Developing the improve mobility method for Gauss- Markov mobility model of MANET

Priyanka D. Lanjewar¹, Dr.V.M.Thakare²

¹P.G Student, Dept. of Comp. Sci. & Engg., SGBAU, Amravati, prilanjewar2@gmail.com  
²Head of Department, Dept. of Comp. Sci. & Engg., SGBAU, Amravati, vilthakare@yahoo.com

ABSTRACT

Mobility models of MANET have been still research area in mobile computing and in wireless network with lots of mobility algorithms to design the efficient mobility model. There are many mobility models was developed to give the framework for the communication of mobile node. This paper focused on five different techniques such as Enhanced mobility-based Opportunistic Routing protocol, hybrid routing scheme, General-order Linear Continuous-time mobility model, impact with Opportunistic Routing Algorithm and three-hop store-carry-accelerate-forward scheme. Each of this method is explain in details to analyses the advantages and disadvantages as shown in table. But some problems are include in each mobility method so to overcome the problems that are given in analysis and discussion , improve “multidimensional location prediction” mobility method for Gauss- Markov is propose using the analysis of the various mobility models. When mobile nodes moves out off the network then some delays' are produce in communication then to overcome this problem new method is propose here. This method will calculate some mathematical expression and give the location of the movable node.

Keywords: Mobile ad hoc network, Capacity, Delay, Throughput, Opportunistic Routing, Interference prediction and Location prediction etc.

1. INTRODUCTION

Mobility scheme plays the important role in designing the different mobility models for mobile ad hoc network (MANET). Mobility models have been broadly classified into many models such as Entity Mobility Models, Correlated/Group Based Mobility Models, Human or Sociality Based Mobility Models and Vehicular Mobility Models. Each mobility models have their own application with different behaviour to communicate with other nodes in the network. Mostly used mobility models are: Random waypoint mobility model (RWP), Random direction mobility model (RD), Random walk mobility model (RW) and model with temporal dependency that is Gauss-Markov mobility model (GM).

This paper discusses five different mobility schemes such as Enhanced mobility-based Opportunistic Routing protocol, hybrid routing scheme, General-order Linear Continuous-time mobility model, impact with Opportunistic Routing Algorithm and three-hop store-carry-accelerate-forward scheme. These mobility schemes provide the better capacity-throughput-delay tradeoffs, overhead and packet delivery ratio. But these methods also have some problem so to overcome such problems improve version of mobility scheme that is “multidimensional location prediction” mobility method for Gauss Markov mobility model is proposed here that depend upon the speed and direction.

2. BACKGROUND

Many studies on mobility models have been done to develop the mobility scheme in recent past years. Such schemes are:
New OR protocol that is Enhanced Mobility-based Opportunistic Routing protocol (EMOR) is proposed to define the new metric for mobile network and EMOR compare with other five routing protocol to in terms of various parameter to improve the performance [1]. Hybrid routing scheme utilizes both ad hoc routing and cellular routing, with the purpose of improving the network capacity and system throughput [2]. GLC mobility model has been proposed with the Compound Gaussian point process functional general framework obtains analytical results on the mean value and moment-generating function of the interference prediction and providing the simulation result with the effectiveness and accuracy [3]. The analysis of different kinds of
mobility models with the mobility traces is presented with the impact of the performance in terms of throughput and delay using the Opportunistic Routing Algorithm [4]. The three hop algorithm that is store-carry-accelerate-forward that improves the performance in terms of throughput-delay tradeoffs in location popularity based scenario [5].

This paper introduces five mobility scheme ie Enhanced mobility-based Opportunistic Routing protocol, hybrid routing scheme, General-order Linear Continuous-time mobility model, impact with Opportunistic Routing Algorithm and three-hop store-carry-accelerate-forward scheme. These are organizes as follows. Section I Introduction. Section II discusses Background. Section III discusses previous work. Section IV discusses existing methodologies. Section V discusses attributes and parameters and how these are affected on mobility models. Section VI proposed method and outcome result possible. Finally section VII Conclude this review paper.

3. PREVIOUS WORK DONE

In research literature, many mobility models have been studied to provide various mobility schemes and improve the performance in terms of capacity-throughput-delay tradeoffs, overhead and packet delivery ratio. Mohammad Tahooni et al. [1] have worked on the candidate selection and candidate coordination of EMOR that gives the better performance with respect to various mobility models. And provide the better and stable performance for different mobility models.

Zhenzhi Qian et al. [2] has proposed the hybrid scheme combining the previous routing scheme using multicast transmission for upper and lower bound for better network capacity such as improving the throughput and capacity of network.

Yirui Cong et al. [3] has worked on the analysis of the interference prediction in MANET with finite number of node by proposing the General-order Linear Continuous-time (GLC) Mobility Model for node mobility describe the dynamics of moving node. Also proposed the Compound Gaussian point process functional (CGPPF) as a general framework.

Suvadip Batabyal et al. [4] has presents the analysis of various mobility models with the mobility traces with the impact of Opportunistic Routing Algorithm. And also shows the effect on the performance of the mobility models in terms of throughput and delay.

Jingjing Luo et al. [5] have shown the impact of location popularity using Three-Hop relay algorithm that is store-carry-accelerate-forward to improve the capacity and delay tradeoff that means delay is decrease without sacrificing the overall capacity of the mobility model using popular cell in network.

4. EXISTING METHODOLOGIES

Many mobility schemes have been implemented over the last several decades. There are different methodologies that are implemented for different mobility models i.e Enhanced mobility-based Opportunistic Routing protocol, hybrid routing scheme. General-order Linear Continuous-time mobility model, impact with Opportunistic Routing Algorithm and three-hop store-carry-accelerate-forward scheme.

4.1 Enhanced mobility-based Opportunistic routing protocol:

Enhanced Mobility-based Opportunistic Routing protocol (EMOR) is a hop-by-hop protocol consists of two phase candidate selection and candidate coordination. In candidate selection algorithm first neighbour list is check and remove the dead node and node which is out of coordination range. After that candidate set is sort based on ID if respective node ID is in the neighbour list then it calculate EPP over candidate set. In coordination phase when node selects its candidate it put them into header of packet and then broadcast it. When node receives the packet it first checks for ID in header. If not exist then it will drop packet otherwise candidate will wait for time according to priority. EMOR uses predicted position of node and link delivery probability between current node and its neighbour [1].

4.2 Hybrid routing scheme:

The Multicast capacity networks by ad hoc routing scheme for upper bound and lower bound is developed. The scheduling scheme is present to improve the throughput and capacity of the network. In the first phase, a multicast source node routes the packets to a BS. In the second phase, the packets are routed to the cells that contain destinations. In the last phase, BSs of these cells broadcast packets to the destinations. At last the hybrid routing scheme for both the upper-lower bound under both ad hoc network and cellular network is being proposed. Hybrid routing Scheme RH evaluates both pure ad hoc routing and cellular routing RC, and adaptively selects a better scheme analyze the upper bound of multicast capacity for hybrid routing [2].
4.3 General-order Linear Continuous-time mobility model:

General-Order Linear Mobility Model and Node Distribution network consists of \( N \) node in \( d \)-dimensional space which can be model using state space model. Random vector contain velocity acceleration that are depend upon way of mobility of nodes that are modelled. The random walk and discrete-time Brownian motion models are used in homogenous environment. Thus, they are homogenous first-order linear mobility models. The one-dimensional homogenous continuous-time mobility model can be used to recover the Gauss-Markov Mobility model [3].

4.4 Impact with Opportunistic Routing Algorithm:

Analyze the various mobility models and then collect the mobility traces using much Trace Collection method as polling-based event-based methods and then Modelling the Contacts from Traces with each trace have specified format. The impact of proposed methodology that is Opportunistic Routing Algorithm, which shows the impact of performance of mobile network in terms of Contact Time and Inter Contact time. Contact time (CT) is time interval during which two mobile nodes are within each other’s communication range and can exchange messages and Inter-Contact Time (ICT) is defined as the time elapsed between two successive contact periods for a given pair of devices. Various mobility models have been proposed with their analysis and impact of performance in Mobile Opportunistic Network (MON) with the different power law distribution [4].

4.5 Three-hop store-carry-accelerate-forward scheme:

This scheme has two steps as follows:

1) If S-D pair is exist in the cell then select such a pair over all possible pairs within the cell. If the source has a new packet to send to the destination, then transmit it and then delete it from its buffer. Otherwise remain idle.

2) If there is no S-D pair within the cell, then design a node in the cell as sender. If it is a popular cell and the designated sender has packets, transmit all the packets in its buffer to all other nodes in the cell with the assistance of AP. If a packet is received by its destination successfully, delete the packet from the buffers of all nodes holding it. Else remain idle. If it is not a popular cell, independently choose another node as receiver among the remaining nodes in the cell with the two options [5].

5. ANALYSIS AND DISCUSSION

EMOR protocol shows how packet delivery ratio and end-to-end delay affect in random waypoint mobility model, random direction mobility model and manhattan mobility model [1]. Hybrid routing scheme performed in both strong and weak mobility regimes with infrastructure support. When the mobility is strong, both ad hoc routing and cellular routing are available to achieve multicast scenario. [2]. GLC mobility model shows the interference prediction and improve the performance using three mobility models that are 2D Brownian Motion, 2D Brownian Motion with Inertia and UCM in 3D space [3]. Opportunistic routing algorithms shows the analysis of mobility models with mobility trace in different scenarios like conferences, university campus, public places to study the movement pattern of human, wildlife and vehicles [4]. Three hop algorithms shows how location popularity affect the performance in terms of delay-capacity and buffer size. This algorithm can easily decrease the delay and increase the capacity [5].

<table>
<thead>
<tr>
<th>Mobility scheme</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced mobility-based Opportunistic Routing protocol</td>
<td>With help of the OR and EMOR various parameter of different mobility model can be enhanced such as delivery ratio, latency and avoid duplication of packets, reduce delay and increase overall transmission of packets.</td>
<td>Different protocols used by EMOR have different drawback. AODV has high packet loss CBF suffer from high latency. GPSR does not give better delivery ratio. OR suffer from duplicate packet due to failure of coordination zone and also more than on node send same packet if they cannot overhear each other.</td>
</tr>
</tbody>
</table>
Hybrid routing scheme
This method improves the throughput and the network capacity due to multicast transmission of packets.
Hybrid routing scheme provide the better performance than single routing scheme.
Design of such real hybrid model which combines both ad hoc and cellular routing is very complex as compare to previous one.

General-order Linear Continuous-time mobility model
This proposed method is very efficient and scalable in wireless network.
It reduces the overall interference by predicting them under different mobility models.
The drawback of this method cannot predict the interference beyond the Gaussian.
Due to more complex and dynamic nature of method it takes more time.

Impact with Opportunistic Routing Algorithm
This method improves the throughput-delay tradeoff, speed, CT and ICT for various mobility models.
Also provide more realistic models for human and vehicles with their traces.
This method is not well suited for complex nature of human mobility model.

Three-hop store-carry-accelerate-forward scheme
This algorithm can easily decrease the delay and increase the capacity. This method overcomes the problem of two-hop relay algorithm. It maximizes the overall throughput using three-hop relay algorithm.
Three hop algorithms require access point (AP) in some popular cell which results in extra cost for deployment.

<table>
<thead>
<tr>
<th>Hybrid routing scheme</th>
<th>General-order Linear Continuous-time mobility model</th>
<th>Impact with Opportunistic Routing Algorithm</th>
<th>Three-hop store-carry-accelerate-forward scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>This method improves the throughput and the network capacity due to multicast transmission of packets. Hybrid routing scheme provide the better performance than single routing scheme.</td>
<td>This proposed method is very efficient and scalable in wireless network. It reduces the overall interference by predicting them under different mobility models.</td>
<td>This method improves the throughput-delay tradeoff, speed, CT and ICT for various mobility models. Also provide more realistic models for human and vehicles with their traces.</td>
<td>This algorithm can easily decrease the delay and increase the capacity. This method overcomes the problem of two-hop relay algorithm. It maximizes the overall throughput using three-hop relay algorithm.</td>
</tr>
</tbody>
</table>

| | This method is not well suited for complex nature of human mobility model. |
| | Three hop algorithms require access point (AP) in some popular cell which results in extra cost for deployment. |

TABLE-1: Comparisons between different mobility schemes

6. PROPOSED METHODOLOGY

Mobility scheme is important and difficult task to analyse and discuss about various methods based on different parameters that are accuracy, packet delivery ratio, time, overhead, throughput, delay, capacity, energy etc for different mobility models. There are still problems which trouble in this field. New mobility method called “multidimensional location prediction” mobility model for Gauss Markov mobility model is propose here to overcome the problems of this model. As this model is depend upon the speed of current node and direction and current value is calculated using the previous values of speed and direction. As MANET has the dynamic topology so mobile node moves anywhere anytime out of the network. When source node has a packet to send to destination node but the destination node is moves out of the network. So by applying appropriate method that is multidimensional location prediction when mobile node is moves out of the network. Then this method will apply some mathematical equation on multidimensional direction to gives the location prediction of mobile node that moves out the network. One buffer is required to store the location prediction of the movable node. With the help of this buffer source node checks the location of the movable node and then sends the packet to the destination node. In this way, when node moves out off network, then with the help of this method it is easy to send the packets to movable nodes without having any delay because this method perform as soon as any
node moves out of the network. With the help of multidimensional concept the proposed method performed in less time with less delay. Basic steps of algorithm:

Step1: when source node has packet to send to destination then source node search for destination node.
Step2: due to dynamic topology if destination node moves then the multidimensional location prediction method will apply.
Step3: this method will perform some mathematical equation using speed and direction of previous node.
Step4: the calculated value of location is then store in one buffer.
Step5: then source node will use the location which is store in buffer to send the packet to movable node.

Diagrammatic representation of proposed method is shown as follows:

```
When source node has a packet to send

If destination node moves then out of n/w then apply the proposed method

Method will perform some mathematical expression

Calculated value for location of movable node will store in buffer

Source node sends the packets using location store in buffer
```

**Fig-1: Flow of proposed method**

7. OUTCOME AND POSSIBLE RESULT

In this way the proposed method is perform for the Gauss Markov model when node moves out of network. With the help of the speed and direction the proposed method calculate location of movable node in less time and store in buffer for the source node to send the packets without having any delay.

8. CONCLUSION

This paper focused on the study of various mobility scheme i.e. Enhanced mobility-based Opportunistic Routing protocol, hybrid routing scheme, General-order Linear Continuous-time mobility model, impact with Opportunistic Routing Algorithm and three-hop store-carry-accelerate-forward scheme. But there are some problems in routing packets so to improve this “multidimensional location prediction” mobility method for Gauss Markov model” is proposed here. When node moves out of network then the propose method provide the location of movable node in less time to send the packets.

9. FUTURE SCOPE

From observations of the proposed method the future work will include exact accuracy of location prediction with the help of more close form of mathematical expression.
REFERENCES


Priyanka lanjewar has completed B.E. Degree in Information technology from Sant Gadge Baba Amravati University, Amravati, Maharashtra. She is persuing Master’s Degree in Computer Science and Information Technology from P.G. Department of Computer Science and Engineering, S.G.B.A.U. Amravati. (e-mail id: prilanjewar2@gmail.com)

Dr. Vilas M. Thakare is Professor and Head in Post Graduate department of Computer Science and engg, Faculty of Engineering & Technology, SGB Amravati university, Amravati. He is also working as a coordinator on UGC sponsored scheme of e-learning and m-learning specially designed for teaching and research. He is Ph.D. in Computer Science/Engg and completed M.E. in year 1989 and graduated in 1984-85. He has done his PhD in area of robotics, AI and computer architecture. His area of research is Computer Architectures, AI and IT. He has published more than 150 papers in International & National level Journals and also International Conferences and National level Conferences. He has also successfully completed the Software Development & Computerization of Finance, Library, Exam, Admission Process, and Revaluation Process of Amravati University. (e-mailid: vilthakare@yahoo.co.in)