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Evaluate the effect of LLT on performance and QoS network

Hamid Mehdi

Department of Computer, Andimeshk Branch, Islamic Azad University,Andimeshk, Iran

Abstract

There are many algorithms to increase the QoS of mobile networks thanks to an underlying mobility prediction.This paper aims how the accuracy of the prediction method can influence the network QoS. It shows that the mobiles behavior must be adapted according to the prediction scheme accuracy in order to achieve good performance and good QoS in network.
The quick development of wireless networks brings new challenges to the network community. In particular, it is commonly admitted that those networks next generations should provide new kinds of services requiring a high QoS.

Keyword*:* QoS, Mobility Prediction, Performance.

I. Introduction

A Mobile Ad hoc Networks (MANET) is a collection of wireless mobile nodes forming a network without using any existing infrastructure. All mobile nodes function as mobile routers that discover and maintain routes to other mobile nodes of the network and therefore, can be connected dynamically in an arbitrary manner. The mobility attribute of MANETs is a very significant one. The mobile nodes may follow different mobility patterns that may affect connectivity, and in turn protocol mechanisms and performance. Mobility prediction [6, 7, 8, 9, 10, 11] may positively affect the service oriented aspects as well as the application oriented aspects of ad hoc networking. At the network level, accurate node mobility prediction may be critical to tasks such as call admission control, reservation of network resources, pre configuration of services and QoS provisioning. At the application level, user mobility prediction in combination with user's profile may provide the user with enhanced location based wireless services, such as route guidance, local traffic information and online advertising. In this chapter we present the most important mobility prediction schemes for MANETs in the literature, focusing on their main design principles and characteristics.
Because of the importance of mobility prediction in ad hoc networks, there is a significant amount of research work on the topic, while in some cases the proposed techniques follow ideas or approaches used in fixed infrastructure type networks. However, prediction approaches for fixed infrastructure type networks are usually inappropriate in the case of ad hoc networks since: (1) Mobility prediction in fixed wireless networks is based on the use of a static underlying network infrastructure, while in ad hoc networks mobility prediction must be done in a highly dynamic

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environment, where the network topology is changing and the mobility of other nodes should be taken into consideration. (2) Ad hoc networks are usually applied in emergency operations and military environments, where future node movements cannot be based on a record of previous movements because of the dissimilar requirements of each situation. (3) Since mobility prediction methods for ad hoc networks are executed on the mobile nodes, they should be more light-weight than the methods for fixed wireless networks, typically executed on the base stations.

Table 1. RESULT WITH AND WITHOUT MOBILITY PREDICTION

Loss Packets (24%)	Delivery Packets (76%)	Delivery Packets(95%)-MP	Loss Packets(5%)-MP	Packets	Period
2400000	7600000	9500000	500000	10000000	**1**
6000000	19000000	23750000	1250000	25000000	**2**
7800000	22200000	27500000	2500000	30000000	**3**
4620000	13380000	17100000	900000	18000000	**4**
1880000	5120000	6550000	450000	7000000	**5**
8160000	25840000	32100000	1900000	34000000	**6**
29760000	93140000	116500000	6200000	124000000	**Sum**

The remaining of this paper is organized as follows. Section II presents the method used to predict the link Life time (LLT). Section III describes about proof of theory. In Section IV, we evaluate the effectiveness of mobility prediction by simulation. Finally In section V The paper Presents Conclusion.

II. Overview

A. Link Life Time[2]

In our approach, we observe that global scale changes in the network topology are attributed to the network mobility pattern.
In particular, the movements of mobility nodes lead to Network partitioning [1]. Any nodes has velocity $V_j(t)$.
To simplify the problem, we make the following assumptions. First, we assume all nodes have a circular coverage area of diameter _ wherein the mobile nodes are uniformly distributed. Furthermore, we assume the velocities of the mobility groups and the mobile nodes are time invariant, $V_{j,I}$ # f(t) V_j , Based on these assumptions, the network topology can be viewed as a collection of equal sized "circles" that are initially stacked on top of each other. We wish to calculate the time at which the "circles" completely uncover each other using the velocity of each "circle". For example, a simple case of a network consisting of only two nodes C_k and C_j , each moving at the velocity V_j and V_k. Since both nodes are moving, to find the relative velocity between them, we fix one mobility group, e.g. C_j, as stationary. Then, the effective velocity V_{jk} at which C_k is moving away from C_j is:

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$$V_{jk} = V_k + (-V_j) \quad and \quad V_{jk} = (V_{jk,x}, V_{jk,y})$$

$$\begin{aligned} &where \\ &V_{jk,x} = V_{k,x} - V_{j,x} \\ &V_{jk,y} = V_{k,y} - V_{j,y} \end{aligned}$$

Initially, node C_k completely overlaps with node C_j In order for C_k to fully separate from C_j , it must move past a minimum distance of the diameter D of C_j 's coverage area. Hence, the amount of time for C_j and C_k to change from total overlap to complete separation is given by 2: Consider an ad-hoc network consisting of many diverse

$$T_{jk} = \frac{D}{\sqrt{(v_{jk,x})^2 + (v_{jk,y})^2}} \qquad (1)$$

mobility nodes whose nodes are initially dispersed and inter mixed. Given the mean node velocities, the time of separation can T_{jk} be calculated for any pair of mobility nodes. Therefore, the occurrence of network partitioning can be predicted as a sequence of the expected time of separation T_{jk} s between the various pairs of mobility groups in the network. E.g., an ad-hoc network with mobility nodes C_1, C2, C3 and the network is predicted to link at times t=T_{23}وT_{13}وT_{12}.

$$Max(T_{jk}) = \frac{D}{\sqrt{\min(v_{jk,x})^2 + \min(v_{jk,y})^2}} \qquad (2)$$

$$p = \frac{T_{jk}}{Max(T_{jk})} \Rightarrow q = 1 - p \qquad (3)$$

$$\begin{aligned} &if \quad q \le \alpha p \quad then \\ &link \;\; from \quad node\ j \quad to \quad k \exp ired \\ &Else \\ &\text{Continue} \quad Route \quad calculation \end{aligned}$$

Now to obtain maximum Persistence of link (Formula 2) and separation time than the maximum time possible Persistence (p) link is calculated. In the second formula assumes that each node has a minimum speed .
Formula 3 in the loss probability (q) calculated and if the product links in the constant factor of persistence probability of link loss is greater than the calculated path is otherwise link can be removed from the calculations.

III. Proof of theory

First, article must shows there is relationship between mobility prediction and QoS. So this article uses from regression to fix this point. Linear regression is an approach to modeling the relationship between a scalar dependent variable y and one or more explanatory variables denoted X. in sample depended variable is delivery packets and independent variable is loss packet.

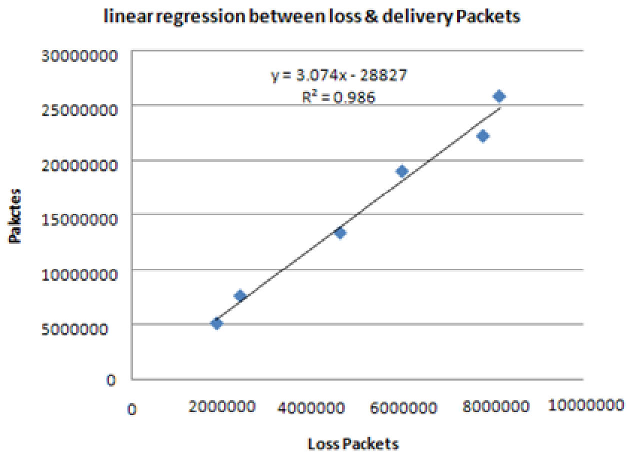

Figure .1. linear regression between loss & delivery Packets

Linear regression function takes the form:

$y_i = \beta_0 + \beta_i X_i$ (4)

Formula 4 y is delivery packets and x is loss packets and according to table I can draws chart to show strength relationship between loss packets and delivery packets when is not prediction. There is a parameter to fix this theory that called R-Square in linear regression and its value is between 0 and 1. So whatever this value near 1 relationship between dependent and independent is strength and can predict correctly.

Table 2. REQUESTS

Period	Requests	Fail Req.	Success Req.
1	1000	50	950
2	2500	125	2375
3	3000	250	2750
4	1800	90	1710
5	700	45	665
6	3400	190	3210
Sum	12400	620	11780

Considering that in figure 1 R-Square is 0.9 thus can get there is strength relationship between loss and delivery packets.

IV. QoS and Performance Evaluation

We implemented the simulator within the Network simulator (NS). Our simulation modeled a network of 50 mobile hosts placed randomly within a 1000 meter 1000 meter area. Each node has a radio propagation range of 250 meters and channel capacity was 2 Mb/s. The size of data payload was 512 bytes. Each node moved constantly with the predefined speed. Nodes randomly selected Moving direction.

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Table I shows results of simulation with and without LLT Algorithm. First column is packets number in simulation and second column is loss packets with probability 5%.

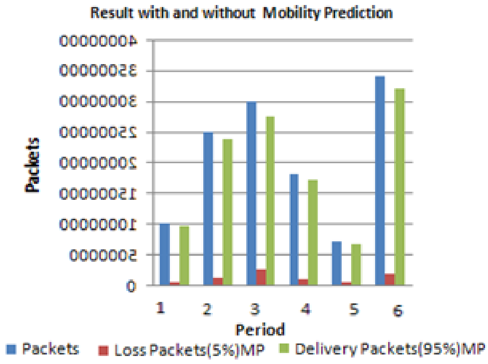

Figure .2. Effect of Mobility prediction LLT Algorithm on Network

Third column is delivery packets with probability 95% that related effect of LLT algorithm. The other column is related simulation without LLT mobility prediction algorithm. According to simulation results without LLT probability of loss packets is about 24% and delivery packets is about 76%.

For example in number 3 row 30000000 packets are in simulation. So when simulation uses LLT Algorithm for Mobility prediction about 2500000 packets loss and 27500000 packets delivery and Without LLT Algorithm 22200000 Packets delivery and 7800000 loss packets. Difference between effects of LLT Algorithm is about 5300000 delivery packets.

Table I shows result of simulation with and without mobility Prediction based on LLT algorithm.

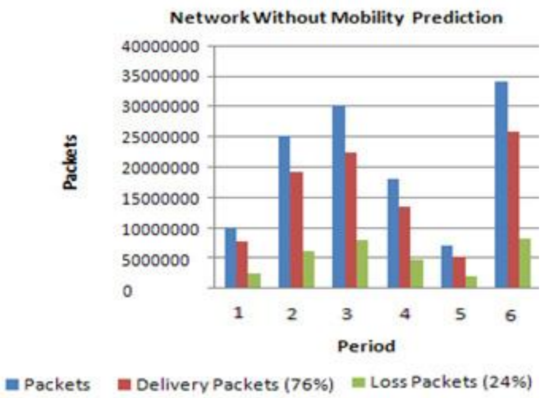

Figure .3. Network Without Mobility Prediction

Figure 2 According to table I shows number of packets when delivered and lost after effects of LLT algorithm on network.

Figure 2 can get mobility prediction in ad hoc a network has good effect and make good performance and QoS. With mobility prediction algorithm 95% packets delivered and success to reach the destination and about 5% packets cannot success, on the contrary, figure 3 shows network without mobility prediction. This figure shows Network without mobility prediction has 76% performance and about 24% loss packet. This result get from table I so in figure 3 exactly is clear about effect of mobility prediction in ad hoc networks. The importance subject in ad hoc network in sensitive conditions reach request to destination but with low loss. In continuous, this article perform new test in order to fix its goal. So assumed for every request require to 1000 packets to transfer data. It means for 3 requests require to 3000 packets for transfer data throughout path. So, Table II gets from table I, for example third row in table I has 3000000 packets and according to assumption in table II has 3000 Requests. So whatever number of request delivered success in destination is important because the main ad hoc networks mission is Communication in critical time, military, floods, earthquake status.

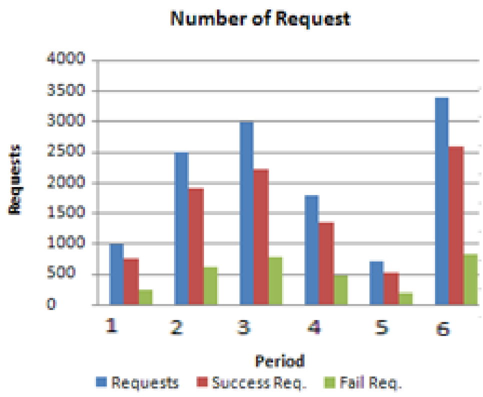

Figure .4. Number of Request

Figure 4 shows all of request sent in networks and Fail request and success request. It be seen blue columns are all of request in network at one mission and reed column related fail requests and green columns are success request that reached to destination. for example in period 4 is 1800 requests in network and the amount of requests about 90 requests fail and doesn't success reached to destination and remaining requests about 1710 requests success reached to destination. So about 5% from requests failed and 95% from request success.

Finally, with regard to what was said, figure 5 fixes effect of mobility prediction on QoS in ad hoc networks. In this figure can be seen that from 12400 requests about 620 request fail throughout paths and 11780 requests success delivery by destination.

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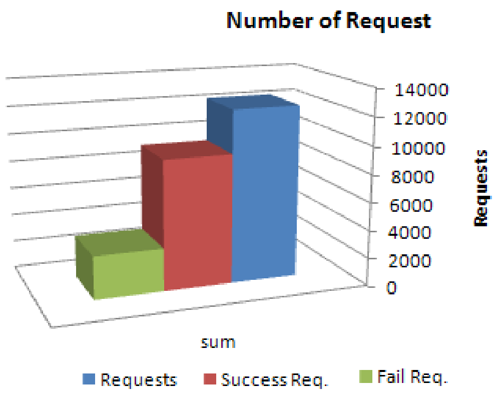

Figure .5. QoS and Performance of Network With Mobility Prediction

V. CONCLUSION

The important subject in networks is quality of service .this item helps all of request reach to destination in very short time and cost with high performance. In this paper tried to show importance of mobility prediction in ad hoc network and their effect on data in network when moving data and according result fix the all of algorithms about mobility prediction are useful and effective in network QoS. All of mobility prediction helps request reach to destination with finding best path that it had low cost for network for redundancy.

In this paper this subject fixed with LLT algorithm and shows when in network used from LLT result are about 95% for success and 5% for fail and when did not use result are 76% for success and 24% for fail. So it can be seen is about 4.8 increasing QoS in network.

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