Mobility Scenario of Dissimilar Mobility Models using the DSR Protocol in Ad-hoc Sensor Network- A Survey

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ABSTRACT

The mobility model used emulates closely the real-life Scenarios. The mobility model dictates the movement of nodes and plays an important role in determining the protocol and connectivity of these nodes. We describe several mobility models that represent mobile nodes whose movements are independent of each other (i.e. Entity mobility models) and several mobility models that represent mobile nodes whose movements are dependent on each other (i.e. Group mobility models) and several mobility models that represent mobile nodes whose movement in pre-defined path with the assumption of obstacles in the simulation terrain (i.e. Geographic Restriction models). The goal of this paper is to present a number of mobility models in order to offer researchers more well-versed choices when they are deciding on a mobility model to use in their performance evaluations. We incorporate more realistic mobility model that includes entity models (Manhattan model and Gauss-Markov model) and group mobility model (Reference Point Group Model) and Random Waypoint mobility model and Geographic Restriction model (Mission Critical Model). The random way point is used as a default mobility model in many network simulations. Our comparative analysis of the mobility models that are existing, are discussed on a variety of simulation settings and parameters like Packet Delivery Ratio (PDR), Average End to End Delay (ED), Control Overhead (CO), Generated packets (GP), Dropped Packets (DP) and Received packets (RP).

Keywords: Performance, NS-2, Bonn motion, DSR, MHN, GM, RPGM, MCM, RWP

1. INTRODUCTION

AWSN are wireless, self-organizing, sensing, processing, and communication systems formed by co-operating sensor nodes within communication range of each other that form temporary networks. Their topology is dynamic, decentralized, ever changing and the sensor nodes may move around arbitrarily. These networks have a wide range of potential applications, including military, environmental, health, home, space exploration, chemical processing, and disaster relief. Their ability to allow remote monitoring of equipment, environments, and inaccessible terrains, is predicted to change the way people live. Several approaches have been proposed within the working group of the Internet Engineering Task Force (IETF), but there is still no clear evidence about which alternative is best suited for each mobility scenario, and how mobility affects their performance. The sensor network may consist of many different types of sensors with varying modalities [1]. These could include seismic, low sampling rate magnetic, thermal, visual, infrared, acoustic, and radar, enabling the following conditions to be monitored:

- Temperature
- Humidity
- Vehicular movement
- Lighting conditions
- Pressure
- Soil makeup
- Noise levels
- Presence or Absence of certain kinds of objects
- Mechanical stress levels of attached objects
- The current characteristics such as speed, direction, size of an object
- Unattended operation.

Important characteristics of a WSN are:

- Mobility of nodes
- Node failures
- Scalability
- Dynamic network topology
- Communication failures
- Heterogeneity of nodes
- Large scale of deployment

The rest of the paper is organized as follows: Section 2 describes related works with regard to studying the performance of different mobility models using routing Protocol. Section 3 gives an overview of the DSR routing protocol and discuss about the mobility models like Random Way point, Reference Point Group Mobility Model, Manhattan, Mission Critical model and the Gauss-Markov mobility models. Section 4 illustrates the simulation results and compares the mobility models with respect to the results obtained for the Packet Delivery Ratio (PDR), Average End to End Delay (ED), Control Overhead (CO), Generated packets (GP), Dropped Packets (DP) and Received packets (RP). Section 5 Concludes with future work of this paper.

2. RELATED WORKS

Several mobility models have been developed and proposed to provide the research community with a solution for realistic environment on Ad-hoc and sensor networks. Recent surveys summarized the related works in the same field [2, 3]. Random Waypoint (RWP) model is a commonly popular model which is used by many researchers, where nodes select a random destination in the simulation area and it move towards the distributed Speed. The properties of RWP model were extensively studied in deep in literature [4, 5, 6]

In the random walk (RW) mobility model, nodes are randomly chosen in terms of speed and direction in constant time intervals without setting destination. In the Random Direction the node change their Speed/Direction for every time slot .In this, new Direction is chosen randomly till the destination is reached. In Realistic Mobility model, the speed and direction follows the distribution that yields more realistic node movement. In the Boundless Simulation area mobility model [3, 7] there is a relationship between the previous and the existing node in Speed and direction. Furthermore when a node reaches the area, it reappears from the opposite one in the toroids network area instead of rectangular one. In the Gauss-Markov mobility model [4], there is a different level of randomness through parameters. It is a temporal dependency model. Smooth Random mobility model [8] produces more realistic movement patterns.

Another type of models is entity model. Under this model, node moves freely with a group mobility movement patterns that are proposed on group mobility. The important model in this category is Reference Point Group Mobility (RPGM) [9] in this model it works with a group, more around the group leader that acts as a reference Point. In [10] the author presents a different group mobility model, applicable to a variety of situations. In the column mobility model, the group moves in a straight line that periodic direction change. Nomandic community mobility models allow node to use one entity mobility model which is discussed above in common reference point. In the pursue mobility model the group nodes are used to chase particular target. In Manhattan model [10], the node movement freeway is emulated.

The above mentioned mobility models have assumptions of the free - space area. This assumption will not be useful for realistic environment where geographic restriction models are proposed. Some of realistic models under indoor and outdoor environment with obstacles as an integral part of many scenarios are operated. The obstacle mobility model proposed in the literature [11]. It used not only has movement constraints but also deals with propagation like signal impairments due to the presence of obstacles. It is created for real environments like campus building. In this model, the nodes should follow the predefined path which is connected to a limited point in the network areas. By using the Voronoi diagram, the node positions are split and placed in the simulation terrain. Another model in geographic restriction is pathway model [12] where nodes are allowed to move along the path with edges that represent streets and pathways. In context, the city section mobility model [13] is appropriate for simulating mobility in the street network of a city and it includes safe driving characteristics. In Environment mobility model [14], the area is divided into geometric and non-geometric area with different mobility factors.

The authors in [15] present an obstacle aware mobility model which is based on the concept of anchors, to define the trajectories in and around the obstacles. It is inclusion of obstacles but it has not considered any special properties of ad-hoc network deployed in Mission Critical Mobility. In [16] mobility model for disaster area scenario is presented for emergency forces acting as a wide range of operational aspects. In Vehicular Ad-hoc Network (VANET) vehicle movement obstacles are taken into account and by using shortest path movement, the routes are determined based on the scenarios. In [17] incorporates a model for spatial and temporal dependency. It is applied to community based Scenarios without focusing on physical impairment of simulation area. In [18] Obstacle based on social networks by using the theory of social networks is applied in patterns with the presence of obstacles. Broch et al [19] evaluates on-demand protocol such as Dynamic Source Routing and AODV perform better than table-driven ones such as Destination Sequenced Distance Vector (DSDV) routing protocol at high mobility rates, while DSDV perform quite well at low mobility rates. High mobility and its effects on the network operation have also been explored recently in WSN.

Sohrabi et al., [20] has proposed Sequential Assignment Routing algorithm which performs organization and mobility management in sensor networks. An enhanced version to identify the nodes using Global Positioning System is proposed in order to locate the position of the nodes. Mobility can be classified into three categories: random, predictable and controlled and Latiff L.A.et al., [21] investigates the deterioration in velocity under the random waypoint model.

Guolong Lin et al., [22] analyzed the steady state distribution function of the random way point model. In addition to confirming the drawbacks of the random waypoint model, the theoretical solution for the speed decay problem was determined and provides a general framework for analyzing other mobility models. In [18, 20, 34] the author compares the performance of proactive Destination Sequenced Distance Vector (DSDV) Protocols under the Different Mobility Models.

In Mission Critical mobility [14] it takes obstacles into account in a more generic fashion. The nodes are to move in the entire free space area without any restriction like moving nodes only in the predefined path. In this model, they are using edge detection in every time and passing through edge till the destination is reached. It is using the group movement with the group leader. It is using a free move around the area and edge moving for passing the obstacle which obstructed and unobstructed movements. The main disadvantage of this mobility is that the time taken to reach the destination is more on implementation. The nodes are mainly controlled or carried by humans in case of emergency.

Apart from specific mobility models there are frameworks which support some mobility models which are also been implemented. Bonn motion [15] is a suite that enables the use and analysis the mobility models. In this work, we have used to analyze different mobility with different parameter sets. There are other frameworks like Trails [21] it provides mobility features like dynamic obstacles and node failure. Mobisim [3] supports a number of mobility model for both group and entity models. MOMOSE [2] is simulation Environment with an even wider range of supported MOM and higher flexibility. It is a Java-based simulator. Frameworks are produced in NS2. It has Compatible trace file and it is not integrated with simulation core.

3. ABOUT MOBILITY MODELS

Mobility model is the model which gives the movement of nodes that is found to have a significant impact with the analysis of results. Simulation and Emulation are the techniques which are frequently used for the evaluation of wireless network. Here, if the device is under mobility, the patterns of movement are of objects that found has impact on simulation and emulation results. The movement patterns have an influence on the topology of the network. Due to this reason many different mobility models are proposed in the last decade.

Mobility models are classified into three different stages:

- **Microscopic**- describes the individual nodes
- **Mesoscopic**- describes about the logistic flow process

- **Macroscopic**- abstract the individual movements and just models the parameters.

There is much attention currently focused on the development and evaluation of mobility model using well known protocol like Dynamic Source Routing (DSR) routing protocols for wireless ad-hoc sensor networks. Most of this evaluation has been Performed [10] with the aid of various network simulators (such as NS-2 and others) and Group models for mobility and data patterns [22]. These models can have a great effect upon the results of the simulation, and thus, the valuation of these mobility models. Figure 1 shows the classification of routing protocols some of the models, which are in consideration in this work, are highlighted and taken for evaluation.

3.1 Random Models: In this model node are assumed to be placed randomly in the simulation area. Few types of this model are discussed, as follows.

3.1.1 Random Waypoint model

In this model, nodes are assumed to be placed randomly in the simulation area [23,10]. The movement of each node is independent of other nodes. The nodes are chosen as the random target location to move. In this model, nodes are distributed randomly over a convex area. The random way point mobility model contains pause time between changes may be in **Direction /Speed**. When a Mobile Node begins to move, it stays in one location for some period of time, then it is called as **Pause Time**. After the specified pause time is over, the mobile node randomly selects the next destination in the simulation area and chooses a speed uniformly distributed between the minimum speed and maximum speed and travels with a speed ***v*** whose value is uniformly chosen in the interval **(0, *Vmax*)**. **V*max*** is some parameter that can be set to reflect the degree of mobility. Then, the MN continues its journey towards the newly selected destination at the chosen speed. As soon as the MN arrives at the destination, it stays again for the indicated pause time before repeating the process.

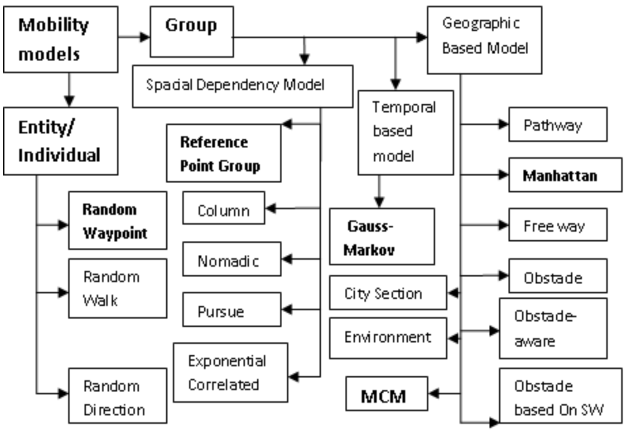

Fig1: **Classification of Mobility models**

3.2 Spatial Dependency Mobility Model

In this model, the multiple moving nodes are considered as entity model and it is moving independently of each other. Sanchez et al., [24] proposes a set of mobility models. Here the nodes travel in cooperative and strong special dependency. In this model, the battlefield communication and museum touring are used. The movement pattern of a mobile node may be influenced by certain specific 'leader' node in its neighbourhood. Hence, the mobility of various nodes is indeed correlated. The group mobility models include Column, Pursue, Reference point Group and Nomadic model.

3.2.1 Reference Point Group Mobility Model:

In this model, the nodes are divided into groups and each group follow the Leader's mobility. The group which is mentioned here is a Logical center or group leader. There is one Leader in a group and then group of members. The movement of the group leader determines the mobility behaviour of the entire group. The group Leader's movement at time't' be represented by motion vector 'V' group. Here it defines the group leader motion and also group member's motion trends. The general description of group mobility can be used to create a variety of models for different kinds of mobility applications like group tours, conferences etc., This model is mainly proposed for military battlefield. It is used as a generic method for handling group mobility. There are three different mobility scenarios like

1. **In-Place Mobility Model**: The entire field is divided into several adjacent regions. Each region is exclusively occupied by a single group. One such example is battlefield communication.

2. **Overlap Mobility Model**: Different groups with different tasks travel on the same field in an overlapping manner. Disaster relief is a good example.

3. **Convention Mobility Model**: This scenario is to emulate the mobility behaviour in the conference. The area is also divided into several regions while some groups are allowed to travel between regions.

3.3 Temporal Dependency model

3.3.1Gauss-Markov Mobility Model:

In this model, each mobile node is initialized with a speed and direction with fixed intervals of time movement that occurs for updating the speed and direction of each node. To be specific, the value of speed and direction at the n^{th} instance of time is calculated based upon the value of speed and direction at the $(n-1)^{th}$ instance and a random variance[v]. It is a temporal dependency mobility model. The value of speed and direction at the n^{th} instance is calculated using the equation 2 and 3 as

$S_n=\alpha s_{n-1}+(1-\alpha)_{n-1}$ Equation (2)

$d_n=\alpha d_{n-1}+(1-\alpha)_{n-1}$ Equation (3)

At time interval n, an MN's position is given by the equations 4 and 5 as

$X_i^{a+1} = x_i^a+ [s_i^a*\cos(\Theta_i^a)]$ Equation (4)

$Y_i^{a+1} = Y_i^a+ [s_i^a*\sin(\Theta_i^a)]$ Equation (5)

3.4. Geographic Restriction Model

3.4.1. Manhattan mobility model:

In this model, the nodes are assumed to be randomly placed in the street intersections. The node movement is decided from one street at one time. To start with this, equal chance is given to every node. After a node is selected in initial locations, a node begins to move in the same direction and reaches in other street intersections. Then the subsequent street in which it moves is chosen probabilistically. The node can continue same direction may be 50% and continue with another chance to change direction with a chance of 25% and then turning to the west/east it depends on the movement of previous nodes moved.

3.4.2. Mission Critical Model: In this model, the nodes move around the obstacles resembling how humans walk past obstacles. It is an add-on of obstacle mobility model. The trajectories that the nodes follow in order to reach the destination points include a series of intermediate points determined by the presence of obstacles [29].Starting from its original position, a node defines the next intermediate point as the vertex of the edge, which hinders its direct movement towards the destination that is closest to the destination. If no such obstruction exists, the next intermediate is set to be the final destination point. This procedure is called recursive from every intermediate point until the destination is reached.

4. ROUTING PROTOCOL:

Dynamic Source Routing (DSR):

DSR is a simple and efficient routing protocol designed specifically for use in multi-hop networks. The sender knows the complete hop by hop route to the destination. These routes are stored in a route cache. This protocol is of two mechanisms, route Discovery and route maintenance which work together to allow nodes to discover and maintain routes to arbitrary destinations in the network.

The advantage of this protocol is that routes are maintained only between nodes that need to communicate, Route caching can further reduce route discovery overhead, and a single route discovery may yield many routes to the destination, due to intermediate nodes replying from local caches.

5. SIMULATION RESULTS:

Simulations have been carried out by the Network simulator version 2 (NS2) [32]. Ns-2 has its different versions which are popular simulation environment which is acceptable for research work. It is a hybrid technique by the combination of both C++ and an object-oriented version of TCL scripting called OTcl. It is convenient when the user become acquainted with it. The modules are developed using C++, in order to provide higher simulation speeds by using of compiled code. We implement the mobility models in version 2.33[19]. Hardware and operating system (OS) configuration for performing simulations is specified in Table 1. The basic mobility scenario generation tool is Bonn Motion [15]. The analysis of simulation results has been performed by means of the Trace Graph.

Bonnmotionv1.5

This tool is an application-level simulator for mobility, which creates and analyses mobility scenarios to investigate ad-hoc sensor characteristics. It is developed by the Communication Systems group at the Institute of Computer Science of the University of Bonn, Germany. It generates mobility scenarios for several mobility models like tunable parameters.. The scenarios are exported for the network simulator NS-2. It provides some features like statistics, link dump and visualization for analysing the mobility scenarios [35].

Table 1: Hardware OS Configuration

Processor	Pentium 4,CPU 1.8 GHZ
RAM	480 MB
OS	Linux, Redhat Distribution
Kernel	Fedora 6,Kernel 2.6
Simulator	NS2-2.29, Nam.1.13

The Studied Scenario of ad-hoc sensor network consists of 50 to 150 nodes with the interval of 50 nodes and speed with 0 to 10ms with the interval of 2ms and the protocol is DSR with the parameters defined below in Table 2

Table 2: Simulation Parameter set

Duration	300ms
Traffic Sources	CBR,Packet 512 byte, inter-arrival time-0.2s
Transport protocol	UDP
MAC protocol	Mac/802.11
N/W interface	Phy/wireless phy
Propagation model	Two ray ground
Radius of node	250m
Antenna	Omni/Antenna
Area Size	1000m*1000m
Mobility Models	RWP,MHN,RPGM,MCM,GM

5.1. Results:

5.1.1 Generated Packets (GP): Here all the mobility models have packets generated as follows:

Table 1.1: Generated packets Vs Speed

Nodes	No. of. Packets
50	3480
100	5798
150	9272

Here all mobility models use the nodes 50,100,150, with different Speed 0 to 10 ms with the time interval of 2ms (maximum speed = 10 m/s). The Generated Packets (GP) remains same even in the change of number of Speed varies.

5.1.2 Packet Delivery Ratio (PDR*)*: This is the ratio of total number of packets successfully received by the destination nodes to the number of packets sent by the source nodes throughout the simulation:

$$\textbf{PDR} = \frac{\text{Total no of data packets successful delivered}}{\text{Total number of data packets sent}} * 100\%$$

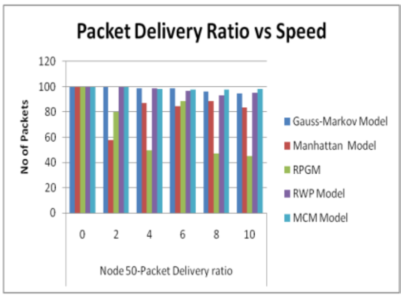

Figure 1: PDR -50 Nodes

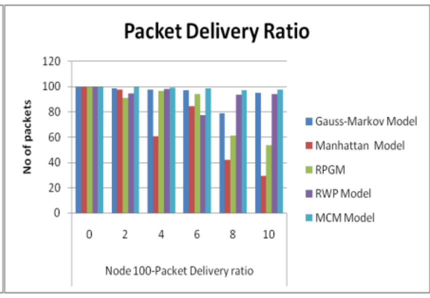

Figure 2: PDR -100 Nodes

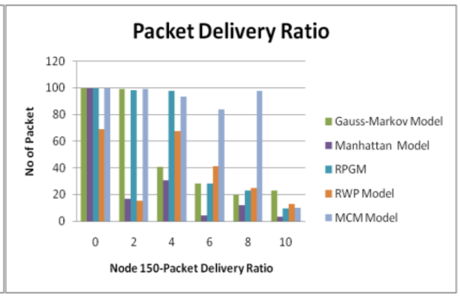

Figure 3: PDR -150 Nodes

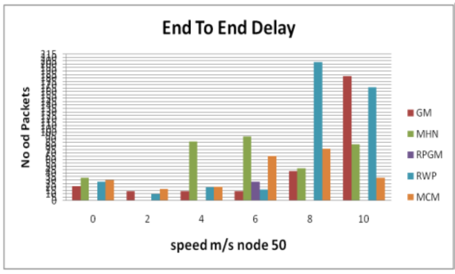

Figure 4: ED -50 Nodes

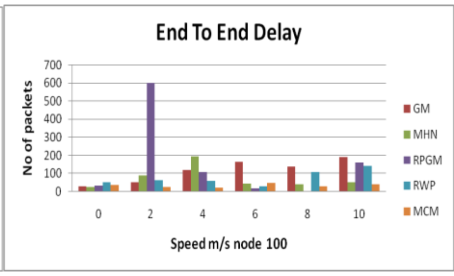

Figure 5: ED -100 Nodes

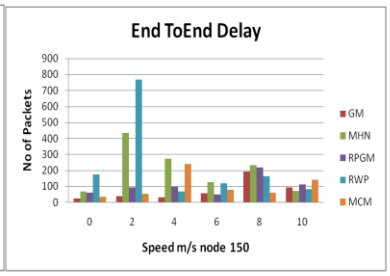

Figure 6: ED -150 Nodes

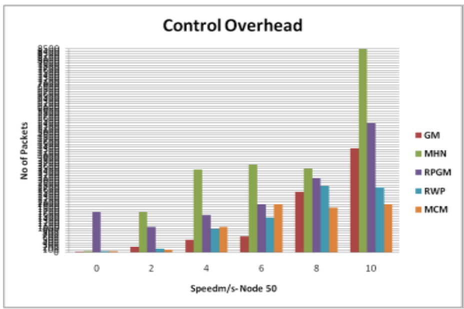

Figure 7: CO -50 Nodes

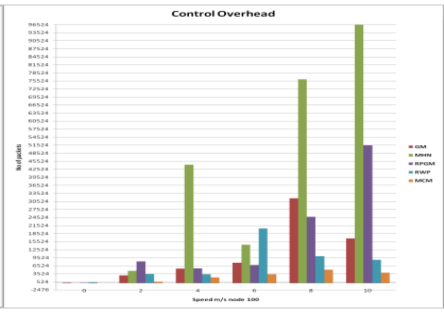

Figure 8: CO -100 Nodes

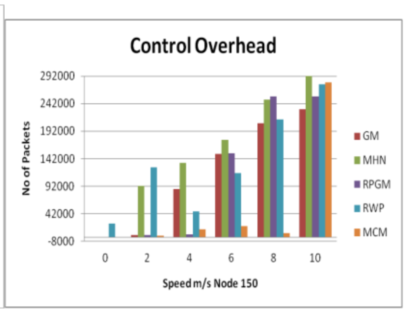

Figure 9: CO -150 Nodes

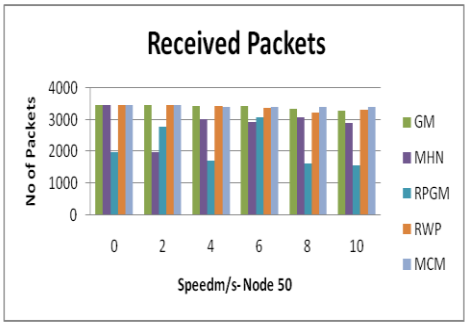

Figure 10: RP -50 Nodes

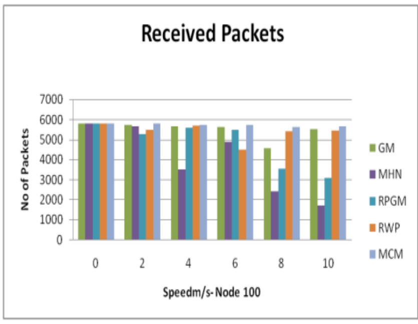

Figure 11: RP -100 Nodes

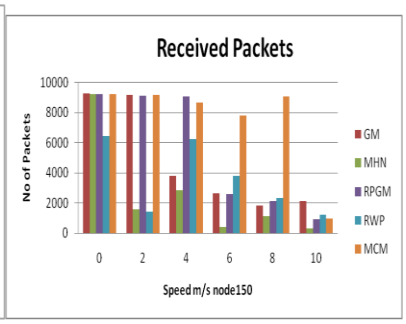

Figure 12: RP -150 Nodes

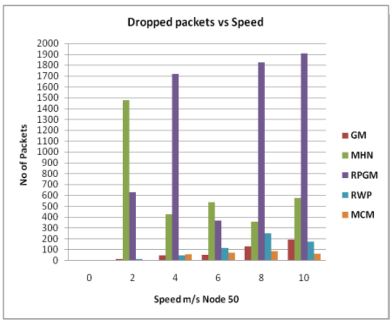

Figure13: DP -50 Nodes

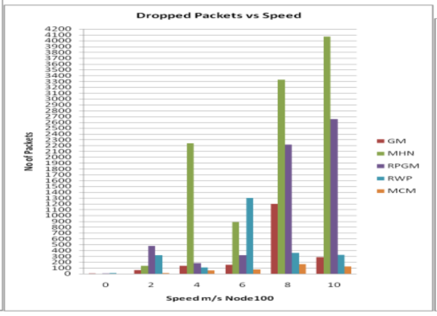

Figure 14: DP -100 Nodes

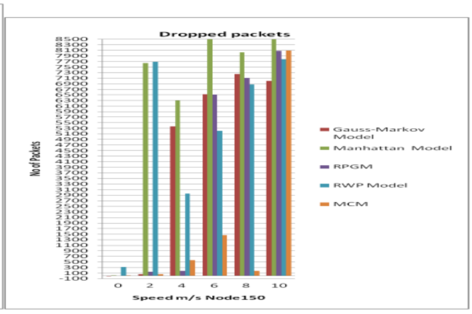

Figure 15: DP -150 Nodes

This estimate gives us an idea about how successful the protocol is in delivering packets to the application layer. A high value of PDF indicates that the packets are delivered to the higher layers and it dictates the protocol performance.

In Packet Delivery Ratio (PDR) in the nodes using a different mobility model with different Speed (maximum speed = 10 m/s). In figure 1, 2 and 3 represents the Packet Delivery Ratio in accordance with Speed. By using 50 and 100 nodes, the performance of the MCM model gives better PDR results and RPGM model is lower result. By using 150 nodes, the performance of the MCM is higher at speed 0, 2,4,6,8 and at speed 10ms GM model is higher result. MHN model gives lower PDR results.

5.1.3 Average End-to-End delay (ED): The average delay in transmission of a packet between two nodes and is calculated. A higher value of end-to-end delay means that the network is congested and it dictates that the routing protocol does not perform well. The upper bound on the values of end-to-end delay is determined by the application [29].

In End to End Delay (ED) using a different mobility model with different Speed maximum speed = 10 m/s) is used. In figure 4, 5 and 6 represents the End to End Delay in accordance with Speed. By using 50 nodes, a congestion packet of RWP model shows high delay but RPGM group mobility model outperforms than other models. By using 100 nodes, congestion packets in RPGM show low delay. By using 150 nodes the Congestion of packets at speed 0, GM models shows lower delay than other models and RWP models shows high delay. At speed 2, RWP model shows high delay that follows Manhattan and other three models. At speed 4, 6, 8 Manhattan models show high delay than others. At speed 10, RPGM and Gauss-Markov models show high delay and Manhattan delay shows low delay. The overall performance shows that MCM delay is high.

5.1.4 Control overhead (CO): The control overhead is defined as the total number of control packets exchanged successfully. In Control Overhead (CO) using a different mobility model with different Speed (maximum speed = 10 m/s) is used. Figure 7,8 and 10 represents the Control Overhead in accordance with speed. By using 50 nodes, the performance of the MCM model gives low CO results. The Manhattan model gives higher packets. By using100 nodes, the performance of the MCM is lower and Manhattan model gives better results .By using 150 nodes, the performance of the Manhattan model gives higher CO results.

5.1.5 Received packets (RP):

In Received Packets (RP) using a different mobility model with different Speed (maximum speed = 10 m/s). In figure 10, 11 and 12 represents the Received Packets in accordance with Speed. By using 50 nodes, the performance of the MCM model gives better RP results. RPGM model gives low RP. By using 100 nodes, the MCM model gives better RP results, MHN model gives low RP. By using 150 nodes, at Speed 0,2,4,6,8ms the MCM model gives better RP and at Speed 10ms GM model gives better result. In overall node 50,100,150, the performance of RPGM model is very fewer packets are received among the other models.

5.1.6 Dropped Packets (DP):

The dropped packets are defined as the total number of packets Dropped. In Dropped Packets (DP) using a different mobility model with different Speed maximum speed = 10 m/s). In figure 13, 50 nodes are used to represent dropped packets in accordance with Speed. At Speed 0, there is no dropped packet in all models. At speed 4, 6, 8 and 10 RPGM model gives high dropped packets. In figure 14,100 nodes MCM model gives low dropped packets and at speed 4,8,10 the MHN model has high dropped packets.

5.2. Disadvantages of Existing Models:

- Random Models are not realistic.
- Group models will take more time to reach the destination from the source.
- Geographic Restriction Models use obstacle by assumption in the simulation terrain which is not realistic.
- Obstacle models are restricted in pre-defined pathways.
- The MCM model node moves to the destination through the edges of obstacles. These models are not in real-life trace. The model is best suited only for emergency and Health care.

6. CONCLUSION

6.1 Obstruction Avoidance Generously Mobility Model (OAGM) proposed:

Graph-theory is a study of graphs; Mathematical structures are used to model the pair wise relationship between objects of vertices or nodes and a collection of edges that connect pairs of vertices. The main contribution of the proposed model is to find the minimum time and Distance to reach the Destination with the Obstacle by using Graph-Theory mechanism.

- A mechanism for placement of Obstacle within a simulation terrain.
- The computation of pathways between obstacle using the graph-theory methods
- The Calculation of area in which signal is obstructed due to obstacles
- A mobility model plugged in NS2.29
- To evaluate the model well-known protocol: DSR
- Parameter sets vary with Number of Nodes and Speed up to 10ms with the interval of 2ms and up to 250 nodes with the interval nodes 50 communication with 300ms simulation time.

It is going to be a realistic real-life tracer. It is used to move nodes in a straight line up to the boundary of an obstacle with a distance of obstacle edges until it reaches the destination by using the shortest path of edges and boundaries. We are going to use Recursive algorithm for node movement. It is a user-friendly manner. The proposed methods have some subdivisions like

- Node placement-Randomly
- Hierarchical node organization-Group Model is used here
- Physical obstacle placement
- Source selection
- Destination selection

We use graph-theory to model the movement constraints which are mandatory in communications. The vertices of the graph represent locations that the user might visit that point and edge model the connection between the Obstacles in the simulation area.

Each node is initialized at a random vertex in the graph and moves towards another vertex, which is selected randomly as a destination. The nodes are moving to the destination through shortest path. In our model, we are considering the obstacles as main and how we are avoiding the obstacle using graph theory technique that includes the following steps arranged with node movement and where can the user can place the Obstacle and then the hierarchical node organization (i.e. source, destination) and finally giving method for avoiding the obstacle with short time and distance. It is an add-on to the MCM model; we are going to develop the model which is moving in a natural way. In MCM the area is separated into sub-regions, but they aren't considering the any corners of the obstacles. In our model we are going to consider the corners and edges of the squares. Although certain things are verified in mathematical and analysis is not yet proofed in the realistic mobility model. By this model, we believe that this model will provide a realistic balance with rectangle balance with a realistic mobility model which exists in random mobility models.

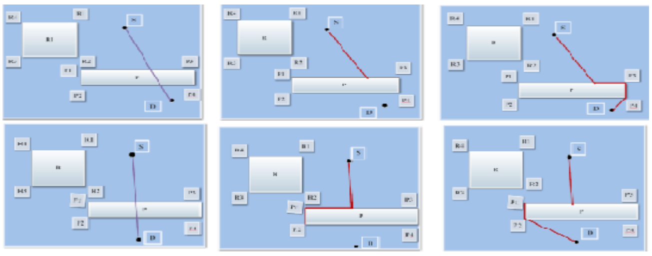

Figure:16. Diagram shows how the model unobstructed line connection to Source and destination point

In our model, a destination point is set as randomly, each node moves its way around the obstacles following a recursive process in order to reach it. If there is an unobstructed line of sight connecting the node with the destination point, the node follows this direct line to get to the desired destination. If there is an obstacle in the way, the node sets as its next intermediate destination the vertex or boundary of the visible obstacle that is closest to the destination and repeats the same process all over again with a starting point as its initial position and destination the chosen vertex. The distance between the vertex is calculated and the nearest edge of the obstacle is found and then the destination and follow through edge and boundary. This is repeated until an unobstructed direct line and until the current destination is found. The whole process is executed recursively until the destination is reached. This algorithm is used for node movement. The algorithm denotes the above process.

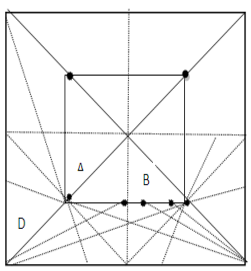

Figure :17. An example of how a node moves towards its destination point around the obstacles in the network area according to the OAGM model.

An example depicting the operation of the movement process is shown in Figure. 16,17. The node U located in point S has set D at its destination point. The algorithm checks if the direct line connecting S to D is unobstructed, realizing that obstacle P is in the way. From the vertices of the edge (P1, P2) that is the first one obstructing node U's way to the point D, the one closest to D is P2. Therefore, P2 is set as the next intermediate destination. In order to reach P2, node U repeats the same process with S as its starting point and P2as destination. Obstacle Q obstructs node U to reach P2 immediately, so the closest to P1 edge p4 is selected. Then, the same process dictates that node U can move directly to S, since there are no Obstacles between S and p2. Then it reaches the Destination D.

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6.3. Conclusion and future work

The main aim is to study the existing mobility model and to prove that the mobility model extremely affects the performance results of a Routing protocol in a realistic environment. NS-2 simulation was used to evaluate the performance of different mobility models over DSR protocols using the performance metric like Packet Delivery Ratio (PDR), Average End to End Delay (ED), Control Overhead (CO), Generated packets (GP), Dropped Packets (DP) and Received packets (RP). Based on the performance analysis of the different models, the Generated Packets (GP) remain same even in the change of number of Speed varies but we consider the PDR and ED there is a high variance in the result. In particular, certain ad hoc routing metrics at speed 0 the number of nodes is 50,100,150 the packet Delivery Ratio (PDR) the models give 90% and above and at Speed 2, 4, 6, 8, 10 the PDR the models gives very low. The overall performance of End to End Delay (ED) is when the number of nodes is 50,100,150 the models give low and the number of nodes is 200,250 the models gives very high delay. The overall performance of Control Overhead (CO) is among different mobility models Manhattan model and RPGM models exchanging the packets overall performance is good among the other models which we selected the models from the group and random models. The overall performance of Received Packets (RP) is among different mobility models Manhattan model and RWP models received packets is good with generated Packets which we selected the models from the group and random models. When the network is small then the Received packets are 95% and above. The overall performance of Dropped Packets (DP) is among different mobility models is very high.

The Existing model might not show the accuracy that represents any scenario in the world, simply because real MN's must travel around obstacles and along pre-defined paths. The proposed model is implemented in NS2.24. So, the work is to avoid obstacles using obstruction avoidance generously mobility (OAGM) model using graph theory based mobility model which suited for the current environment. The Result of this model is yet to compare with the existing model and implement this model in realistic testbed is our future.

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