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Research Paper

Efficient way of implementing the random and GM (Gauss-Markov) mobility model in MANET

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Abstract

In Mobile Adhoc Network (MANET) nodes are communicating each other with the help of routing protocol. In Adhoc networks, a node having high mobility, with that node's moving randomly from node to node. For observing the movement mobility, we are studying different forms of mobility. These models can deploy the mobility of the network condition, including the various parameters such as the size of the network, traffic models of data, throughput and the PDR (Packet Delivery Ratio) are used as performance Parameters. We are investigating the RWP (Random Waypoint) and GM (Gauss-Markov) mobility model to express efficiency of Adhoc routing protocol by using the OMNET++ simulator .The result of the simulator shows that the mobility has more influence upon MANET protocol with the increasing node density. Here, we evaluated RWP and GM mobility model with AODV protocol. The study of these models illustrates dissimilar outcomes related inputs with the increasing performance of the pause time rises among the speed and number of nodes.

Keywords: *Mobility; AODV; Performance; Throughput; Mobility.*

1. Introduction

MANETs are the self-determining group of nodes to interact through the radio range of others, but additional nodes require the support for routing their packets. All the nodes interact with the wireless interface with the other mobile nodes. MANETS are not having any fixed infrastructure as access point or base station, but they are distributed in nature. Most of the MANETs application like battle field, relief operation, and the burning business convention deployed without using the existing infrastructure, such as wires and base station. For achieving of the best mobility management model we need to satisfy factors like
the moving path, location, and change in velocity overtime of mobile nodes.
A number of mobility models are proposed in simulation for getting the best results in MANET's, but in the real world development testing, this kind of network a bit cost. . In this paper, review and Performance analysis of mobility models in MANETs has been given via protocol AODV.
Moreover, simulation has been done through OMNET++.
The remaining structure of the document is arranged like this: II & III section introduces classify, review existing mobility models of MANETs. Section IV describes the study of related work of the model and performance. Section V and VI describe the simulation model and environment and Performance analysis of RWP and GM Mobility Model. Finally, section VII wraps up this paper.

2. Mobility models in MANETS

The mobility of nodes described in MANET, the movement planned to define the configuration of movable customers, and also check in which manner speed; position and acceleration are changed based on time intervals. Movement models might show major responsibility in defining Performance of protocol. And also consider the necessary movement to mimic the models of movement [5]. There are used different types of mobility models in MANETs as shown in fig1.

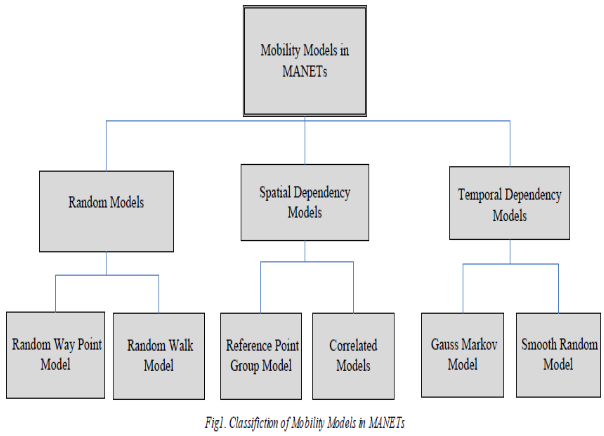

Fig. 1: The Classification of Mobility Models in MANETS.

2.1. Random models

In this model the mobile nodes moving openly and randomly without any constraints. Mean the nodes are independent for selecting of the direction, destination of the node and the velocity are randomizes. In this model every node act as entity and it can move independently. That's why we are calling it as entity models.

2.2. Spatial dependency models

As mentioned in the previous section, one disadvantage of every random model takes each mobile node the same as an entity which entirely unlike from the other mobile node's velocity, location and movement .That's why these models are not suitable for group communication in the MANET application. Model which is supported for group communication is called spatial dependency. These models divided the network into smaller network groups. And it contains the RPG (Reference Point Group) and Correlated models like CM (Column Mobility), PM (Pursue Mobility) and NM (Nomadic Community) Model.

2.3. Temporal dependency models

In this, model the velocity and rate of change in direction depends on each node's movement or mobility restricted by the rules of acceleration. The velocity of mobile nodes maintains the consistent time slot because every node velocity depends on the previous node velocity. This feature we may call as Temporal Dependency of the velocity. It includes the different mobility models like GM (Gauss-Markov) and SR (Smooth Random) Mobility Models.

3. Related work

Mobility models (Radom Waypoint model and Manet_Down_Left) [4] are proposed measures on OLSR. Their simulated result demonstrates RWP configured with OLSR performed better than Manet_Down_Left OLSR in all scenarios where the pause time and speed were varied. Analysis of speed and performance of node density [5] has compared the RWP, GM, RPG and NC models. For small-scale networks, RWP gives the best performance without considering variations in the speed. For a large-scale network, both Nomadic Community and Random Waypoint are offering comparable performance.
The reactive routing protocols AODV and DSR with the varying models and changes the node density evaluated [6] with an unreliable number of source nodes. In the effort of analysis both routing protocols used the RWP model with Constant Bit Rate traffic sources and enhance the detailed performance. The conclusion of this study, DSR gives good results at the low speed with high traffic load better, but the AODV gives better with high traffic load.
The Manhattan grid mobility model and RPG with the Quality of Service metrics examined for the FSR, AODVUU of Mobile Adhoc Networks routing protocols [7]. They compared and simulated the two protocols and computed Performance with increasing host numbers, speed and velocity of data sending rate. The result shows that AODVUU performs better compare to FSR under the Manhattan grid mobility model [7]. DSR and AODV Protocols for measuring the performance parameters [8] are similar to PDR (packet delivery ratio), network and MAC load, and delay by the increasing size of the network. The conclusion of their study indicates that AODV gives the better comparative to the DSR [8].
The mobility measure for MANET [9] is proposed the canonical mobility model for flexible and consistent. The steadiness is establishing by constant linear association with diverse simulation circumstances between the mobility measure and link transform velocity.
The Manhattan and Freeway mobility models with performance parameters approximating average end- end delay, and throughput PDR examined and simulated [10] by routing protocols. They concluded that the MGR (Manhattan Grid mobility) model gives the best results then FM (freeway mobility) the model [10]. MANET routing protocols (AODV, DSR and DSDV) energy consumption is described [11] by the result of the simulation demonstrates that DSDV gives the better performance.
The Performance measures [12] of RPW, RG, and CMM Model on reactive and Proactive Protocols are described. The efficiency of reactive is improved than proactive. The performance of DSDV protocol [13] is compared and simulated with PDF, the network load and delay with various mobility models. Their study illustrates that DSDV with Random waypoint model gives the best performance compared to others with increasing node speed and network load.
Different mobility management models [14] analyzed by using the AnSim simulator for measuring the node behavior with respect to the node speed and pause time. [14]. Compared and simulated to measure the mobility model (random way mobility) with the DSDV, DSR and AODV performance [15]. They demonstrate AODV gives the best performance compared to other comparisons.

4. Mobility model, data traffic (DT) model and performance metrics

In this, section describing two selected mobility (RWP and GM) models are compared with the proper traffic model and checking the properties of Performance of MANETs.

4.1. Mobility models

4.1.1. RWP mobility model

In this, every node randomly select one location as destination and it moves towards the target node in the simulation environment. The maximum velocity of each node at the destination represented from 0 to V_{max} .After the reaching the target, nodes will stop based on the pause time (T_{pause}) the parameter specified in the simulation. If T_{pause} is zero, it shows that the model having the continuous mobility then shifts in the direction of it. The complete development is continual over and over in anticipation of the simulation ends [3]

4.1.2. GM mobility model

In this, the velocity of node implicitly chosen based on time and functions. The main of the model is to reduce the quick and unexpected turns exists in the present model depends on a certain amount of randomness. The movement of change present in this model node's speed and direction [2].

4.2. DT model

The analysis of DT in real time, we selected the Constant Bit Rate for controlling the data and bandwidth between the source and destination [16]. In simulation design, for the CBR connections have been created.

4.3. Performance metrics

The Performance metrics are generally representing the diverse characteristics of the overall network performance like Throughput and PDR (Packet Delivery Ratio) metrics of routing protocols.

5. Simulation scenario and related parameters

5.1. The simulation scenario

The simulation environment is employed to calculate the attainment of mobility models. In this work we utilize OMNET++ to simulate the RWP(Random Way Point) and GM(Gauss Markov mobility) model utilizing AODV Protocol. The following Table-1 illustrates the simulation parameters of these models.

Table 1: Simulation Parameters

Rang of Transmission	250 (m)
Simulation_Time	500 (s)
Bandwidth	2 (Mbps)
Size of Packet	512(bytes)
Rate of Packet	4(packet /sec)
Type of Traffic	CBR
Connected nodes	20% of nodes
Routing Protocol	AODV
Area of Simulation	1000 X 1000 (m x m)

6. The results and discussions

AODV routing protocol performance comparisons under the RPW Model and GM model with the varying node density is presented using the OMNET simulator. We used both model and traffic model as CBR, Size of the Packet 512 bytes, time for simulation 120 seconds; the area was 1000 m x 1000 m. Moreover the generated simulated results were used to check the performance through PDR and throughput.

Table 2: Simulation Parameters of RWP Model

Number of Nodes	25
Mean Speed	5 and 25(m/s)
Pause Time	[10s, 30s] (s)

Table 3: The Particular Constraints of Gm Mobility Model

# of Nodes	25
Mean Speed	5 and 25(m/s)
Pause Time	[10s, 30s] (s)
Tuning Parameter(α)	0,0.25,0.5,0.75,1
Variance	40
Margin	30m

Here, we include the simulation results for analyzing the achievement. Towards measure, the execution of the network , here estimate two parameters at the end of the simulation's throughput and PDR(Packet Delivery Ratio). The throughput and PDR using RWP model are top at low mean speed (5 m/s) and show monotonic decreasing trends as mean speed progresses with a uniform pause time[10s , 30s] for a small number of nodes. This scenario depicts in figures 2 and 3

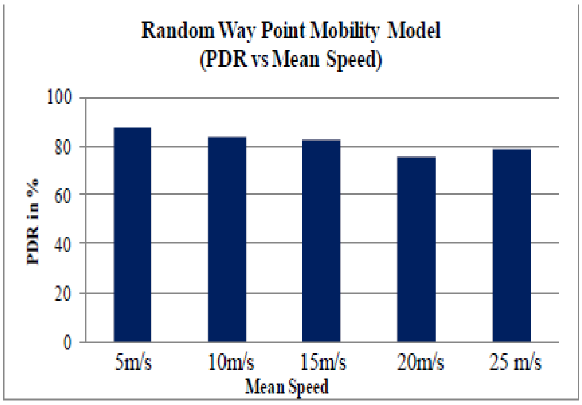

Fig. 2: Function of Nodule Mean Speed Is % in PDR (M/S).

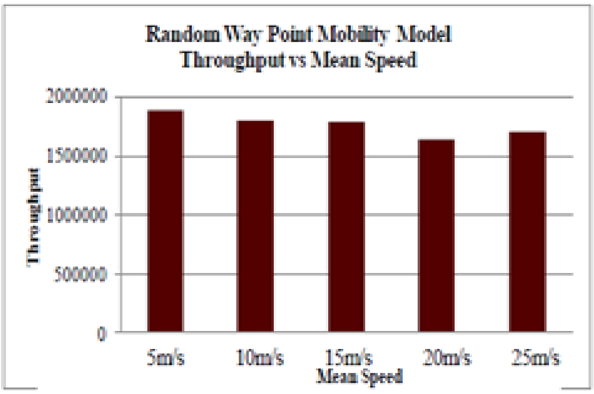

Fig. 3: Function of the Nodule Mean Speed as A Throughput (M/S).

The throughput and PDR using GM (Gauss Markov) mobility model are maximum at low mean speed (5 m/s) with uniform density as α =0 and a bit less uniform density as α=1.Moreover, at high mean speed (25 m/s) throughput is maximum with the uniform density of nodes as α = 0.25 and no uniformity in the distribution of nodes as α=1. The low and high speed scenario results are depicting in the graphs in figures 4 to figure 7.

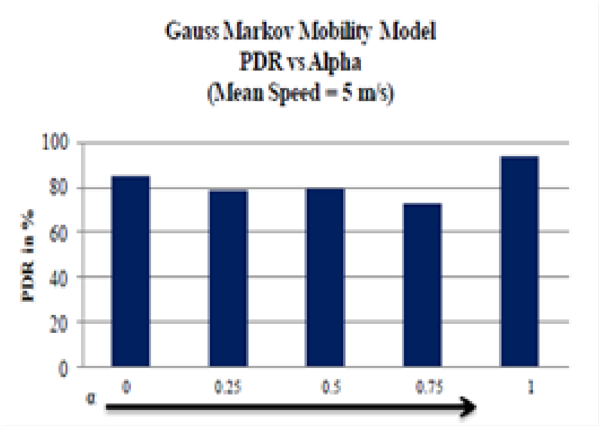

Fig. 4: Function of Nodule Mean Speed as PDR in % vs. Alpha (M/S).

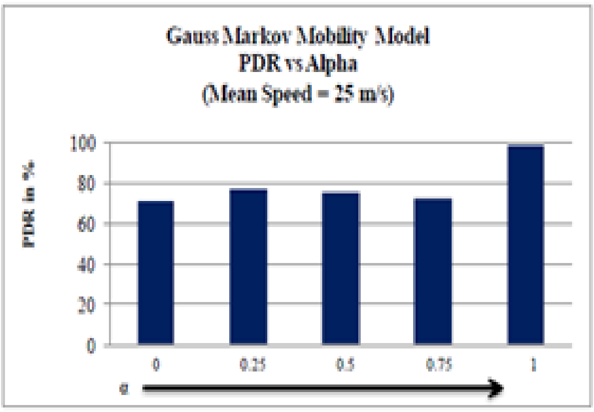

Fig. 5: Function of Nodule Mean Speed PDR in % vs. Alpha (M/S).

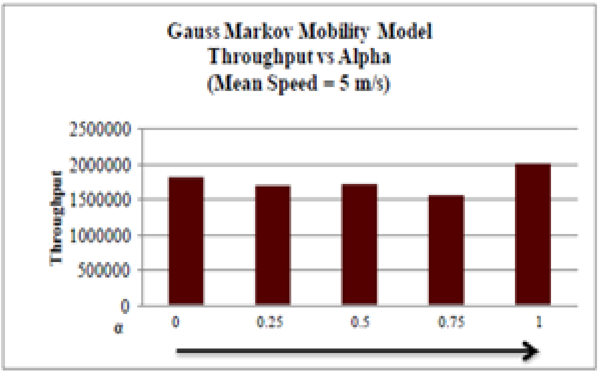

Fig. 6: Function of Nodule Mean Speed as Throughput vs. Alpha (M/S).

7. Conclusion

Here we have presented several mobility models for MANETs along with the performance analysis of RWP and GM mobility models via AODV Protocol. The simulation results illustrates RWP to enhance the GM model through pause time and the small number of nodes. During simulation a result describes that Gauss Markov's mobility model performance is same under low and high mobility scenario as α =0.75. Moreover, output shows that Gauss Markov at the low speed scenario with the tuning parameter α=0.25 and Random Waypoint at high speed scenario give the same performance.

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