COMPARATIVE ANALYSIS OF MOBILITY MODELS USING ROUTING PROTOCOL FOR VEHICULAR AD-HOC NETWORK (VANET)

Vanshri W. Kurhade[1], A. R. Deshmukh[2] ,S. S. Dorle[3]

[1]Research Scholar ,ETC Department ,GHRCE Nagpur (India)
[2]Assistant Professor , ETC Department, GHRCE Nagpur (India)
[3]Professor ,ETRX department GHRCE Nagpur(India)

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Abstract - *VANET has emerged as an important research area over the last few year. It achieve intelligent Inter-vehicle communications(IVC) and improve road traffic safety and efficiency. Network Simulation is the most common method for evaluating the performance of large and complex system. It has a freedom to govern itself or control its own affair and can optimize and heal the mobile radio access network simpler and faster.In this paper AODV routing protocol has been simulated by using different mobility models like Random Trip Model, Random Path Model. The goal of this research paper is to offer more choices by comparing the different quality of services parameter like delay, energy, throughput, jitter and packet delivery ratio. The analysis has been done on the basis of different no. of nodes as the result of an Ad-hoc protocol change drastically.*

Key Words: :VANET, Routing Protocol, Mobility Model, Delay, Energy, Throughput, Packet delivery Ratio, jitter

1.INTRODUCTION

An Ad-hoc wireless network is a self organize and collection of wireless nodes into a network without the help of an infrastructure. All the nodes are mobile. These network can be classified into in three categories on the basis of application.

- Mobile Ad-hoc Network (MANET)
- Wireless Mesh Network (WMNS)
- Wireless sensor network (WSN)

MANET

It is a autonomous network of mobile. That can be formed without the need of existing network ground work or centralized administration and can be set up randomly. These is the popular are for MANET researchers from early 90's many protocol has been introduced for communication by developed the technology of wireless modem and router for commutation for large scale area MANET uses multi hop technique, but for only few kilometers of connectivity that uses single hop developed by some network.

These Network comes under the sub- category of network.

- VANET Ad-hoc network:- used for vertical to RSU, Vehicular communication or Base station
- Smart phone Ad-hoc network It is also known as peer to peer communication Avoiding relay on cellular carrier network Wi-Fi is the example of this type of network.
- Internet Based Mobile Ad-hoc network (iMANET)

Mobiles nodes link with gateway type of network VPN has been used for this type of network VANET enable the Intelligent transportation system hence allow efficient communication therefore VANET are also called vehicle to vehicle or Inter- vehicle communication

Figure 1.1:- Structure of VANET [6]

The major application of VANET is ITS which allow collision traffic awareness preventation and near by vehical services. VANET can also able to commination with internate so thatVANET has many application like playing online music, GPSservices, check email download information also.VANET are further subcategories into two different types they are as follows:-

- wireless Infrastructure network.
- Wireless Infrastructure less network also known as ad-hoc network

The communication done by the mobile nodes follow the rout path of fixed station so that wireless infrastructure network contain base station and AP.
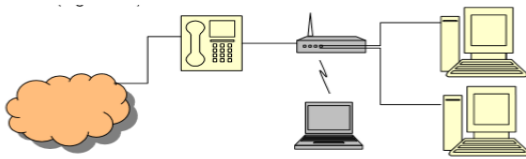
Figure 1.2:- Wireless infrastructure [6]

Fig shows the wireless infrastructure network no wired required for maintain link between VANET this type of network. The fixed base station or router is required to make connectivity between the VANET nodes. VANET node senses and transmit it to the fixed router with the help of some routing protocol and then the data has been forwarded to the others base station with the help of some routing protocol and then the data has been forwarded to the other base station with the wired network.

On the other hand where router required to make communication between vehicle nodes and where no base station or router is required. This type of network is capable to maintain connectivity vehicular nodes directly, this type of nodes is known as wireless infrastructure less network also known as ad-hoc network. This network use IEEE nodes make communication with each other directly by sending ACK and REQ messages to the other nodes. Every forwarded data is received to the exact nodes having their own unique IP adders. This type of system is small but the speed and accuracy is more as compare to other network. This type of network is more popular in VANET.

2. RELATED WORK

In VANET modeling, challenged by feedback two mobility models are used by including feedback for Manhattan mobility model and Random Trip Model using SUMO and OMNeT++ mobility generator with the simulation result the packet delivery ratio and throughput get increasing where as delay and jitter get decreases. In vehicle Mobility for realistic and efficient highway VANET simulation author integrated real world topology and real data extension from freeway performance measurement system. This matching mechanism is used to tune a parameter of lognormal model and Urban Highway model in this paper author simulate the parameter where delay and throughput and jitter get high and packet delivery Ratio get decrease.

In efficient environmental factor for V2I application services. The efficient environmental model algorithm is incorporate in IEEE 802.11 in MAC protocol for safety and non safety application. The result shows the impact on collision and throughput efficient which improve QoS for VANET. In VANET modeling & clustering design author has done complete analysis that integrate three important factors into one model. He use Markov model by introducing idle state. This model uses two dimensional chain according

to the simulation result the throughput increases & then decreases as the cluster size increases , PDR also get increase as the increase in cluster size & delay get high. In stable routing protocol for highway mobility author has uses AODV routing protocol & uses OMNeT ++ & SUMO mobility generator. With the help of stimulation result it shows hat stability increases delay & PDR get decreases

3. INTRODUCTION TO ROUTING PROTOCOL

AODV (Ad- hoc on Demand Distance Vector)

The AODV is on demand reactive protocol as well as DSR(Destination Sequence Number), AODV is used for dynamic wireless network is a reactive routing protocol where nodes might leave and enter the network frequently. Hence It is an on demand routing protocol it mean it routs when desired by source node. The source node immediate broadcast rout when aspire by source node. The source node then broadcast a rout request messages (RREQ) to its neighbor, when source node desired a rout to a destination. It acknowledge a rout with reply messages (RREP), if any of its neighbor rout to the destination otherwise, node, neighbor again broadcast the RREQ continue until the RREQ returns the request. AODV has a local aliment scheme to maintain rout as long as they are effective.

AODV has been design to decrease the distribution of information of control traffic and eliminates end to improve scalability and achievements, main advantages of this protocol is that rout take place in demand and destination number sequence help to find the current rout to the goal and the connection setup delay is lower.

4.INTRODUCTION TO MOBILITY MODELS

4.1 Random Trip Mobility Model-

The random trip Mobility model changes direction and/or speed including the time pause in between nodes by staying in one location for a certain period of time and once. This time node chooses a random destination in the simulation area and a speed that is uniformly distributed between min and max speed. The node uniformly and randomly select its new direction $\phi(t)$ from $(0,2\pi)$ and speed $S(t)$ from $(0,S_{max})$ in time interval t, the node moves with vector of velocity $[V(t) \cos \phi(t) , V(t) \sin \phi(t)]$, as node reaches the simulation region boundary it bounce back in an angle of $\phi(t)$ or $\pi-\phi(t)$.

The Random trip model is memory less & it generate an in practicable movement pattern.
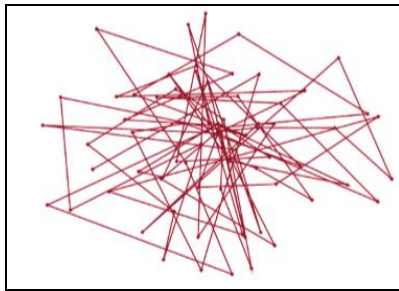
Figure 4.1:- Traveling pattern for Random Trip Model

4.2 Random path Mobility Model-

The uniform node distribution finally reaches a steady state as the simulation time elapse and is transformation of Random path model. Mobiles are concentrated in central rather than boundaries of the region. Here mobile node are almost zero. Random path model has overthrown such actuality. The node randomly and comparably chosen a fixed direction and move side by side the direction until it reaches the boundaries. It randomly choose another direction to travel after reaching the boundaries and stopping for some t pause. Therefore this model is more stable than RTMM.

4.3 Manhattan Model-

The Manhattan Grid (MG) mobility model which uses a grid road topology**.** This mobility model was mainly proposed for the movement in urban area, where the streets are in an organized manner. The mobile nodes move in horizontal or vertical direction on an urban map. The MG model employs a probabilistic approach in the selection of nodes movements since, at each intersection, a vehicle chooses to keep moving in the same direction or to turn. The pause probability and maximum time of pause can also be defined so to model different situations such as traffic lights or traffic jumps.
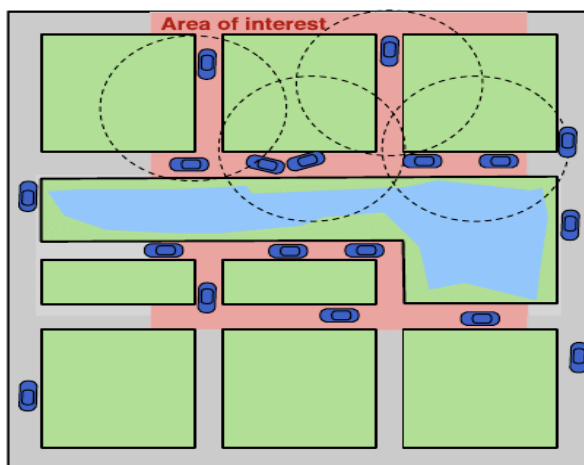
4.3 Vehicles distribution using the Manhattan Grid model

4.4 Markov Model-

In practical systems, a mobile user usually travels with a destinations in mind, therefore mobile's location and velocity in the future are likely to be correlated with its current location and velocity. The memoryless nature of random-walk models makes unsuitable to represent such behaviour. Another widely used mobility model in cellular network analysis is the fluid- flow model, which is suitable for vehicle traffic in highways, but not pedestrian movements with frequent stop-and-go interruptionsThe Gauss-Markov (GM) model represents a wide range of user mobility patterns including, as the two extreme cases, the random-walk and the constant velocity fluid- flow models. In the GM model, the future location of a mobile is predicted based on the probability density function of the mobile's location, which is given by the GM model based on its location and velocity at the time of the last location update. . This model captures the velocity correlation of a mobile node in time and represents random movement without sudden stops and sharp turns. At fixed intervals of time movement occurs by updating the speed and direction of each node. At each iteration, the new parameter values are calculated depending respectively on the current speed and direction and on a random variable.

4.5 Urban Vehicular Mobility Model-

In urban vehicular mobility model, street is a crucial factor that forces nodes to confine their movements to well defined paths irrespective of their final destination. Two different urban vehicular mobility models are as follows

Stop Sign Model (SSM) :-

Stop Sign Model imitates the mobility of vehicles in the presence of stop signs at every intersection. Every vehicle waits for a fixed period of time when it arrives at any intersection before moving to its destination. Every vehicle maintains a specific distance from the vehicle in front of it.

Traffic Sign Model (TSM):-

In this model vehicle may or may not stop at a traffic light. If a vehicle waits at an intersection, all consecutive vehicles arriving at that intersection wait till it moves. Vehicles queued at any intersection move together after passing the chosen wait time

5. CONCLUSION

This paper contains survey on VANET and different Mobility models along with the given routing Protocol. Section II describes related work by several researchers and academicians. This review will contribute to the further work. We compare the different parameters of Random Path Model (RPM), Random Trip Model (RTP), Manhattan Model (MH), Markov Model (Mk) and Urban Vehicular Model (UMM) using AODV Routing Protocol.

Table -1:

M M	Jitter	Energy	Through-put	Delay	PDR
RTM	High	High	Varies according to cluster size	Less	High
RPM	Less	High	High	Less	High
MH	Less	Less	High	Less	Less
MK	High	High	High	High	Less
UMM	High	Less	Low	High	Less

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