without decreasing noise power. This signal loss may exceed some or all of the bandwidth of the signal. Fading can also be a problem as it changes over time: communication systems are often intended to cope with these impairments, but fading can change quicker than adaptations can. Fading in MANET can cause networking transmission issues .Some of the parameters like average delay, throughput, jitter, and PDR as these parameters play a vital role in the performance analysis & design of the mobile Ad-hoc network.

3.4 PROPOSED METHODOLOGY

The MANET with sensors transmits a FC estimator's findings. The sensor magnifies by one factor its observation. The sensors propagate the magnified observations to the FC over autonomous channels. The flat fading channel between the sensor and the fusion center is standardized to ensure that the distances between the sensors and the FC are approximately the same in each case when the sensors are placed close to each other and far from the FC, and the assumption is reasonable All these random variables are presumed to be mutually independent. There is an overall energy constraint on the sensors.

The FC is presumed to have complete understanding of the channels and gains in sensors, but only statistical data on the sources of noise. Because of the received signal, the unbiased evaluation of the minimum variance linear is as follows:

$$\frac{\sum_{i=1}^{L} n_i \alpha_i h_i}{\sum_{i=1}^{L} \alpha_i h_i} \tag{3.1}$$

Wired channels are described as a function of frequency that is time invariant by their attenuation and time delay characteristics. In addition, wireless channels display random and time variant characteristics of channels. To characterize the fading channel, it is required to execute its higher order fading statistics. Statistics of the first order such as likelihood density function (PDF) and Cumulative Density Function (CDF) of the received signal strength can only be used to achieve average channel conduct which involves the Bit

Error Rate (BER). Statistics of the second order such as Average Fade Duration (AFD), Level Crossing Rate (LCR), and probability of failure characterize a fading channel with a greater insight into the behaviour of the channel. Emerging 3G and 4G mobile networks are modelled to offer wide variety of services in aggressive propagation environments.

Therefore, for channel characterization purposes, extra fading parameters need to be identified. Tolerance time is described as the brief Packet Error Rate (PER) outage times that can be tolerated by a wireless communication scheme to satisfy the application based maximum value. Outage incident happens in mobile communication systems when the received signal Signal to Interference Ratio (SIR) is below the designated SIR (SIRth) limit. With the introduction of tolerance time, if SIR is below the SIRth for longer than tolerance time, an outage would be said to have occurred. Tolerable outage time is protocol and application dependent. For packet communication, the outage is defined in terms of packet error rather than drop in received signal strength. Rice demonstrated the minimum duration of outage using Fade Duration Distribution (FDD) function and applied it over Rayleigh channel L. Jie and Mandyam considered lognormal shadowing and analyzed the fading statistics using results presented by Rice.

FDD is presumed to be the distribution function of Hybrid N.W.Scheme in this section. It has been noted that Weibull pdf is more flexible and in terms of its shape parameter can efficiently model outages in distinct propagation settings. Weighbull and Nakagami channel fading parameters are evaluated with differences in fade depth and spread of Doppler. Further connection with and without tolerance between fading statistical parameters are also computed

3.4.1 Estimation of Fading Statistics of Nakagami Channel with Weibull Distributed Tolerable Outage Time

Furthermore, tolerance time interpretation is also discussed. Work organization is the following. It introduces the problem formulation with its fading features considering the Nakagami channel. Section 3 uses Weibull FDD to analyze fading parameters of mobile radio stations.

3.4.2 System Model

Our system model comprises of a cluster with N amount of mobile devices and they are not permitted to alter place as it is deemed to be just one place. All mobile devices are fitted with a Global Positioning System (GPS) and can be transmitted to other mobile devices. A CH is around the cluster core and the remaining N − 1 Mobiles are members of the cluster. A CH sends a beacon signal inviting all neighboring mobile phones to join the cluster. The mobile overhearers respond with a request message containing parameters such as roaming, signaling and bandwidth requirements. A CH assists all other nodes in communicating through obtaining, processing and then transmitting the signal to N – 1 Mobile. Let Yi denotes the placement in the cluster of ith mobile and Yic denotes the position of CH.

In addition, di indicates the distance between mobile CH and i and di = Yi − Yic. The time scale referenced is taken into account in milliseconds. Mainly for this purpose, two fading schemes weighbull and nakagami were emerged as hybrid N.W Gamma scheme for verifying and gave solution to the fading problems.

The system comprises of parallel relays p and k connected wirelessly to s and d. First hop CSI channels are presumed. This protocol says that S gets the CSIs for each transmission (γ1(l) for l =1,... N) RF relay channels through local feedback. Once the CSIs are obtained, S sort the values of the CSIs in an incremental amplitude order as follows: $\gamma 1(1) \leq \gamma 1(2) \leq . . . \leq \gamma 1(N)$.

S chooses the relay with the largest RF -SNR, which is obviously the last rank N relay based on this sorting. Since the relays operate in half-duplex mode, the best N-rate relay may not always be available for transmitting the signal. A will pick the next best relay in this situation, and so on. Moreover, even after the choice, the relay with the last rank is not always the best one. The channels vary in time, and the feedback from the relays to S is very slow. In this case, the CSIs are susceptible to significant variations and therefore their values are not the same before and after the lesson. It turned out that the channel estimation is not ideal and therefore the choice of relays is made on the basis of obsolete CSIs.

A time correlation coefficient between the outdated and the updated CSIs is combined to model this incomplete channel estimate. The best relay is therefore not necessarily the last one because the choice is based on the obsolete CSI. Suppose S chooses the relay of rank m, the received signal is provided by the relay:

$$X1(m) = hm(s + \eta 1) + \nu 1 \ (1) \tag{3.2}$$

Where hm is the RF channel fading, $s \in C$ is the information signal, $\nu 1 \backsim CN\ (0, \sigma\ 2\ 0)$ is the AWGN of the RF channel, $\eta 1 \backsim CN\ (0, \kappa\ 2\ 1P1)$ is the distortion noise at a, $\kappa 1$ is the impairment level at S and P1 is the average transmitted power from S.

Once the RM relay receives the signal entirely, it is enhanced by a set gain G which depends on the RF channels ' average electrical SNR where P2 is the average transmitted energy from the relay to D and E is the expected operator. The improved signal at the output of the relay is given by:

$$yopt(m) = G(1 + \eta e)y1(m) \tag{3.3}$$

Where ηe is the electrical-to-optical conversion coefficient. Finally the received signal at the destination can be expressed as follows:

$$y2(m) = (\eta oIm)\ r\ 2\ [G(1 + \eta e)(hm(s+\eta 1) + \nu 1) + \eta 2] + \nu 2 \tag{3.4}$$

where ηo is the optical-to-electrical conversion coefficient, Im is the optical irradiance between Rm and D, It is the distortion noise at the relay Rm, κ2 is the impairment level at Rm, ν2 ∽ CN (0, σ 2 0) is the AWGN of the optical channel and r = 1, 2 stands for heterodyne and IM/DD detections respectively.

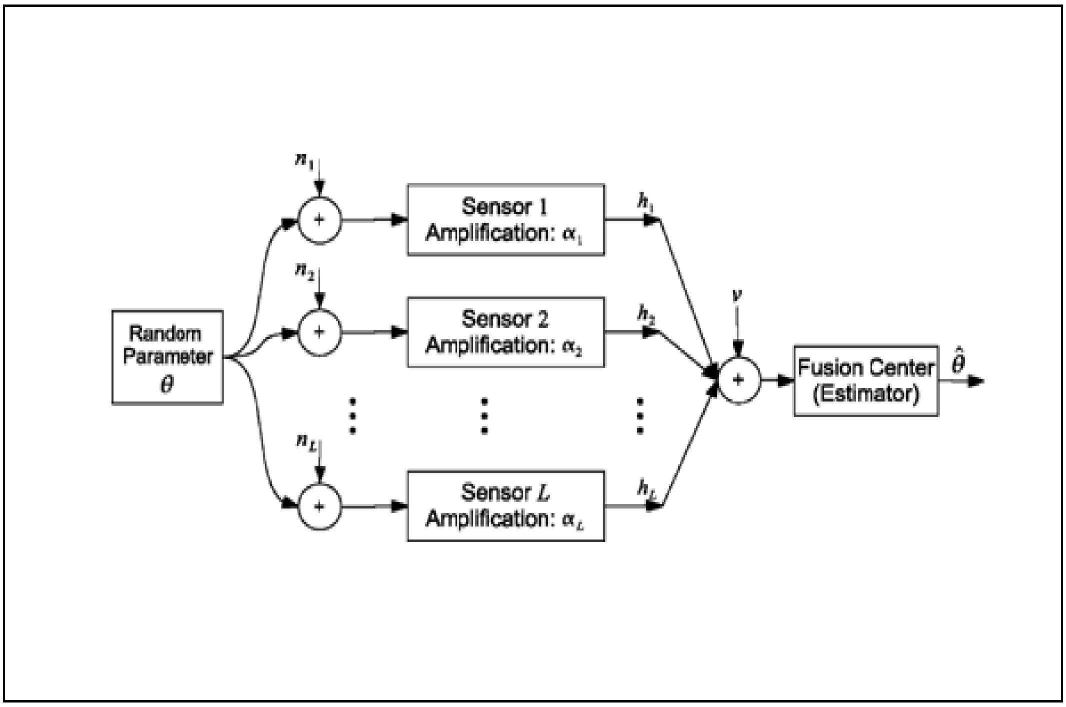

Figure 3.2 Hybrid N.W Gamma scheme Representation

A realistic channel of propagation comprises of two major phenomena like multipath fading and shadowing. Multipath fading is primarily owing to the reality that the signal parts meet with distinct channel gain and phase at the receiving node, whereas the shadowing is due to the obstruction of the signals. Therefore, both phenomena must be considered concurrently in order to characterize the channel correctly. A composite model is therefore a mathematical model class that involves both the phenomena and is therefore a more realistic model amidst the available class of composite fading models.

The importance of Hybrid N.W. Scheme lies in the reality that the Weibull distribution is known to characterize the multi-path impacts of an indoor and outdoor channel based on its outstanding matching with the measurements carried out in associated settings. In addition to characterizing the wireless channel, Weibull distribution has been used in numerous other areas such as radar clutter, reliability engineering, and data analysis of failure. Furthermore, models for mobile-to-mobile channels in a 1.85 GHz suburban region with thick scattering settings have been revealed and a combination of Weibull and Nakagami distribution found to be suitable in several test scenarios for small-scale fading.

The channel's shadowing impact is best captured by the distribution of Lognormal (LN). In addition, the LN distribution has been shown to characterize a number of wireless apps such as outdoor scenarios, fading phenomenon in indoor environments, radio channels impacted by body worn devices, ultra-wide indoor channels, weak to moderate channels of turbulence in free-space optical communications channels, etc. Furthermore, the suitability of the LN allocation based on the shadowing parameter was also recorded in, and the references in, several other applications, i.e. the multi-input multi-output Ultra-Wide Indoor (UWB) channel (between 1 and 4 dB), the Single-

Input Single-Output (SISO) indoor UWB channel (between 3 and 5 dB) and the medium-scale fading (between 6 and 12 dB) were recorded.

There are several basic works that explore the energy detector's performance analysis over a multitude of fading distributions. In terms of bivariate Fox's H-function over several classes of fading models such as Rayleigh, Maxwell, etc., the energy detector performance over Weibull and several other multi-path fading models was provided with closed-form expressions of the probability of missed detection (PM). In addition, asymptotic PM solutions were obtained at low and high Signal-to-Noise (SNR) ratios.

In the analytical expression, fading channel is obtained in the form of infinite summation terms for the probability of detection (PD) for Weibull. Number of multipath models is regarded, namely Nakagami-m, Rician, Weibull, etc., and the PD expression is obtained and the outcome is further used to evaluate cooperative spectrum sensing (CSS) performance.

In addition, to experience the efficiency of the energy detector in a realistic setting, the work describes the evaluation of the detector taking into account the composite distributions. The average detection probability for K and KG composite fading channels with maximum combination proportion (MRC) and selection combination (SC) is obtained in the closed-form phrases. The model is regarded in expanded generalized composite fading channel and the PD expression is presented in terms of the H-function of Fox.

The research regarded the gamma shadowed Rice channel environment and conducted derivations for significant metrics such as the PD and the average region under the receiver operating characteristic curve (AUC) taking into account both the likelihood distribution function (PDF) approach and the

Moment Generating Function (MGF) modeling and performance analysis of the energy detector over-based application with diversity reception. Also, the PM's asymptotic analysis was conducted. The achievement of the W – LN composite fading channel and the analytical outcomes of the likelihood of failure, the amount of fading (AOF), the average likelihood of symbol mistake (ASEP), and the channel capability were suggested.

The likelihood of detection evaluation linked to W – LN composite fading, however, is rather uncommon to the best of the author's understanding, and is therefore the motive of the current job. A class of W – LN composite fading channel is regarded in this job and the analytical expressions for detection likelihood and average AUC were obtained In addition, the research is expanded to present the closed-form asymptotic PD and average AUC solutions with diversity schemes such as MRC, equal profit combination (EGC) and SC. Lastly, the derived results are applied to the cooperative spectrum sensing analysis taking into account the erroneous channel between the secondary users (SUs) and the fusion center (FC).

3.4.3 Weibull Distribution Function

There are distinct fading features of mobile radio stations like Rayleigh, Rician or Na-kagami. In this job, the Weibull distribution function and Nakakami are chosen for such channels as a fade length distribution, because it can represent various shaped FDD with values of its shape factor “α”. The pdf and CDF of the Hybrid N.W Gamma scheme is given by

$$f\ t\ \square\ \pi\varnothing^{\square\,\tilde{}\ 1}\ e^{\lambda t\,\square} \qquad (3.5)$$

$$F t\ \square\ \ \tilde{1}\ e^{\square\ t} \qquad (3.6)$$

Where $\pi > 0$ is the shape parameter and $Ø > 0$ is the scale parameter of the distribution and "t" is outage time duration. The distribution has "$1/\lambda$" is its average value. The Hybrid.N.Weibull Gamma scheme with "$\pi = 1$"match up to exponential function and "$\pi = 2$" corresponds to the Nakagami distribution. A value of $Ø < 1$ denotes that the fading rate diminish over time. This happens if channel improves continuously in terms of fading. A value of $\pi = 1$ denotes that the fading rate is constant irrespective of time.

3.4.4 Adaptive Model

The fading channel model used is based on the Hybrid N.W. Gamma scheme radio channel model, where the transmitted signal is affected by multipath fading channel environment through specific channel coefficients. In the frequency domain, the coefficients can produce speed-dependent spectrum. Since Hybrid N.W. Gamma scheme is not required with respect to this work, the Hybrid N.W. Gamma scheme is simplified to single input single output (SISO) channel model. This is the spectrum of Doppler, selected by Clarke model. Usually, Clarke spectrum is valid when the multi-path stages that arrive at the receiver are distributed in values evenly. The channel coefficients in the above model can be either distributed by Rician or Rayleigh.

3.4.5 Hybrid N.W. Gamma Scheme

Distribution of Weibull-Gamma (WG) for multipath modeling along with shadowing. Because of its less computational complexity, the WG fading channel is used to evaluate the output of the Hybrid N.W. Gamma system.

The ergodic capability was assessed under such fading channel circumstances and the error rate performance of the Hybrid N.W. Gamma system was assessed using an effective detection method. Since many geometry locations are on the edge of their cells, users operate frequently at low SNR apart from operating at high SNR. According to 40% of the geographical region gets signals as low as 0 dB and less than 10% of the region gets a SNR higher than 10 dB.

The system efficiency assessment at low SNR is essential for the developers under these circumstances. In Hybrid N.W. Gamma Merit Scheme relies on standardized energy per data bit (Eb / N0) rather than SNR. In the low SNR regime, the per-symbol channel capacity analysis gives misguided results and thus capacity is defined as the minimum energy per information bit. From now on, channel bandwidth, power and transmission rate were analyzed with an arbitrary number of antennas transmitted and received by minimizing Eb. In the ergodic capacity of spatially multiplexed (SM) and OSTBC Hybrid N.W. Gamma scheme has been computed over GKfading channel.

This channel model reduces energy levels to a prominent range, the Hybrid N.W. Gamma system, namely SM with optimal detector, SM with MMSE detector and OSTBC, was created to assess efficiency over Weibull fading channel at low SNR. Statistical characterization of Hybrid N.W. scheme fading channel is not fully investigated in existing literature. Therefore, with this generic allocation, capability efficiency is evaluated.

This generic channel model is analytically better than other composite channel models, which show the linear approximation of multipath and shadow fading circumstances. $Eb/N0$ min and wideband slope ($S0$), the important parameters for reliably transmitting any positive data rate and analyzing the ability of the low SNR Hybrid N.W. Gamma system. SM's superiority against OSTBC is being created elsewhere in providing better ability. However, the SM scheme is not optimal at low SNRs and allows working with channel matrix trace, which is given in Optimal detectors, apart from its own statistics, to offer the maximum capacity of the Hybrid N.W Gamma scheme MMSE detectors, however, are less complicated than ideal detectors and deliver better output of capability. Furthermore, OSTBC is a method based on diversity. Thus, under WG fading, we investigated these three methods. Further, the Hybrid N.W. Gamma scheme's capacity at low SNR is evaluated.

3.4.5.1 Measurement-based Hybrid N.W Gamma scheme distributions

As described in our introduction, a broad class of fading channel circumstances can be modeled. This model of fading distribution gained momentum, since the Hybrid N.W Gamma scheme distribution often gives the finest land-mobile and indoor mobile multipath propagations. More recent studies also showed that Hybrid N.W Gamma scheme gives the appropriate satellite-to-indoor and satellite-to-outdoor radio wave propagation The probability density function (PDF) for a Hybrid N.W Gamma scheme distributed channel.

The hybrid gamma equation is

$$f_{x(x)=ds/\emptyset c^2 x^{f-1}\exp}[-s]x^2/\infty \qquad (3.7)$$

Where = d= [Xc2] , s = [(1 + 2c)]c⁄2 and ( ) is the Gamma function. Here c is the multipath parameter, as c → ∞ channel condition improves. A Lognormal random variable

(RV) has the PDF

$$f\ Z(z) = \frac{1}{3\omega}\sqrt{2\pi \exp \frac{(inz-u)}{1)}}\ \emptyset 2/2,, \qquad (3.8)$$

The composite distribution is obtained by superimposing two features of probability distribution, according to the fundamental theory of statistics. In this case, one distribution of probabilities is considered the Weibull and the other the LN distribution.

Thus, defining a composite distribution as

$$f_{x(x)=\int_0^{\infty} dsx^{f-1\exp}\left\{-s.\frac{2x}{z}\right\}^{3^2} 1/z\omega\sqrt{2\pi}exp\sqrt{2\pi\exp^{(inz-u)}_{1\}}}\emptyset 2/2} \quad (3.9)$$

where $fX\_Z(x\_z)$ is the conditional PDF of multipath in the presence of shadowing. Assuming t = ln $z\sqrt{2}$ and after some mathematical manipulations, we get

$$f_{x(x)=cs/2\pi\int_{\infty}^{-\infty} x^c-1x^{f-1\exp}\left\{-s.\frac{2x}{z}\right\}^{3^2} 1/z\omega\sqrt{2\pi\exp^{(inz-u)}_{1\}}}\emptyset 2/2} \text{y} \quad (3.10)$$

Applying Gauss-hermite (G-H) integration $f(t)\exp(-t2) \approx \Sigma Ni{=}1\ wif\,(ti)$, where wi and ti are the weights and abscissas of G–H integration respectively, N is the number of G–H terms (it may be noted that larger the value of N, lesser the truncation error in the analytical expression of the envelop PDF is given

$$f\ X(x) = cA\ wa\hat{}ix\ \hat{}i\sqrt{x+2\pi}E\hat{}S \quad (3.11)$$

We can evaluate the signal-to-noise ratio PDF from the conversion envelope PDF where = Es is the word in the numerator describes energy per sign and the word in the denominator is one-sided power spectral density of additive white Gaussian noise (AWGN).

$$f\ X(x) = [cA\ wa\hat{}ix\ \hat{}i\sqrt{x+2\pi}E\hat{}S+\{RDLT\ (\varepsilon, \lambda) = \mu s\}] \quad (3.12)$$

3.4.6 Additive White Gaussian Noise (AWGN)

In information theory, it is a fundamental noise model used to replicate the impact of many random processes occurring in nature. The modifiers indicate particular features:

- **Additive** relates to noise inherent to the data scheme**.**
- **White** relates to the concept of having standardized authority for the information system across the frequency band. It is an analogy to the white color that has uniform emissions in the visible spectrum at all frequencies.
- **Gaussian** has an average time domain value of zero in the time domain**.**

Wideband noise arises from many natural noises, such as conductor heat vibrations of electrons (referred to as heat noise or Johnson – Nyquist noise), shot noise, earth black body radiation and other hot items, and from heavenly sources such as the Sun. The central limit theorem of probability theory suggests that the summing up of many random processes tends to be called Gaussian or Normal distribution.

AWGN is often used as a channel model where a linear addition of wideband or white noise with a steady spectral density (expressed as watts per hertz of bandwidth) and a Gussian distribution of amplitude are the only impairment in communication. It does, however, produce easy and tractable mathematical models that are helpful to gain insight into a system's fundamental conduct before these other phenomena are regarded.

For many satellite and deep space communication connections, the AWGN channel is a nice model. For most terrestrial connections, it is not a excellent model due to multipath, terrain blocking, interference, etc. However, AWGN is frequently used for terrestrial route modeling to simulate background noise of the channel being studied in relation to multipath, terrain blocking, interference, ground clutter and self-interference that contemporary radio systems meet in terrestrial operation.

3.4.6.1 Performance over AWGN Channels

We first examine the performance of the system channels over AWGN, The signal at the GPS receiver can be written as

r(t) =N.sv where s= 1

ds(t − τs)βs(t − τs)e+ j2πfDstCs(t − τs) + η(t)

Where t is the GPS time, Nsv is the number of satellites in view at time t and ds(·) is the data bit from satellite s. The complex channel coefficient, instantaneous delay, and Doppler frequency from satellite s at time t are defined respectively by βs(t), τs, and fDs. Here Cs(t) is the transmitted code and η(t) is an additive noise.

Compared to various theoretical distributions such as Rayleigh, Rician, Nakagami, the correlator output corresponding to the satellite v, the timely delay π and the signal amplitude R = distribution. The PDF of a hybrid N.E gamma scheme fading channel coefficient with amplitude R and the N-W gamma scheme parameter is given by r.

3.5 RESULTS AND DISCUSSION

This chapter discusses the results for the throughput, PDR, jitter; end to end delay displays that the Hybrid N.W Gaussian approach is much better than the existing model. The data packet size is presumed to 512 bytes in all and each reported outcome is the average 300 second. It is also concluded that the performance of fast Rayleigh lowers when the speed of the nodes rises.

Table 3.1 Number of Nodes Vs End to End Delay

Number of nodes	**SM scheme**	**PSK Scheme**	**Hybrid N.W gamma scheme**
5	0.39	0.35	0.15
10	0.36	0.3	0.13
15	0.33	0.27	0.12
20	0.3	0.24	0.11
25	0.29	0.2	0.09
30	0.27	0.18	0.08
35	0.25	0.15	0.07
40	0.22	0.13	0.06
45	0.2	0.12	0.05
50	0.19	0.11	0.04

In the above Table 3.1, the proposed approach is compared with the conventional approach. The outcome of this Hybrid N.W Gaussian strategy is due to two impacts proposed by a change in the channel consistency length ; an increase in the average channel length of excellent quality and an increase in quality.

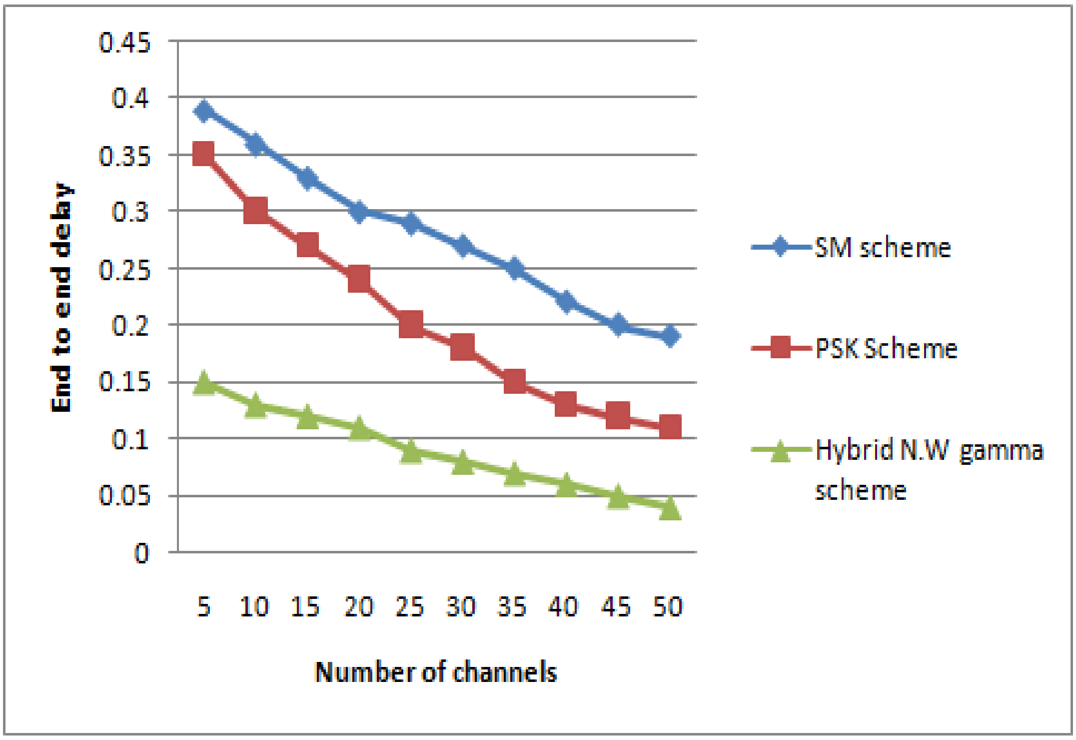

Figure 3.3 Comparison of Proposed Method with Existing Method

Figure 3.3 shows the comparison of recommended innovative hybrid method with other two conventional methods. Thus it is clear that Hybrid N.W gamma approach gives less end to end delay as compared to other two existing approaches.

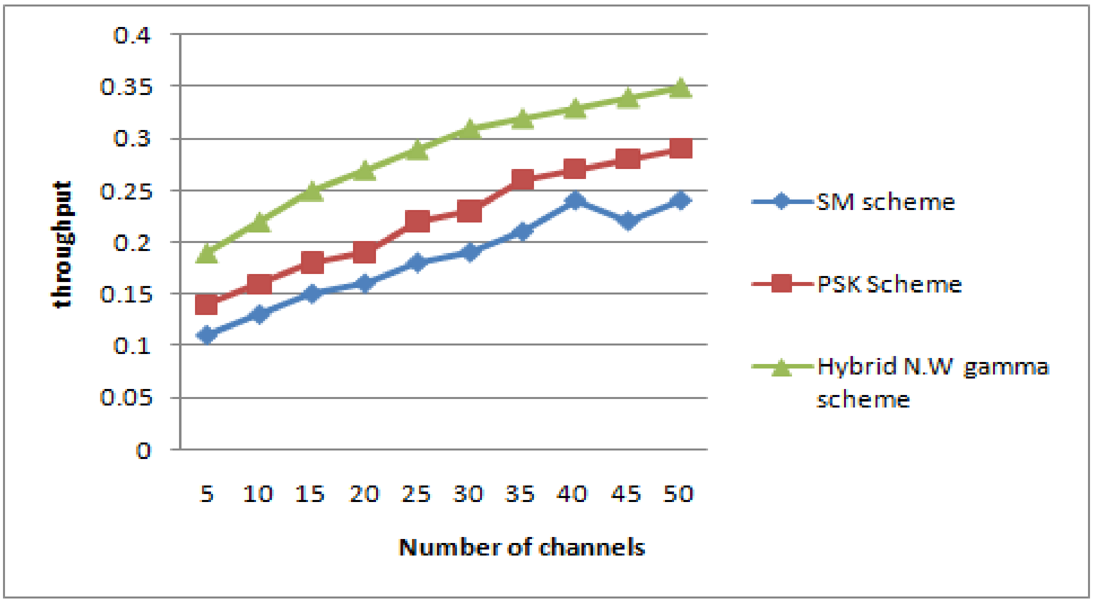

Figure 3.4 Throughput Ratio

Table 3.2 Number of Channels Vs Throughput

Number of nodes	SM scheme	PSK Scheme	Hybrid N.W gamma scheme
5	0.11	0.14	0.19
10	0.13	0.16	0.22
15	0.15	0.18	0.25
20	0.16	0.19	0.27
25	0.18	0.22	0.29
30	0.19	0.23	0.31
35	0.21	0.26	0.32
40	0.24	0.27	0.33
45	0.22	0.28	0.34
50	0.24	0.29	0.35

Table 3.2 displays the comparison of proposed approach values with conventional method values and figure 3.4 compares another method with the suggested method. From the graph, it is proven that the throughput ratio goes high for proposed method. This exhibits that when novel Hybrid N.W scheme is implemented for fading issues, it gives better results as compared to other existing approaches.

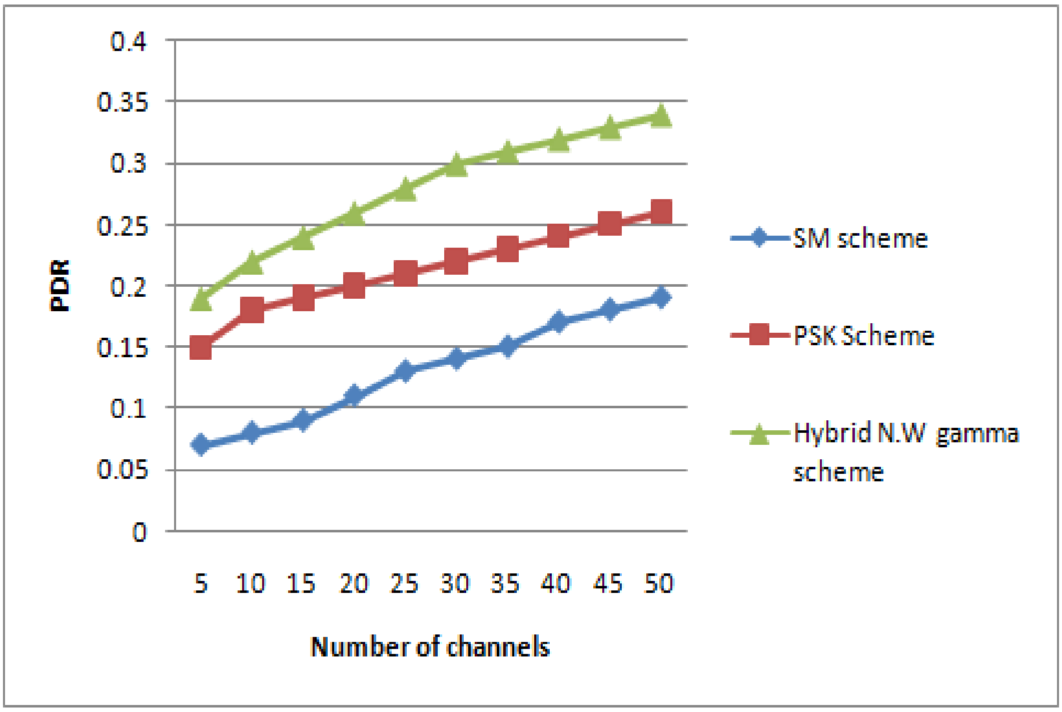

Figure 3.5 PDR

Table 3.3 depicts the comparison of proposed method values with conventional method values. The values of the table clearly show the difference between other existing method and proposed Hybrid N.W.Gamma scheme. The changes in the values clearly proves that the proposed scheme express the better results and the figure 3.5 compares another method with the recommended work. Therefore from the obtained graph, it is clear that the PDR value goes high for the proposed method. This exhibits that when novel Hybrid

N.W scheme is executed for fading issues, it gives better results as compared with other existing approaches.

Table 3.3 Number of Channels Vs PDR

Number of nodes	**SM scheme**	**PSK Scheme**	**Hybrid N.W gamma scheme**
5	0.07	0.15	0.19
10	0.08	0.18	0.22
15	0.09	0.19	0.24
20	0.11	0.2	0.26
25	0.13	0.21	0.28
30	0.14	0.22	0.3
35	0.15	0.23	0.31
40	0.17	0.24	0.32
45	0.18	0.25	0.33
50	0.19	0.26	0.34

Figure 3.6 compares the remaining method with the proposed method. As a result, from the obtained graph it is evident that the jitter value gets less for the proposed method. This illustrates that when novel Hybrid N.W scheme is executed for fading issues, it will gives better results compared to other existing methods and the table 3.4 depicts the comparison of proposed method values with existing method values. The values in the table clearly represent the difference between other existing method and proposed Hybrid N.W.Gamma scheme. The changes in the values clearly depicts that the proposed novel scheme can express better results.

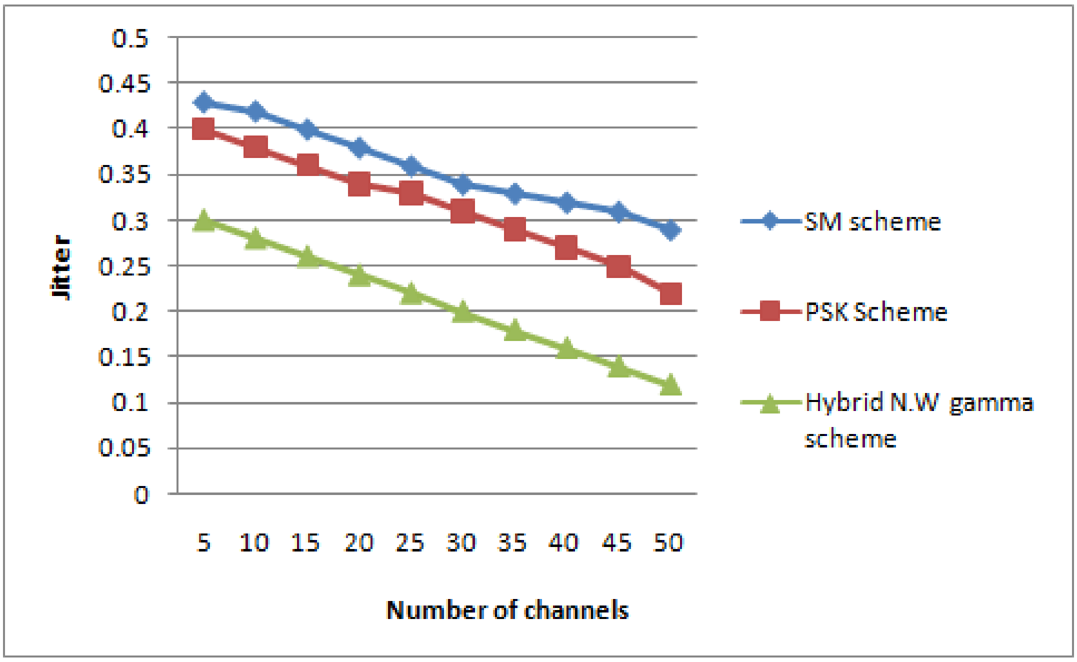

Figure 3.6 Jitter

Table 3.4 Number of Channels Vs jitter

Number of nodes	SM scheme	PSK Scheme	Hybrid N.W gamma scheme
5	0.43	0.4	0.3
10	0.42	0.38	0.28
15	0.4	0.36	0.26
20	0.38	0.34	0.24
25	0.36	0.33	0.22
30	0.34	0.31	0.2
35	0.33	0.29	0.18
40	0.32	0.27	0.16
45	0.31	0.25	0.14
50	0.29	0.22	0.12

3.6 SUMMARY

In this proposed work with the consideration of the results for the throughput, PDR, jitter, end to end delay, it is evident that the proposed Hybrid N.W.Gaussian scheme is far better than the existing methods. It is also concluded that the performance of nakagami and weighbull enhances whereas the performance of other traditional methods reduces when the speed of the channels rises. This outcome is due to two impacts highlighted by the shift in channel consistency, the increase in the average channel length of excellent quality and the increase in bad quality.

A comparison of the performance of an ad hoc network working in a Hybrid N.W Gamma scheme fading channel with the more commonly used in range channel model has shown that the end to end delay is inadequate for describing the performance of the model Hybrid N.W Gamma scheme fading for most applications of interest. Hence the throughput, jitter, delay are more suitable performance metrics that offers a more intuitive indication of delivery of packets in ad hoc networks operating in a Hybrid N.W Gamma scheme fading environment From the outcomes, it is noted that the quantity of fading in the signal envelope is increased as the user velocity is increased. As a result, as the velocity of the nodes rises, more of the signal gets below the limit and increases the quantity of fading. It is also concluded that the delay and jitter lowers as the speed of the channel rises for all fading models. From the outcomes, it is noted that the quantity of fading in the signal envelope is increased as the user velocity is increased. As a result, as the velocity of the nodes rises, more of the signal gets below the limit and increases the quantity of fading.

CHAPTER 4

EFFECTIVE UPGRADING THE FADDING CHANNELS PERFORMANCE IN MANETS USING QPSK BASED GROVER SEARCHING ALGORITHM

4.1 OBJECTIVE

A novel approach QPSK based Grover searching algorithm is adopted to upgrade the fading channel performance in MANET. This chapter, addresses the enhancement of the fading channel that is employed to prove optimal routing efficiency and maximization of mobile ad hoc network lifetime. Thus it deals less in Path loss, Total Energy consumption, Average Bit error Rate, enhanced Packet Delivery Ratio, Probability Density Function, and Data Transmission Rate. The primary intention is to achieve the fading channel performance that is needed to enhance the efficiency and well-organized network communication.

4.2 INTRODUCTION

Wireless mobile network and utilization of mobile equipment's are increasingly famous as they support consumer's access to information anytime and anywhere. Mobile Ad hoc Networks (MANETs) is one of favourable communication technology in situations like emergency, military , and civilian applications, collaborative computing and communication in smaller areas [1]. MANET topology fluctuates frequently due to node/link failures, node joining/leaving and mobility of nodes. So, there are several problems in MANETs like routing, resource allocation, security, adaptability with heterogeneous platforms and equipment's, Quality of Service (QoS) management, power management, media access, channel management, addressing, mobility management, performance modeling, etc. Routing is one of the prominent concerns in MANETs that involves the route location and route maintenance among source and destination of node pairs. Routing approaches in MANETs are unicast (one-to-one), multicast (one-to-many), any cast (one-to-one of many) and broadcast (one-to-all). To support real-time multimedia applications in unicast, multicast and any cast in MANETs, QoS must be guaranteed as per to the user requirement.

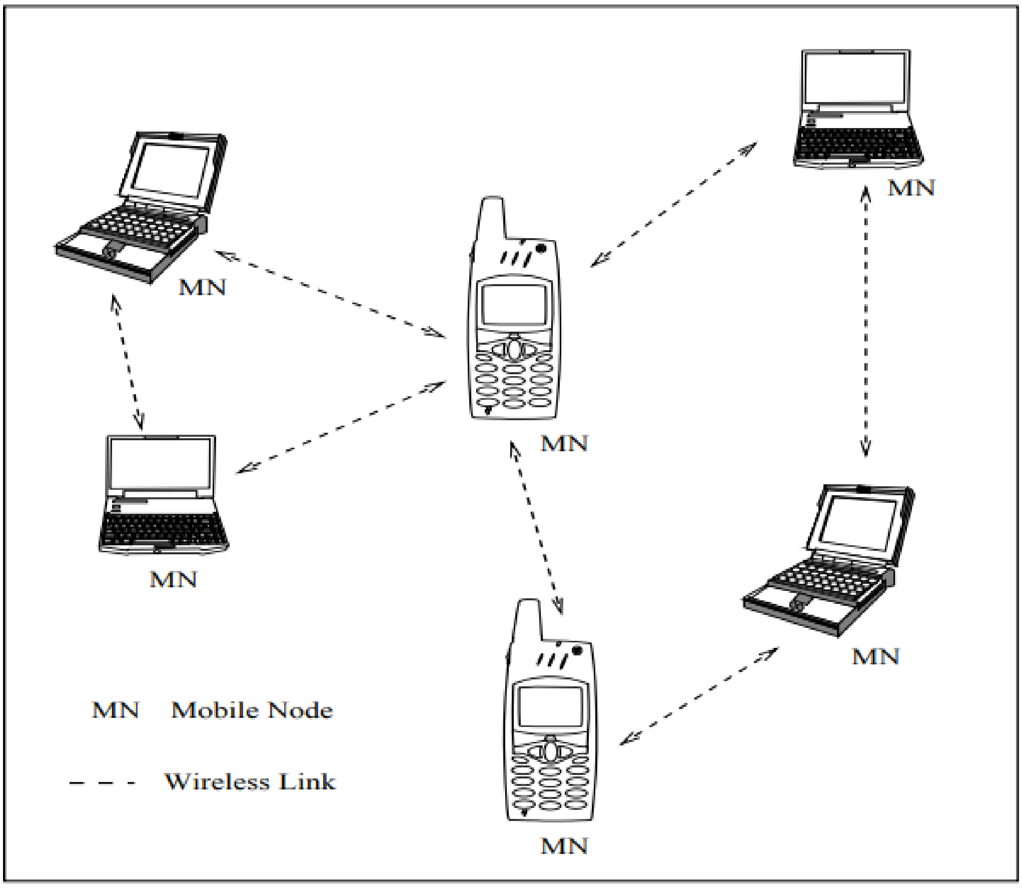

Figure 4.1 MANET settings

MANET nodes are linked by wireless connections. In the network all node works as a limit system as well as router for other nodes and nodes move freely in a random manner. Ad hoc nodes communicate to their neighbors through wireless connection within an area of influence as illustrated in figure 4.1. The size of transmission is a function of various parameters like node interface, and battery power level, interference from the environment, etc.

4.2.1 Prefaces to Fading Channel

Fading is quick variation in the magnitude, delay of multiple radio signals for small duration of period pay no attention to huge scale path loss effects. It is due to intervention of the transmitted signal added at the receiver.

Signal broadcast through dissimilar tracks and appear in receiver, hence received signal, a multipath wave mixture that are with unlike phases and magnitudes. The transmission waves are of two categories: Specula and Diffuse equipment's. Specula waves are differentiated by strong line of sight equipment and addition of reflected components at same time, diffuse waves are made up of faint waves with random amplitude and periods commonly referred as scattered components. The consequential signals at the receiver is given by equation (4.1)

$$R_s = \sum_{j=1}^{k} R_j exp\left(i\theta_j\right) + \sum_{m=1}^{V} R_m exp\left(i\theta_m\right) \qquad (4.1)$$

From equation 4.1 it is clear that received signal is made up of N strong components and M diffuse components. A specula component is a single term$\{R_j \exp\left(i\theta_j\right)\}$, stand for single multipath wave arrival. Phase θ_j is a random specula component and envelope $R_j$is constant. A Non specula diffuse component, carrying power with several entity waves is insignificant to the entire mean power.

TWDP stands for Two Wave Diffuse Power Fading consisting two strong LOS mechanisms and a lot of diffuse components. This model has attracted attention because present settings are correctly characterized by this fading model. It has two parameters that are K and Δ defined below:

$$K = \frac{R_1^2 + R_2^2}{2\emptyset^2} \Delta = \frac{2R_1R_2}{R_1^2 + R_2^2}$$

Where $R_1$and $R_2$are voltage amplitude of the two specula waves and $2\emptyset^2$ presents diffused component mean power, ratio of the specula to diffused power is known as K and Δ represents comparative power of two specula components.

Figure 4.2 exhibits fading model of TWDP of specula and diffuse component. The exceptional examples of TWDP fading models decadent to Rayleigh, when K=0 and Δ=0 Rician fading is approximated and when Δ ~= 1 and K→Ω .

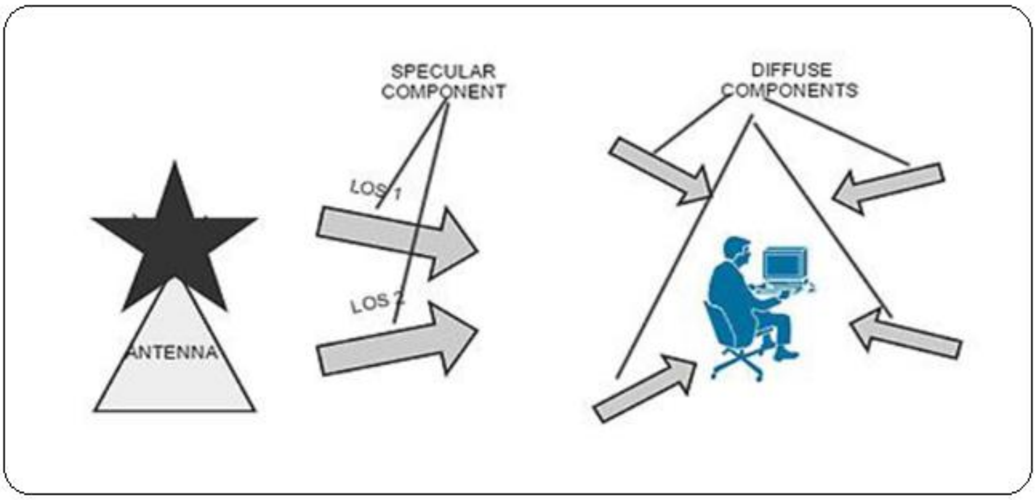

Figure 4.2 TWDP Environment

Few important attributes of fading channels, their impact on the coded modulation network performance execution and counter measures implemented to improve the performance were presented in this chapter.

Fading emerges owing to attenuation of radio signal which allows objects to the receiver through transmitter as aoutcome of reflection and scattering of transmitted signal, based on the receiver and transmitter distance signal power is lowered. Organizations of remaining chapter areas follows: Section 4.3 represents the statement of the problem. Section 4.4 introduces proposed technique. Section 4.5 depicts the performance analysis for Path loss, jitter, Link failure, Bit error Rate and Packet Delivery Ratio .Finally the thesis is concluded in section 4.6.

4.3 PROBLEM STATEMENT

The major challenges for MANET are to improve the fading channels that maximize the secrecy capacity of the channel model. Moreover, establishing paths with the highest performance is a challenging issue forreducing Path loss, Total Energy consumption, Average Bit error Rate, and improve Packet Delivery Ratio, Probability Density Function, and Data Transmission Rate.

4.4 PROPOSED METHODOLOGY

In this chapter, MANETs route searching is carried out by QPSK based Grover searching algorithm on node probability computation. Using parallel quantum phase-shift-keying (QPSK) schemes the operating time is reduced by Grover's searching algorithm. Due to extent of large solution conventional searching algorithms requires more paths and the solution path amplitude set is very small which a major drawback is in Grover's searching algorithm. Hence core of QPSK based Grover searching algorithm determines the making of the amplitude to streamline the solution- path set quickly. Alternatively itis not easy for Grover's searching algorithm to explore all paths and aims at increasing the probability of solution paths by converting non-solution paths amplitude to amplitude solution paths.

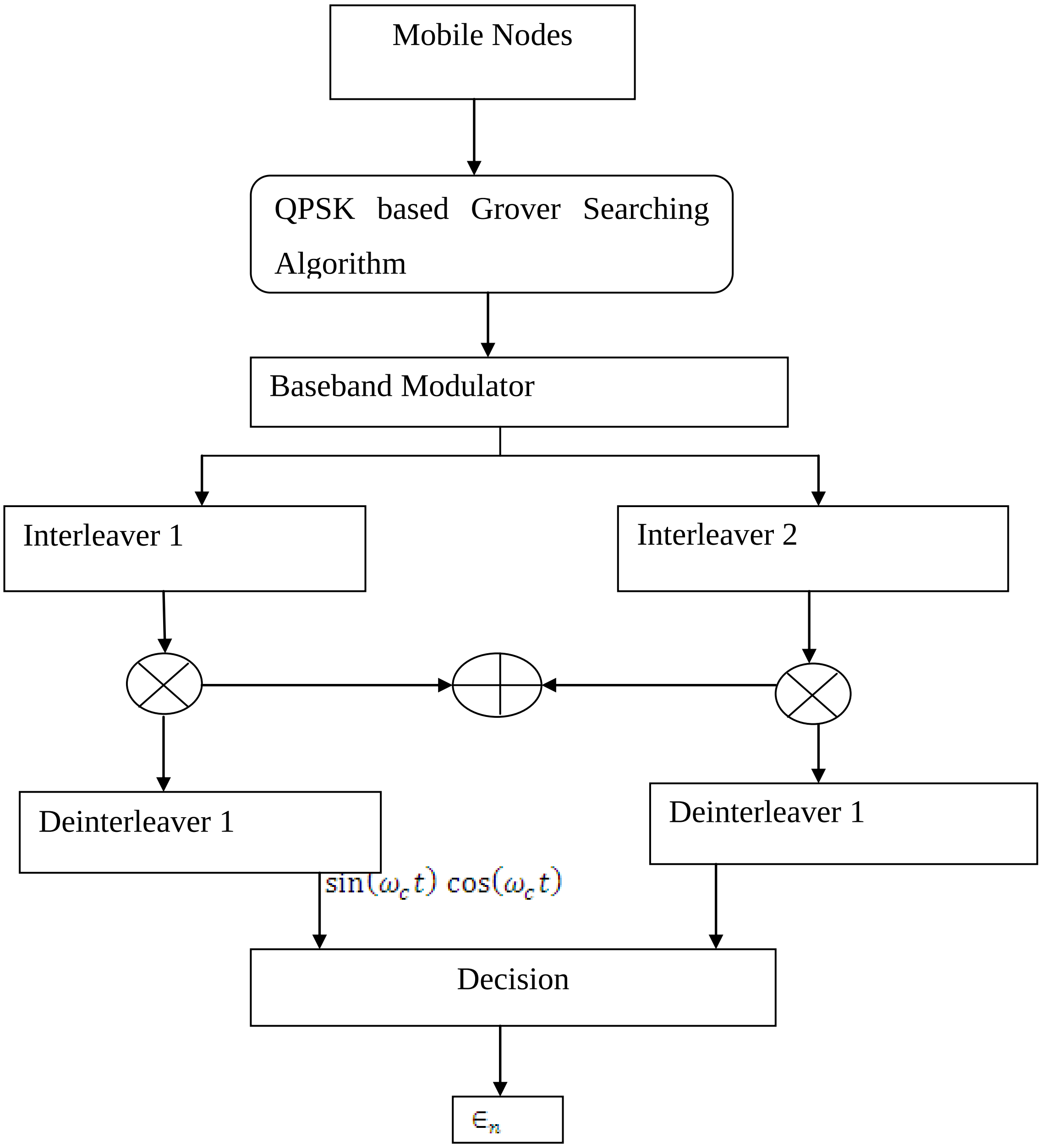

Figure 4.3 System Model for QPSK based Grover searching algorithm

Figure 4.3 show the system model for QPSK based Grover searching algorithm for improving the fading channel performance in MANET. From observation the execution of modified scheme is proportional to coded scheme and proposes that inter leaving coded schemes cannot suitable for fading channel optimization which is process. Thus its performance can be improved further.

4.4.1 Channel and Approach

The channel presumed as slow with TWDP fading statistics as not frequency non-selective and Ts (one symbol duration) is communicated as

$$S^{'}(t) = jz^{r\emptyset}\, l(t) + m(t) \tag{4.2}$$

Where l(t) = transmitted symbol of energy e_a, n(t) = noise, (¢) = suggest phase and r = TWDP fading amplitude.

Parameters such as K and Δ are used to identify the TWDP PDF shape is given below

$$K = \frac{R_1^2+R_2^2}{2\emptyset^2} \; and \; \Delta = \frac{2R_1R_2}{R_1^2+R_2^2},$$

Where R1 and R2 represent the voltage magnitudes of specula waves and $2\emptyset^2$represent the diffuse waves mean power. K is the proportion of complete speculative power to energy diffusion and Δ represents comparitive strength of two specula components. By altering K and Δ value more models can be created.

K=0	--------	Rayleigh
K>0	Δ = 0	Rician
K→∞	Δ = 0	One Wave
K→∞	Δ > 0	Two Wave

In this model by assumption received signal contains two LOS components along with different non-specula components and investigation of TWDP fading systems need TWDP fading PDF and represented as:

$$PDF\ L(l) = \left(\frac{l}{\emptyset^2}\right) \exp\left(-K - \frac{l^2}{2}\emptyset^2\right) \sum g_i B\left(\frac{l}{\emptyset}; K; g_i\right) \quad (4.3)$$

Where,

$B(a; K; g_i) =$

$\frac{1}{2} \exp(g_i K)\ Io\ (a\sqrt{2K(1-g_i)}\ ) + \frac{1}{2} \exp(-g_i K)\ Io\ (a\sqrt{2K(1-g_i)}$

),

Where Io = first kind Bessel function with zeroth order, H is the order of TWDF $g_i = \cos\Delta(\frac{\pi(i-1)}{2H-1})$ PDF and given as L >= (1/2) K.

4.4.2 QPSK Based Grover Searching Algorithm

A QPSK based Grover searching algorithm modulation is viewed as two binary PSK modulations such as I channel and Q channel; hence two parallel signals which are orthogonal are alienated in the receiver.

Accordingly fading channels which are self-reliant are employed to transmit two signals initiates gain in to the system, which is attained by self-reliant interleaving I and Q channels. But diversity gain concept helps quadrature components when redundancy exists between them.

By considering predictable QPSK based Grover searching algorithm, broadcast signal is represented by,

$$R(t) = S\sum_{n=-\infty}^{+\infty} q_n h(t - mS_n)\cos(2\pi f_c t) + S\sum_{n=-\infty}^{+\infty} p_n h(t - mS_n)\sin(2\pi f_c t)$$

(4.4)

Where

$q_n, p_n = \pm 1$with equal probability

$$h(t) = \begin{cases} 1, & 0 \le t \le S_n \\ 0, & elsewhere \end{cases}$$

And f_c is the carrier frequency.

QPSK based Grover searching algorithm scheme is defined without affecting its bandwidth efficiency. M-dimensional state space Y can be applied as m=$\log_2$M; there is an angle $(\pi/2\theta)$ between $|\omega >$ and $|b >$ where θ is given by:

$$\cos\left(\frac{\pi}{2\theta}\right) = \frac{1}{\sqrt{M}}, \quad \sin\theta = \frac{1}{\sqrt{M}} \qquad (4.5)$$

The operator W_ω is a reflection at the hyper plane orthogonal to $|\omega >$ for vectors in the plane spanned by $|b >$ and $|\omega >$ it act as a reflection at the line through $|\omega >$. The operator W_b is the reflection at the line through at the line through $|b >$. Therefore the state vector remains in the plane spanned by $|b >$ and $|\omega >$ after each application of W_b and its straightforward to check the operator $W_\omega W_b$ of each QPSK based Grover searching algorithm iteration steps rotates of the state vector by an angle of 2θ towards $|\omega>$. The number of times iterate to given by *rad*.

For $$M>>1, \theta = \frac{1}{\sqrt{M}}, \quad rad = \frac{\pi\sqrt{M}}{4} \tag{4.6}$$

This is closest to the $(\frac{\pi}{\theta} - 2)/4$. The angle between $|\omega>$ and the final state vector is $O(\theta)$.

$$\pi \frac{\sqrt{M}}{4}\left[1 + \frac{1}{\sqrt{2}} + \frac{1}{2} +\right] \tag{4.7}$$

From observation of transmitted information it is clear that self-reliant exists between one channel to the other. Unless redundancy is reduced in two quadrature channels, system cannot take lead in derived diversity. To construct such redundancy, QPSK based Grover searching algorithm is used by not changing its bandwidth efficiency.

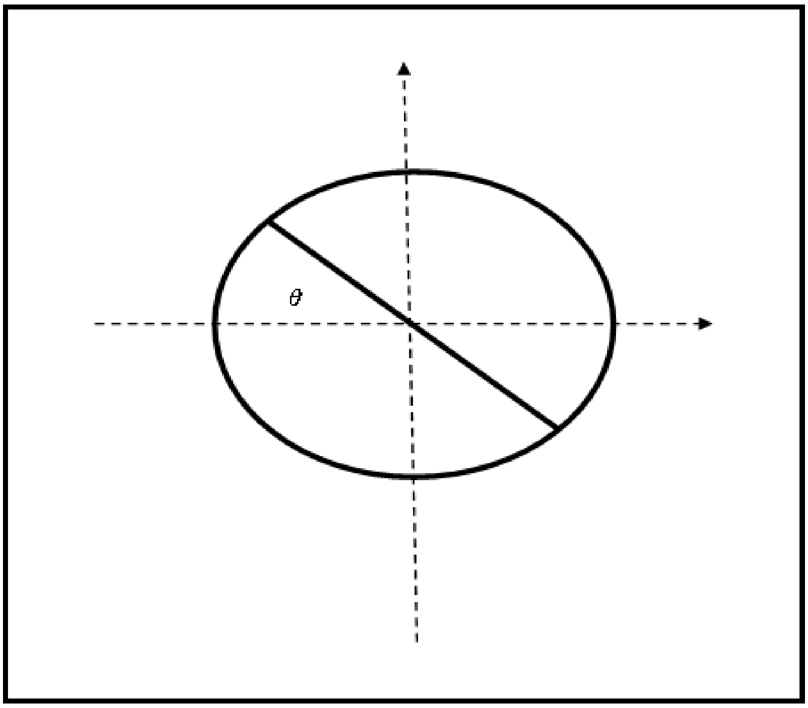

Figure 4.4 Signal assemblage

Figure 4.4 conveys signal assemblage by interleaving each bit as self-reliant and coded bit position number is raised by the diversity order of QPSK based Grover searching algorithm schemes. Coded schemes are damaged by the properties of Euclidean distance which leads some decay in AWGN channel and comparison is made to QPSK based Grover searching algorithm scheme in TWDP. Furthermore at the receiver bit separation before demodulation remains a huge task.

In QPSK based Grover searching algorithm all coordinates are interleaved self-reliant and diversity order is raised by a factor of two. By employing symbol-by-symbol identification, the implementation of QPSK based Grover searching algorithm schemes over fading channels is enhanced.

QPSK BASED GROVER SEARCHING ALGORITHM

Initialize the system of the state.

Perform the function rad (M) is described as,

Apply the probability approaching 1 for N>>1.

Our initial state:

$$|b> \frac{1}{\sqrt{M}}\Sigma_y |r>$$

The overlap is plane spanned

$$<\omega|b>= \frac{1}{\sqrt{M}}$$

Sufficiently high probability

$$\pi\frac{\sqrt{M}}{4}\left[1+\frac{1}{\sqrt{2}}+\frac{1}{2}+\right]$$

Set correlation function $\rho_r = \rho(mS_n)$

Set the average error probability by the PDF of the random variable in

$$\beta_1^2 = 1 - \sqrt{1-(1-\beta_g^2)\varepsilon_u^2\varepsilon_v^2}$$

$$\beta_2^2 = 1 + \sqrt{1-(1-\beta_g^2)\varepsilon_u^2\varepsilon_v^2}$$

$$\beta_g = 0\ (\varepsilon \gg 1, ideal\ interleaving\ with) as\ numerical,$$

$$\beta_1^2 = \varepsilon_u^2$$

$$\beta_2^2 = \varepsilon_v^2$$

Whereas, $\beta_g = 1.0\ (\varepsilon = 0\ ideal\ deinterleaving\ with)$

$$\beta_1^2 = 0$$

$\beta_2^2 = 0$

Require: $K \geq 0$, $0 \leq \Delta \leq 1$, $\sigma > 0$, $N \geq 0$, $r \geq 0$

$P'' \leftarrow 0, p' \leftarrow 1$

$L'' \leftarrow 0, l' \leftarrow 1$

$a \leftarrow 1$

$f \leftarrow 1, F \leftarrow 1$

for k = 1 to M **do**

$a \leftarrow -K/k \times a$

$p \leftarrow (2 – 1/k)$-$(p-(1 – 1/k$ _ $(1 - \Delta 2)p''$

$l \leftarrow (2 - 1+r^2/(2\sigma^2)/k)l' - (1 – 1/k)\, l''$

$f \leftarrow f + a \times p \times l, F \leftarrow F + a \times p \times (l – l')$

$p'' \leftarrow p', p' \leftarrow p$

$l'' \leftarrow l', l' \leftarrow l$

end for

$\beta = \exp(- r2/2\sigma^2)$

$f \leftarrow r/\sigma^2\beta \times f, F \leftarrow 1 - \beta \times F$

return f, F

4.4.3 Bandwidth and Delay Scrutiny

In the proposed model, QPSK based Grover searching algorithm schemes have been optimized at the fading channel. There is always an issue when the transmission is to be considered due to mobile nodes that may vary the transmission process due to various parameters such as delay and bandwidth. Delays can never be removed completely, but the delays can be lowered to such a level that these can be neglected. Bandwidth offered to a channel also controls the amount of delay in the network that might have occurred due to low performance at a node because of various computations being performed simultaneously.

4.4.3.1 Bandwidth consideration

Bandwidth depends on quantity of channels used per node of the entire network. With respect to live application's the channels quantity vary from node to node. The overall network can be classified by the number of channel variants in the network structure. For N number of hops, if same quantity of channels is indulged, then overall channels used will be computed as M * H, where H denotes the number of channels used by a node. The numbers of channels to be used are pre-determined and pre-configured. Also, $M * H_i$ = M, i.e. H_i= 1, where i varies from 1 to M, if single channel is used on each node. Thus, bandwidth will depend on the minimum rate that each node can follow to transmit presentation units and the number of channels used for transmission process. Therefore, required network bandwidth will be calculated as:

$$\beta = \frac{Min_{rate} + \frac{20\%\ of\ routing\ overheads}{Loss\,Time}}{No.of.channel\ used} \quad (4.8)$$

$$= \frac{Min_{rate} + \frac{20\%\ of\ S_R}{P_J}}{\sum_{i=1}^{M} H_i} \quad (4.9)$$

The estimated bandwidth will be given as,

$$\beta = \frac{Min_{rate} + \frac{20\%\ of\ S_R}{P_J}}{M} \quad (4.10)$$

For $H_i = 1, \forall i.$

The approach will be better for a network with smaller data applications to be handled between the hops, however, in an extensive network, hybrid nodes are present. The set of these nodes differs in configuration and the types of data transmitted over them rely on the quantity of channels used and link capacity of each node. The minimum rate of transmission will vary as per the transmission policy of the network. By transmission policy, it is meant that whether all hops are transmitting at same rate or variable rate. For the same rate, the number of channels used per node will remain the same. Therefore, the power requirement for computation will remain the same for all hops. For network operating on multimedia type of applications, constant rate for each hop can be used. For them, the minimum transmission rate will be selected as follows:

$$Min_{rate} = MIN\left(\sum_{j=1}^{M} L_j\right) \quad (4.11)$$

Where $L_j$denotes achievable rate for each node. Min_{rate} Is the minimum rate feasible to each node in the network for transmission process.

4.4.3.2 Delay consideration

Delays in a network are the time slot, during which the transmission rate is lower than the certain threshold value defined for successful transmission to the receiver. Delay in a network cannot be aloof completely, however for enhanced performance; delays should be controlled under certain threshold value. Thus, it is required to identify those factors that will extensively affect the network in terms of performance, failing which can cause various network overheads. Considering the same network model with N number of nodes, the mobility can be denoted as $g_1, g_2, \ldots, g_j$, $\forall j \in M$ where j denotes the active number of connections. Also, $dst_1, dst_2, \ldots, dst_j \forall dst \in E$ is the distance covered by each node in defined range, where E is the distance from one end to other end. The active quantity of connections are considered keeping in mind that the network delays will be considered only for those nodes that are configured to be active during scenario generation of the network. Let $T_{arrival}$ be the time taken by node to arrive in range, F_t be the network idle time, E_p be the propagation delays, T_{pkl} be the transmission delays, such that

$$Delays_{(y)} = T_{arrival} + F_t + E_p + T_{pkl} \tag{4.12}$$

$$E_p = \frac{Nrt\ (N-1)G_p}{\beta} + T_{pkl} \tag{4.13}$$

$$T_{arrival} = \sum_{l=1}^{j} \frac{v_l}{o_l} \tag{4.14}$$

As a result,

$$Delays_{(y)} = \sum_{l=1}^{j} \frac{v_l}{o_l} + F_t + \frac{Nrt\ (N-1)G_p}{\beta} + T_{pkl} \tag{4.15}$$

Equation (4.15) computes delays related to transmission process. It is the idle time for which no transmission occurs in the network. This can be computed as average wait time of the network structure. Average wait time is explained as quantity of cycles that were utilized without any data transfer. Also, T_{pkl} is the time loss due to packet loss. It can also include various losses such as fading loss, vegetation loss. For a controlled network, i.e. network in which mobility of node is strictly defined and is manageable, all active nodes cover equal distance during the transmission process. For such network scenario, node approaching time changes as:

$$\sum_{l=1}^{j} \frac{v_l}{o_l} = \frac{v_{avg}}{o_{avg}} \tag{4.16}$$

As a result, for this type of mobile node network, the delays will be clear as:

$$Delays_{(y)} = \frac{v_{avg}}{o_{avg}} + F_t + \frac{Nrt\ (N-1)G_p}{\beta} + T_{pkl} \tag{4.17}$$

Nrt is the number of re-transmissions carried, when a packet is dropped or when no ACK is received from the receiving unit. The model proposed is capable of handling packet admission as well as scheduling tasks, hence avoids congestion in the network. It ensures QoS to end users with improved efficiency over traffic differentiation services. The working of algorithm shows that bandwidth is optimized and is not wasted as it would have been during pre-reservation techniques. The slots left idle, during the transmission process are also utilized. Packet categorization and resource allocation improved the network survivability assuring the successful transmission of packets up to end receiver.

4.4.4 Variable Channel-Based Network

The variable channel-based network model is considered, which chooses transmission rate depending upon the amount of available transmission energy rather than operating at a similar rate. The power consumption for such type of network is higher, but the performance is better than for those operating at similar rate. $M_{latency}$ for such type of network will vary from link to link and will be computed as:

$$M_{latency} = \frac{\sum_{l=1}^{j}(PU_l - Nrt_l)}{link_{capacity}} + Cmp_{delays}, \forall j \in M \tag{4.18}$$

Where,

$$link_{capacity} = \frac{\frac{1}{X_1} + \frac{1}{X_2} + \cdots + \frac{1}{X_j}}{Z_1 + Z_2 + \cdots + Z_j}$$

$$= \sum_{l=1}^{j} \frac{\frac{1}{X_l}}{Z_l} \quad (4.19)$$

With the use of variable channels for transmission process, the power consumption of the network increases, but it can be optimized either by reducing the packet size or by decreasing the number of re-transmissions (Nrt). This will allow the node to perform to maximum capacity, but it may also decrease the fault tolerance of the network. Thus, energy always remains a constraint for network when QoS is to be improved.

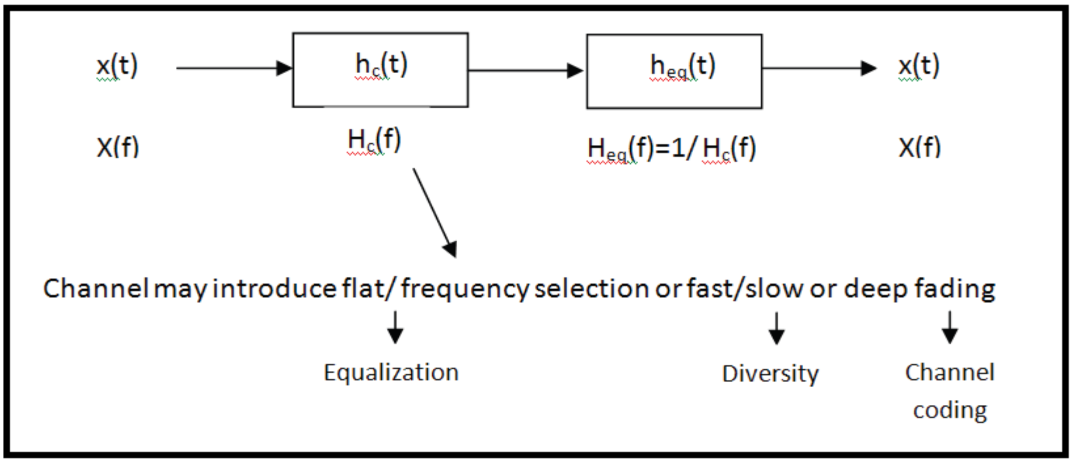

Figure 4.5 Fading Effects Framework and their Mitigation Method

Wireless communication system need signal processing to upgrade the link execution using equalization, diversity and channel coding methods.

When the bandwidth of the modulation surpasses the channel's coherence bandwidth, it develops ISI (Interference Symbol) and it is solved by equalization technique for enhancing link achievement for message transmission. At receiver part, faded transmitted signal portion is recovered. Channel coding helps in rectifying errors that are initiated by the channel. Diversity which is yet another method for reducing fading channel disability, co-channel and error bursts by using two or more antennas. Diversity method follows the transmission of message signal through various statistical features of one or more path, thus reducing parallel deep fade experience of all signal.

4.4.4.1 Signal Fading Data

Free space propagation prototype is used when channel property is not mentioned and it does not consider the LOS path and obstacles between the path of transmitter and receiver, hence in free space the signal impaired. Equation 4.20 represents free space loss for hypothetical isotropic antenna.

$$\frac{A_R}{A_T} = \left(\frac{n}{4\pi r}\right)^2 \qquad (4.20)$$

Where A_R is called as received power, A_T is called as transmitted power, r= space between transmitter, n =receiver wavelength of propagating signal. For designing wireless communication system channels are classified by its distribution function.

4.4.5 Dissemination Path Loss

Path loss calculates the loss of mean power in between the node, also it provides a bench mark for calculating coded modulation system in a fading channel and defined as:

$$w = \frac{-A_R}{A_T}$$

Due to fading channel the mean value of the received power becomes more clear and when comes to application the required path loss value mostly rely on medium of transmission and features of propagation among nodes.

4.5 RESULTS AND DISCUSSION

In this chapter, an approach is implemented in for the QPSK based Grover searching algorithm scheme without affecting its bandwidth efficiency. A comparison is made on the behalf of the results obtained by comparing the existing methodology.

Probability Density Function (PDF)

Signal strength received is illustrated by probability density function and achievement of wireless receiver in the existence of noise, interference and envelope is determined. It also represents ultimate Shannon channel capacity of a fading wireless link in MANET.

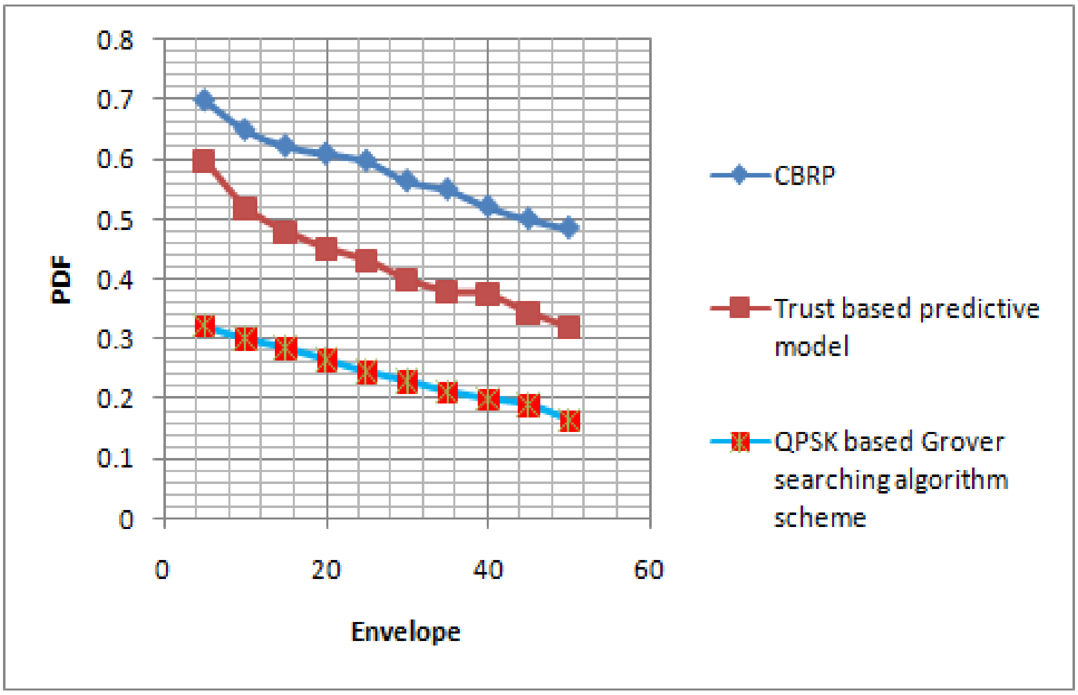

Figure 4.6 Probability density function of TWDP fading Channel

Figure 4.6 together illustrates probability density function properties and control of the transmitted signal for TWDP channel deliberate above substantial span is the favourable feature for an efficient system.

Average Bit Error Rate (ABER)

The statement of ABER is given by the ratio of number of errors to the number of bits transmitted.

$$ABER=E\ [M_e / M_b]$$

Where,

M_e = No. of errors, M_b =No. of bits transmitted.

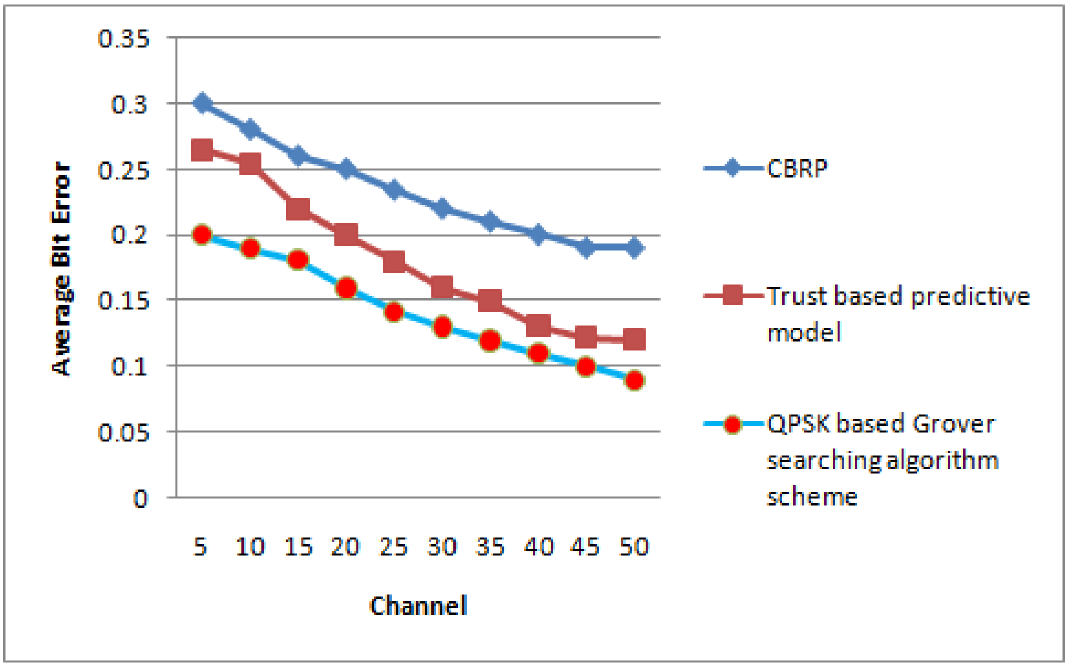

Figure 4.7 Number of channels Vs Average Bit error

Figure 4.7 shows the Number of channels Vs Average Bit error. Thus from this comparison, QPSK based Grover searching algorithm scheme has less average bit error occurred the transmitted signal for fading channel in MANET. Hence the average bit error is less than existing methodologies.

Path Loss

Fabrication of path loss model is carried out by free-space path loss and path loss exponent (n) which differ in environment and named as log-distance path loss model, where d is represented as,

$$PL_{LD}(d) = PL_F(d_0) + 10n \log\left(\frac{d}{d_0}\right)$$

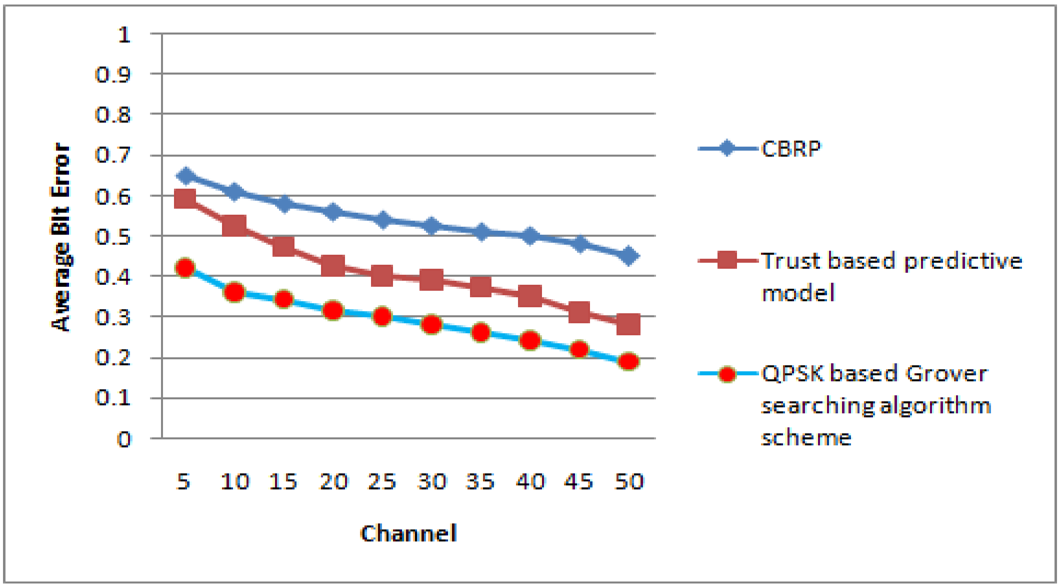

Figure 4.8 Number of channels Vs Path Loss

Figure 4.8 shows the Number of channels Vs Path Loss. From this comparison, it is clear that the QPSK based Grover searching algorithm scheme has minimize path loss occurred the transmitted signal for fading channel in MANET. Hence it is verified that the path loss is minimized than existing methodologies.

Total energy consumption

Energy level variation occurred by transmit packets without causing any delay in the transmission of packet delivery, whereas the energy consumed is less during the communication speed. Therefore the network lifetime increases with its available bandwidth.

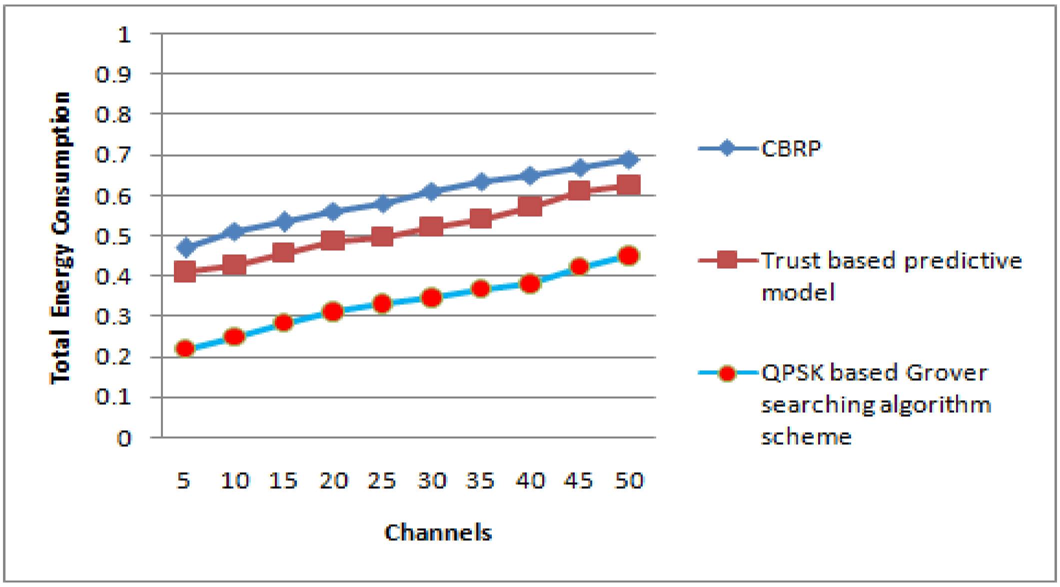

Figure 4.9 Number of channels Vs Total energy consumption

The comparison of Number of channels versus Total energy consumption is shown in figure 4.9 and it is clear that QPSK based Grover searching algorithm scheme has low energy consumed the transmitted signal for fading channel in MANET. Hence packet delivery ratio is higher than the existing methodologies.

Packet Delivery Ratio

The proportion of data packets of destination to the sources at generation is known as Packet Delivery Ratio.

The proportion of data packets of destination to the sources at generation is known as Packet Delivery Ratio.

The relation between Number of channels Versus Packet Delivery Ratio is shown in fig.4.10. From this comparison, it is clear that QPSK based Grover searching algorithm scheme has more packet delivery ratio occurred in transmitted signal for fading channel in MANET. Hence packet delivery ratio is higher than the existing methodologies.

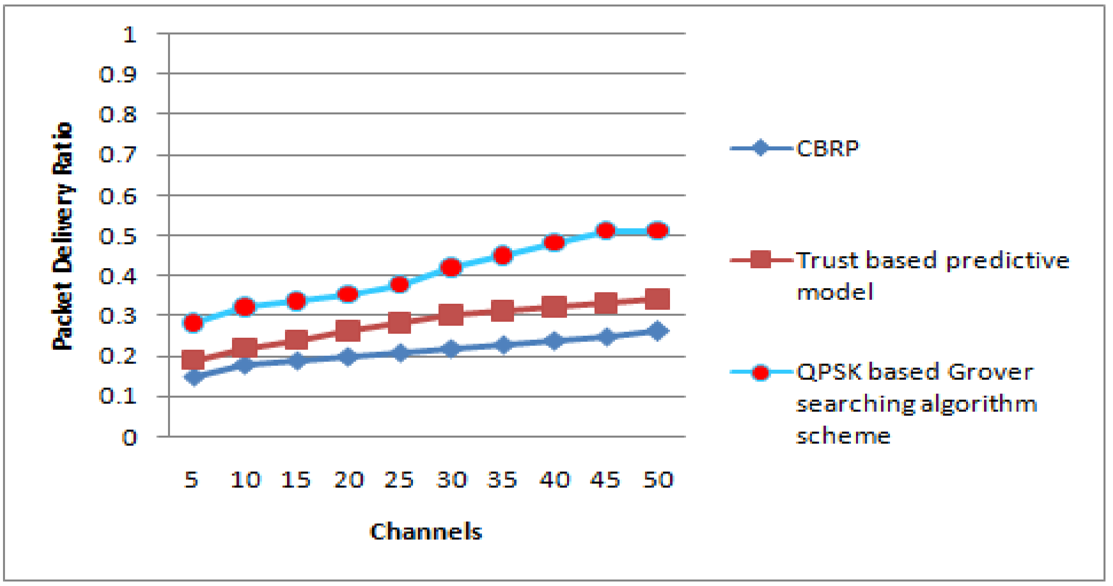

Figure 4.10 Number of channels Vs Packet Delivery Ratio

Data Transmission Rate

The data transmission rate with higher transmit of packets among the channels to the destination, is based on the selected optimal route.

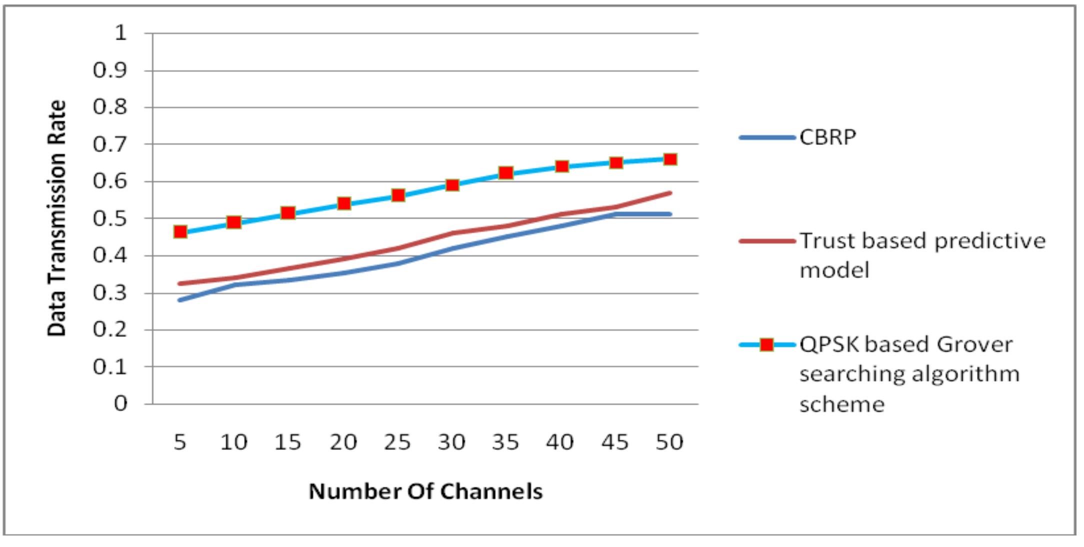

Figure 4.11 Number of channels Vs data transmission rate

Figure 4.11 show the comparison of Number of channels Vs data transmission rate. From this comparison, it is clear that QPSK based Grover searching algorithm scheme has maximize data transmission signal for fading channel in MANET. Hence the data transmission rate is maximized than the existing methodologies.

4.6 SUMMARY

In this chapter, QPSK based Grover searching algorithm scheme is proposed for improving fading channel performance in MANET. It has been clear that by altering the signal assemblage of the QPSK based Grover searching algorithm scheme pooled with autonomously interspersing the system of quadrature mechanism by using symbol-by-symbol detection, the performance is noticeably enhanced in the fading channel. Based on circumstances of fading a suitable interleaving depth select the PDF of TWDP fading effortlessly, which are articulated as convergent inestimable series and for evaluation a low-complexity algorithm was created.

CHAPTER 5

PERFORMANCE ANALYSIS

In this chapter, the results for the throughput, PDR, jitter; end to end delay shows that the Hybrid N.W Gaussian scheme is much better than the existing model. For a data packet size of 512 bytes, a result of 300 second is said to be reported on an average and concluded that fast rayleigh performance gets reduced as the node speed reduces.

Table 5.1 Number of nodes Vs end to end delay

Number of nodes	SM scheme	PSK Scheme	Hybrid N.W gamma scheme
5	0.39	0.35	0.15
10	0.36	0.3	0.13
15	0.33	0.27	0.12
20	0.3	0.24	0.11
25	0.29	0.2	0.09
30	0.27	0.18	0.08
35	0.25	0.15	0.07
40	0.22	0.13	0.06
45	0.2	0.12	0.05
50	0.19	0.11	0.04

In the above table 5.1, proposed method is compared with some other existing methods. This Hybrid N.W Gaussian scheme result is due to two effects highlighted by the change of the channel coherence duration the increase of the average channel duration of good quality and the rise of poor quality.

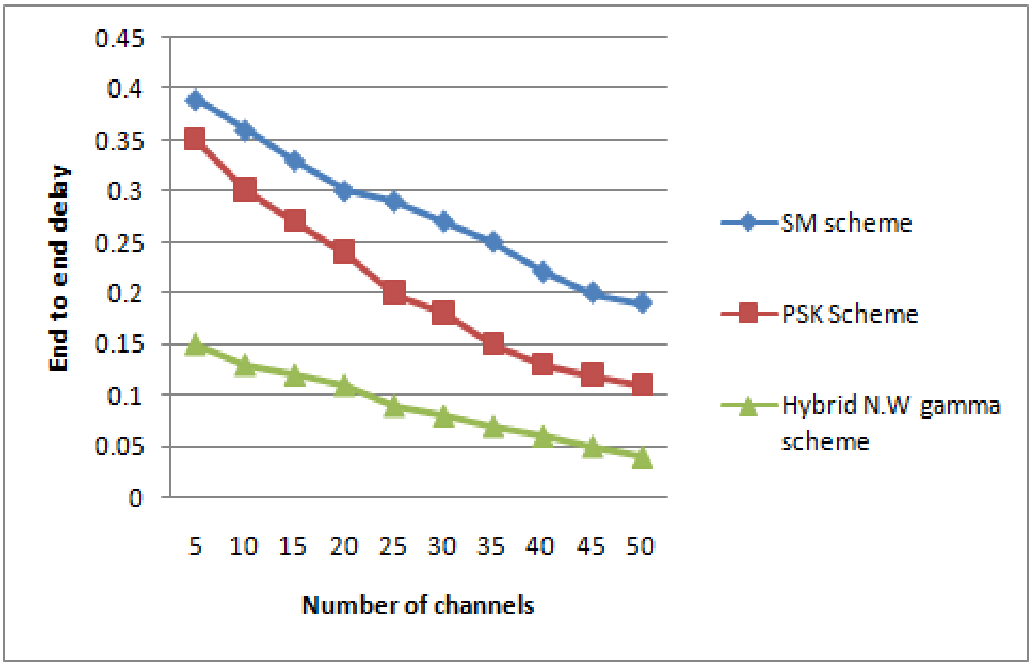

Figure 5.1 Comparison of proposed method with existing method

Comparison of Proposed novel hybrid method with other two existing methods is shown in Figure 5.1. It shows that the proposed Hybrid N.W gamma scheme gives better results compared to other two methods.

Table 5.2 Number of Channels Vs Throughput

Number of nodes	SM scheme	PSK Scheme	Hybrid N.W gamma scheme
5	0.11	0.14	0.19
10	0.13	0.16	0.22
15	0.15	0.18	0.25
20	0.16	0.19	0.27
25	0.18	0.22	0.29
30	0.19	0.23	0.31
35	0.21	0.26	0.32
40	0.24	0.27	0.33
45	0.22	0.28	0.34
50	0.24	0.29	0.35

Table 5.2.Values of proposed method compared with two existing methods.

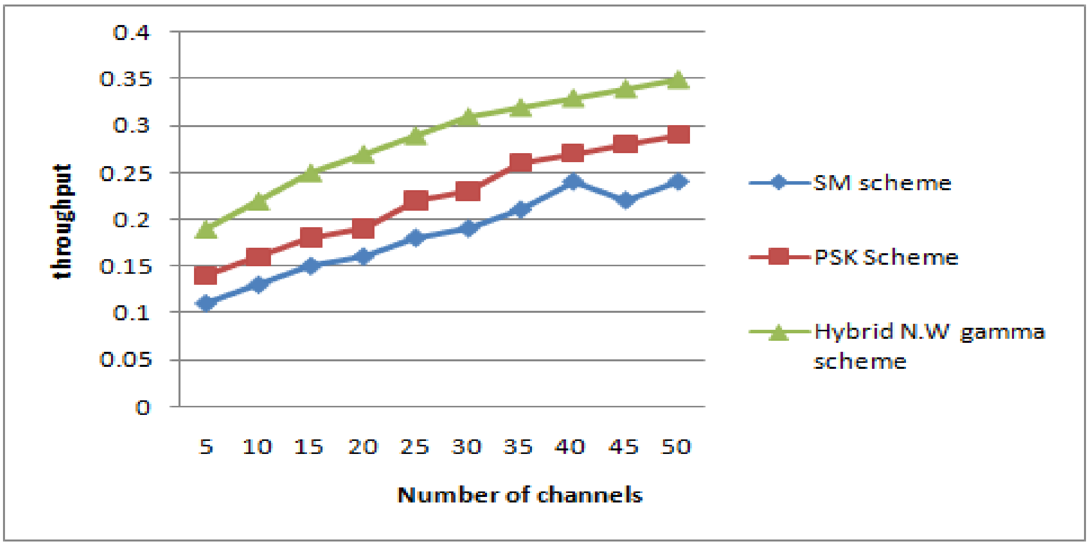

Figure 5.2 Throughput

Comparison of proposed novel hybrid method with other two existing methods is shown in Figure 5.2. The results indicate that Hybrid N.W gamma scheme is comparatively good with respect to other two existing methods.

Table 5.3 Number of Channels vs PDR

Number of nodes	SM scheme	PSK Scheme	Hybrid N.W gamma scheme
5	0.07	0.15	0.19
10	0.08	0.18	0.22
15	0.09	0.19	0.24
20	0.11	0.2	0.26
25	0.13	0.21	0.28
30	0.14	0.22	0.3
35	0.15	0.23	0.31
40	0.17	0.24	0.32
45	0.18	0.25	0.33
50	0.19	0.26	0.34

Table 5.3 clearly shows the difference between other existing methods and proposed Hybrid N.W.Gamma scheme. The variation in the values clearly shows that proposed novel scheme can express the better results.

Figure 5.3 shows the comparison of proposed novel hybrid method with other two existing methods. The results indicate that Hybrid N.W gamma scheme gives high PDR compared to other two existing methods.

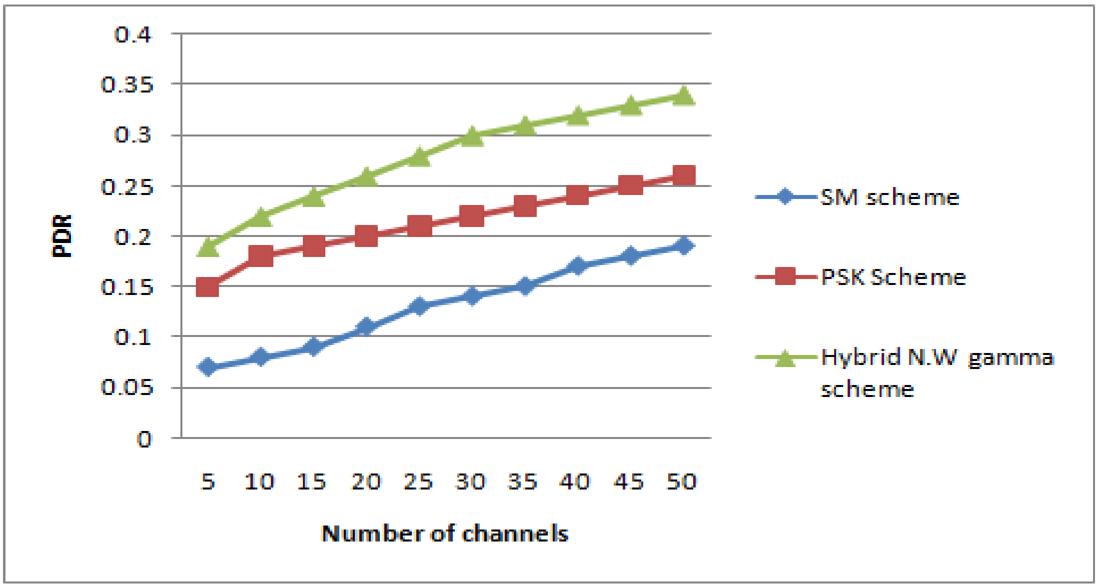

Figure 5.3 PDR

Table 5.4 Number of Channels Vs jitter

Number of nodes	SM scheme	PSK Scheme	Hybrid N.W gamma scheme
5	0.43	0.4	0.3
10	0.42	0.38	0.28
15	0.4	0.36	0.26
20	0.38	0.34	0.24
25	0.36	0.33	0.22
30	0.34	0.31	0.2
35	0.33	0.29	0.18
40	0.32	0.27	0.16
45	0.31	0.25	0.14
50	0.29	0.22	0.12

Table 5.4 clearly shows the difference between other existing methods and proposed Hybrid N.W.Gamma scheme. The variation in the values clearly shows that proposed novel scheme can express the better results.

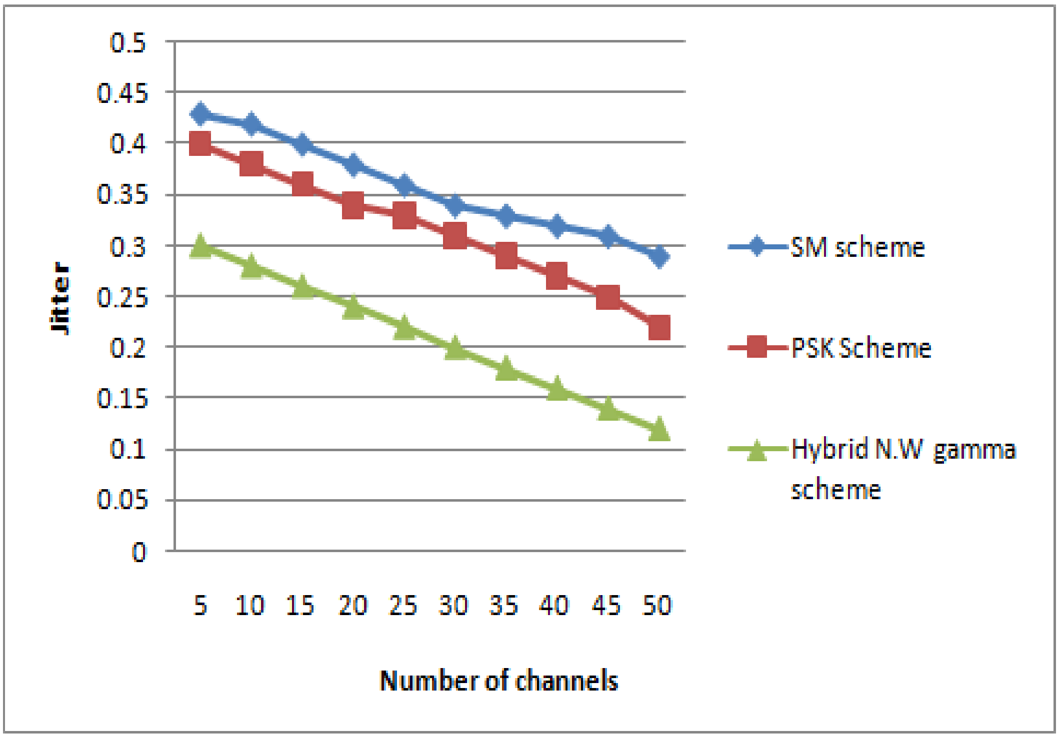

Figure 5.4 Jitter

Proposed novel hybrid method with other two existing method comparison is shown in fig.5.4 .Thus it is clear that, the proposed Hybrid N.W gamma scheme gives less jitter compared to other two existing methods.

In our second stage of experimental work, the results of the QPSK based Grover searching algorithm scheme is introduced, which is implemented in TWPD fading channel and comparison is made with the existing methodology.

1. Probability Density Function (PDF):

Signal strength received is illustrated by probability density function and achievement of wireless receiver in the existence of noise, interference and envelope is determined. It also represents eventually Shannon channel capacity of a fading wireless link in MANET.

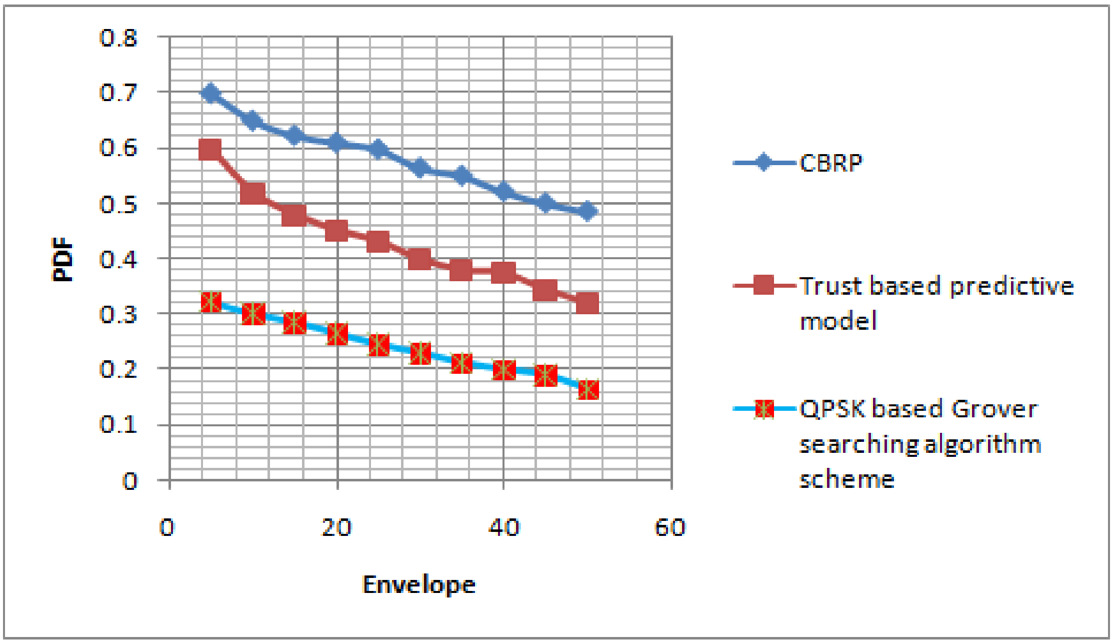

Figure 5.5 TWDP fading Channel probability density function

Figure 5.5 together illustrates probability density function properties and control of the transmitted signal for TWDP channel deliberate above substantial span is the favourable feature for an efficient system.

2. Average Bit Error Rate (ABER)

The statement of ABER is given by the ratio of number of errors to number of bits transmitted.

$ABER=E\ [M_e / M_b]$

Where,

M_e = No. of errors, M_b =No. of bits transmitted.

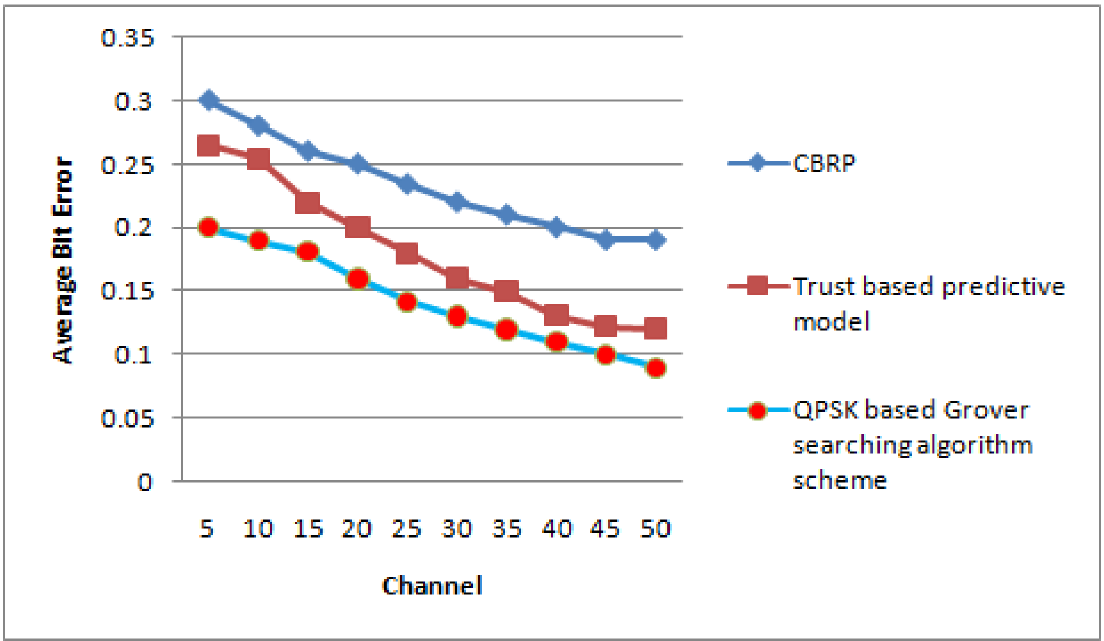

Figure 5.6 Number of channels Versus Average Bit error

Number of channels versus Average Bit error is shown in fig. 5.6 and from this comparison, it is clear that the QPSK based Grover searching algorithm scheme has less average bit error occurred the transmitted signal for fading channel in MANET. Hence the average bit error for proposed method is less than existing methodologies.

3. Path Loss

Fabrication of path loss model is carried out by free-space path loss and path loss exponent (n) which differ in environment and named as log-distance path loss model, where d is represented as,

$$PL_{LD}(d) = PL_F(d_0) + 10n \log\left(\frac{d}{d_0}\right)$$

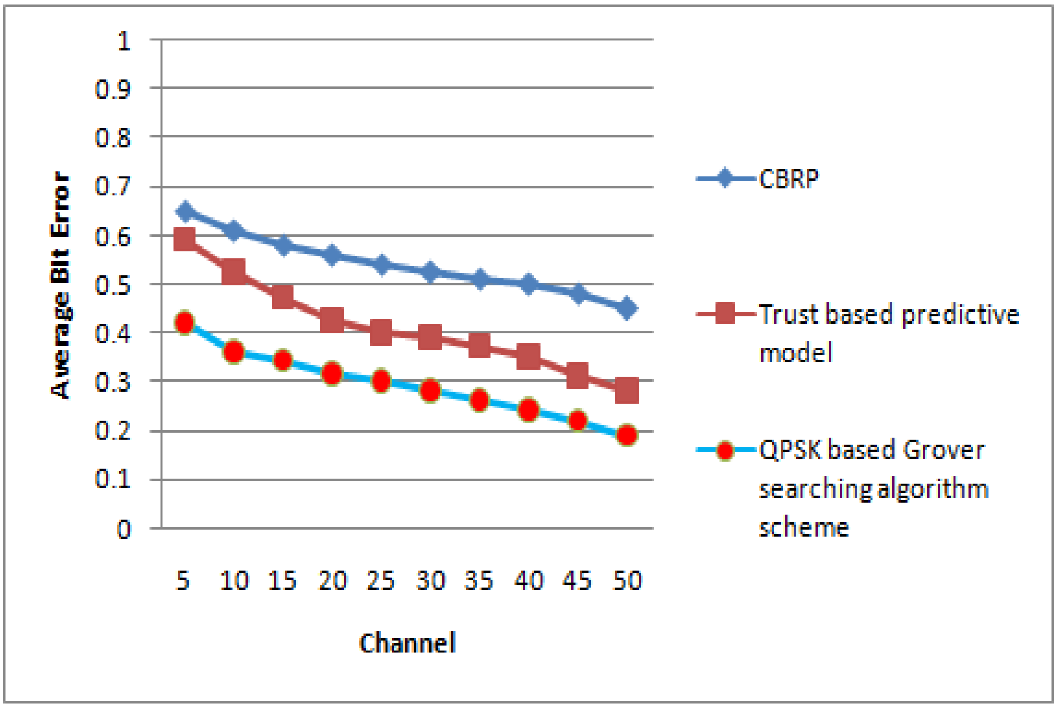

Figure 5.7 Number of channels Versus Path Loss

The relation between Number of channels versus Path Loss is shown in fig.5.7 and from comparison, it is clear that QPSK based Grover searching algorithm scheme has minimized path loss occurred the transmitted signal for fading channel in MANET. Hence it is verified that the path loss is minimized than existing methodologies.

4. Total Energy Consumption

Energy level variation is occurred by transmitting packets without causing any delay in the transmission of packet delivery, whereas the energy consumed less during the communication speed. Thus the network lifetime increases with its available bandwidth.

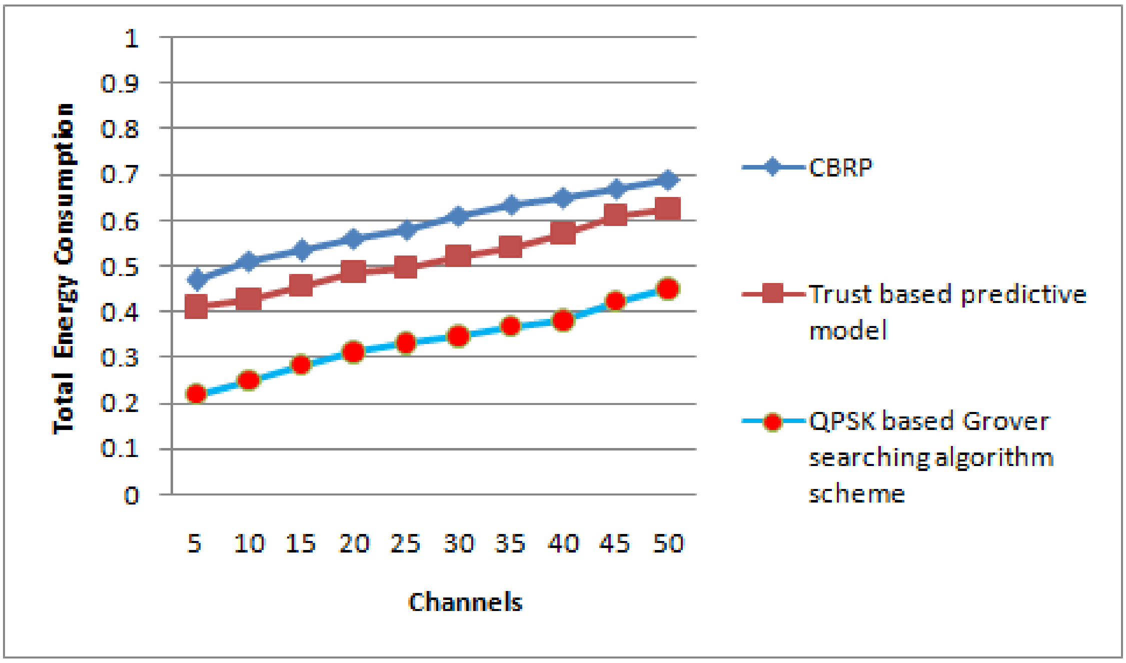

Figure 5.8 Number of channels Versus Total energy consumption

The relation between number of channels versus Total energy consumption is shown in fig.5.8. From this comparison, it is clear that QPSK based Grover searching algorithm scheme has less energy consumption occurred in the transmitted signal for fading channel in MANET. Hence on comparing, the total energy consumption is lesser with respect to existing methodologies.

5. Packet Delivery Ratio

The proportion of data packets of destination to the sources at generation is known as Packet Delivery Ratio.

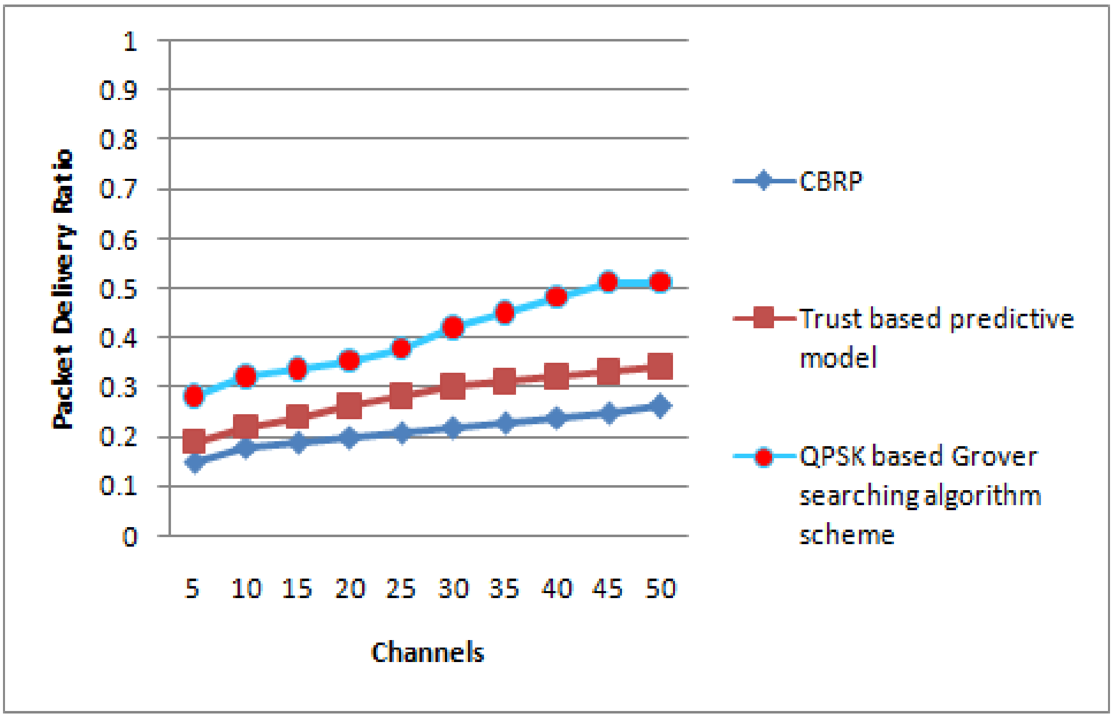

Figure 5.9 Number of channels Versus Packet Delivery Ratio

The relation between Number of channels Versus Packet Delivery Ratio is shown in fig.5.9. From this comparison, it is clear that QPSK based Grover searching algorithm scheme has more packet delivery ratio occurred in transmitted signal for fading channel in MANET. Hence packet delivery ratio is higher than the existing methodologies.

6. Data Transmission Rate

The data transmission rate with higher transmit of packets among the channels to the destination is based on the selected optimal route.

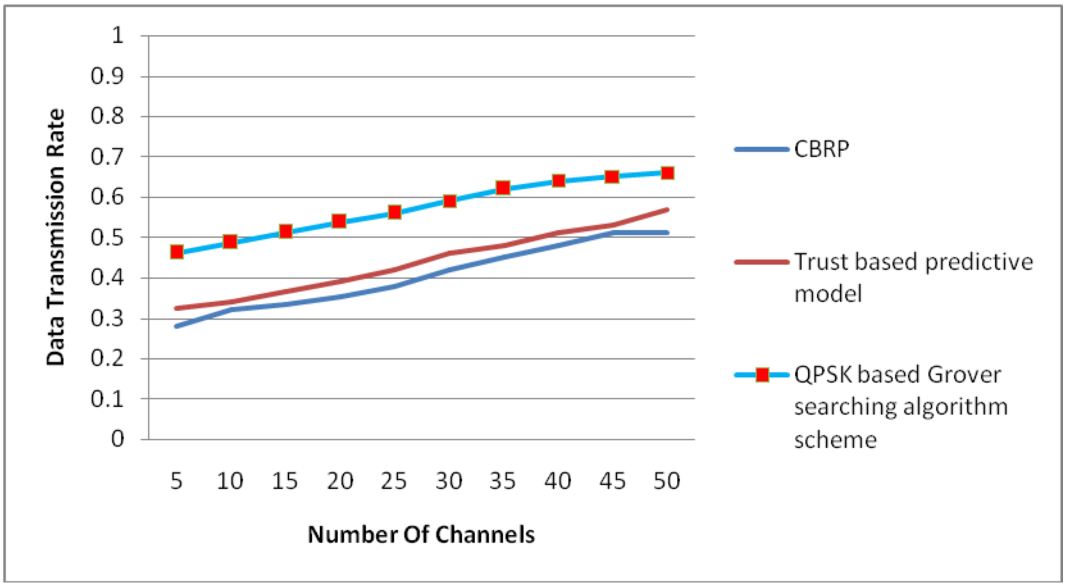

Figure 5.10 Number of channels Versus Data Transmission Rate

Number of channels versus data transmission rate is shown in Figure 5.10. From this comparison, it is clear that QPSK based Grover searching algorithm scheme has maximized data transmission signal for fading channel in MANET. Hence the data transmission rate is maximized than existing methodologies.

CHAPTER 6

CONCLUSIONS

The first stages of research work discuss the results for the throughput, PDR, jitter and end to end delay. The outcome proves that Hybrid N.W.Gaussian methodology is much better than the conventional methodologies and achievement of Hybrid N.W gamma technique is enhanced by declining fading effect. Due to change in channel coherence duration output, the effects such as average channel duration of good and bad quality are initiated.

Hence performance of an ad hoc network operated by Hybrid N.W Gamma scheme fading channel is compared with more commonly used in range channel model, which has shown that the end to end delay is inadequate to describe model Hybrid N.W Gamma scheme performance fading for most applications of interest.

From the output quantity of fading in the signal envelope is increased due to increase in user speed, therefore node speed is increased and large amount of signal moves well below the threshold and hence fading increases. It is also concluded that the delay and jitter decreases, as the speed of the channel increases for our fading models.

In the second stage of our research work, i.e., QPSK based Grover searching algorithm scheme for improving fading channel performance in MANET, an additional model for fading in mobile communication system will be developed.

Thus it is clear that, by altering the signal assemblage of the QPSK based Grover searching algorithm scheme pooled with autonomously interspersing the system of quadrature mechanism by using symbol-by-symbol detection, the performance is noticeably enhanced in the fading channel. Based on circumstances of fading a suitable interleaving depth select the PDF of TWDP fading effortlessly, which are articulated as convergent inestimable series and for evaluation a low-complexity algorithm was created.

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