A MOBILITY MODELS IN MOBILE ADHOC NETWORK

Amol Dewangan[1], Kajal Chandrakar[2]

[1][2]Asstt. Professor, Computer Science , Kruti School Of Business Management Raipur C.G.

E-mail- amoldev92@gmail.com, kajalch293@gmail.com

ABSTRACT

Mobile Adhoc Network is a self configuring, agglomeration of wireless nodes. It can dynamically changing network topology that formed without using any pre installed infrastructure or any central administrator. Currently Adhoc technology is not deployed too much spacious hence research in this area is only simulation based. Many parameters are momentous for MANET performance like routing protocols, energy efficiency, security of network and mobility of nodes. This paper presents different mobility models that delineate the movement behaviors of different mobile nodes under different geographic conditions.

Keywords :- *Adhoc, MANET, MNs, Mobility Model*

1.Introduction

Mobile Adhoc Network (MANET) is a agglomeration of wireless mobile nodes that exhibit the properties like self formed, self healing, self configuring and without under the control of any pre installed environment. Mobile nodes (MNs) in MANET move freely without any restriction. Direct link formed between MNs if they are within the radio range of other MNs. Otherwise the indirect link used i.e. in-between nodes used to send data from source to destination node.

Always same path are not followed to transfer information between sender and receiver because network topology in MANET are continuously due to the mobility of nodes. Some nodes leave and some entering in communication range of mobile network after duration of some time.

So every time it requires checking connectivity whether the path exist or need to be reconfigured. Two types of routing protocols are used to establish the path between different MNs Proactive and Reactive. In Proactive routing protocol information are continuously exchanging within the network topology to keep track different path whether they active or not. Whenever any MN wants to communicate with other nodes link will available immediately. On the other hand in Reactive protocol route formed only on demand. Whenever any MN wants to communicate with other MN link will be formed.

MANET will provide extensive applications in future like movable virtual classroom connectivity, battlefield communication management, disaster relief management, search and rescue management.

2.Mobility models

Mobility models represent the movement of mobile devices and also describe how the location, velocity and connectivity within the nodes are changing over the time. These mobility models are use for simulation intent whenever new changing techniques and environment are applied on mobile nodes to get commendable performance and obtrusive connectivity within the mobile Adhoc network. Different protocols are applied to test the behavior of mobile devices under different mobility models.

Two types of mobility models are available Traces and Synthetic. Traces are used to observe the mobility patterns in real life situations. Trace provides accurate information when there is large number of users present for long duration of time. But it is difficult to modeled in case of new environment like Adhoc network where traces have not yet been created. It is difficult to create trace of network because MANET not so physically deployed so synthetic models are used that is not trace driven. In synthetic models different mobility models are used that provide the behavior of MNs under different geographic and spatial conditions .

Random Based mobility Model

In random mobility models the mobile nodes move freely and randomly irrespective of any restrictions. The parameter like destination, velocity and directions are randomly chosen and are independent of other mobile nodes. RBMM are more used for simulations purpose than other models .Random waypoint model, Random direction model, and Random walk model are the category of RBMM. Random waypoint model (RWPM) RWPM was first proposed by Johnson and Maltz. This model now became benchmark to provide comparability of different Mobility models because of its simplicity and widely used. The MNs used random speed between pre defined range [min-speed max-speed] and direction between [0, 2π]. The RWPM includes pauses between changes of speed and direction. The MNs are free to move in any direction and at any speed. After choosing random speed and direction MNs moves towards that particular point and after reaching that point all MNs take pause time and again take random speed and random direction and continue until MNs are not reaches to simulation area. Relative speed of two MNs determines whether the link between two nodes broken or formed instead of defined their individual speed.

Random Direction Model (RDM)

RDM was created to overcome the problem of density waves produced in random way point model. Density wave problem is the clustering of nodes at one part of the simulation area. In RDM MNs choose random direction instead of random destination. Every time destination is border of simulation area. All the MNs are placed in the simulation area and assigned angular

direction in rang between $[0\ 2\pi]$ and velocity between $[0\ V_{max}]$.

When MN reaches border of simulation area it pauses for certain time period and again start moving with random direction until simulation not terminate. All MNs pauses at border of simulation area so that the average hop count for data packet at RDM are much higher than other mobility models and also network partition will be more likely with RDM as compared to other models.

Gauss-Markov Model

Gauss-Markov model (GMM) was first proposed by Liang and Haas [C] .The main disadvantage of random mobility models is sudden and sharp turns and sudden stops. To overcome this problem GMM used previous velocity and direction of node to calculate current speed and direction. By using the current speed and velocity of node i the future location can be calculate.

Random Walk Model (RWM)

RWM was mathematically described by Einstein in 1926 [3, 9].RWM describes individuals of MNs w.r.t. cells. Many MNs spectacle unpredictable movement behaviors so RWM was developed to mimic the eccentric behavior of those MNs. RWM describes the memory less process i.e. does not keep track of previous speed and direction, after time t it again calculate speed and direction. Whenever all the MNs reaches to border of simulation area, the whole process terminate the further movement of MNs and angle calculated the incoming angle. The difference previous random model and RWM model is that previous models used some pause time but this model used zero pause time.

Reference point group model

Reference point Group model (RPGM) describes the behavior of MNs group that are dependent to each others like in military number of solders moves in a groups and in disaster relief the number of person moves in groups.

Set of Correlated Models

Column Mobility Model and Purse Mobility Models model are spatially correlated models that describe the strong spatial dependency between MNs. In Column Mobility Model (CMM) MNs moves in predefined fixed directions. When MNs reaches at the boundary of simulation area it rotated at 180 degree. CMM are used for searching and scanning purpose. In Purse Mobility Model (PMM) group of nodes moves behind single head node and mainly used in target tracking and law enforcement.

Pathway mobility model

Pathway Mobility Model (PMM) is used to restrict the behavior of MNs according to obstacles in pathway. The map is predefined or can be generated randomly based on certain map of real life situation. A figure 9 show the PMM in which node describes the buildings and edge describes the path between those buildings. MNs are placed on edge and simulation starts and with randomly chosen destination node move towards destination and after reaching it take pause for certain amount of time .

Obstacle mobility model

Obstacle Mobility Model (OMM) describes the behavior of MNs in different obstacles placed between simulation areas. As shown in figure 10 obstacles in the form of rectangular area placed within the simulation area. Voronoi path computation used to extract the pathway between buildings.

3.Conclusion

In this paper we studied the different Mobility Models that are used to mimic the behavior of MNs. Each model have their own characteristics and limitations like random mobility models describes how the MNs are moving randomly choosing direction and speed without the effect of other MNs and group mobility models describing how the MNs behave in groups with dependent movement behavior. Models with temporal dependency describing how the MNs current velocity related with previous velocity, spatial dependency models describing how the behavior of group members have changed with group leader and geographic mobility models describing how MNs operate under predefined area or obstacles. These mobility models are not provide user dynamics behavior perfectly but it gives close scenario of real life movement of MNs so the major challenge in this area is to enhance the movement patterns of different mobility models and to overcome the different limitations of different mobility models will be the future work.

4.References

[1] F. Bai, and A. Helmy, "A survey of mobility modeling and analysis in wireless adhoc networks," Book Chapter in "Wireless Ad hoc and Sensor Networks" Kluwer Academic Publishers, 2004.

[2] Babak Pazand et al., "A Critique of Mobility Models for Wireless Network Simulation," 6th IEEE/ACIS International Conference on Computer and Information Science (ICIS 2007).

[3] Anuj K. Gupta et al., "Performance Analysis of MANET Routing Protocols in different Mobility Models," I.J Information Technology and Computer Science, 2013, 06,73-82.

[4] Preetha et al., "Impact of realistic Mobility Models on Wireless Network Performance," 1-4244-0495 IEEE 2006.

[5] Gowrishankar.S et al., "Mobility Based Energy Analysis of Five Mobility Models in MANET using Five Routing Protocols," IJCSNS International Journal on Computer Science and Network Security, VOL.10 No.5, May 2010.

[6] Ashish Gupta et al., "A Survey on Node Mobility Models on MANET Routing Protocols" IJR International Journal of research Vol-1, Issuue-5, June 2014 ISSN 2348-6848 .

[7] Fahim Maan et al., "MANET Routing Protocols vs Mobility Models: A Performance Evaluation," 978-1-4577-1177-0/11 IEEE 2011.

[8] G.Vijaya Kumar et al., "Current Research Work on Routing protocols for MANET: A Literature Survey," (IJCSE)

[9] S Gowrishankar et al., "Effect of Random Mobility Models Pattern in Mobile Ad hoc Network," IJCSNS International Journal on Computer Science and Network Security, VOL.7 No.6, June 2007.

[10] VALENTINA TIMCENKO et al., "MANET Routing Protocols vs. Mobility Models: Performance Analysis and Comparison," international conference on APPLIED INFORMATICS AND COMMUNICATIONS (AIC'09) ISBN: 978-474-107-6.

