Efficient Mobility scheme for MANET to improve throughput and overhead tradeoffs

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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. This paper focused on five different techniques such as capacity achieving scheme, three-hop routing scheme 3HR, two-hop relay scheme, TDMA Scheduling, joint coding-scheduling algorithm. To improve this scheme the new method is proposed here that is "Link Failure Detection and Local Route Repair" that gives better throughput and less overhead.

Keywords— **Mobility models for MANET, multicast capacity-delay tradeoffs, two/three routing, TDMA.**

I) INTRODUCTION

Mobility scheme plays the important role in designing the different mobility models for mobile ad hoc network (MANET). Different mobility models have been designed such as Random walk model, Brownian motion model, Reference Point Group mobility model, random waypoint model, uniform mobility model, correlated mobility model, and independent- identical distributed (iid) mobility models. Analysis of such models has been carried out to calculate the performance evaluation. Mobility models show how mobile nodes in mobile ad hoc network behave using many proposed scheme. Mobility models are also designed for the human, animal and vehicle. So such models provide the information about the movement of mobile node, animals and vehicles. Applications of Mobility scheme are**:** zebraNet for animal migration,Toronto and Infocom for human, UMassDieselNet for vehical, Mobile-phone mesh network, etc.

This paper, discusses five different mobility schemes such as capacity achieving scheme, three-hop routing scheme 3HR, two hop relay scheme, TDMA Scheduling, joint coding-scheduling algorithm. These mobility schemes provide the better capacity-delay-throughput tradeoffs under different mobility models in MANET.

But these method also have some problem so to overcome such problems improve version of mobility scheme is proposed here that is **"Link Failure Detection and Local Route Repair".**

II) BACKGROUND

Many studies on mobility models have been done to develop the mobility scheme in recent past years. Such schemes are: Optimal multicast capacity-delay tradeoffs technique is used in both homogeneous and heterogeneous mobile networks. The algorithm is performed in first in homogeneous and then result of it is given to heterogeneous network [1]. Three-hop routing scheme for inter- and intra-groups packet transmission over MANET with correlated mobility and f-cast relay. The effective two-hop f-cast relay algorithm is further extended for the most effective way to transmit packets over inter and intra-groups [2]. Two-hop relay scheme with the two mobility modes as hybrid random walk mobility model and another type is discrete random direction mobility model.

Various Mobility models are consider with two broad classes of mobility models called as the hybrid random walk model (HRWMM) and the discrete random direction model (DRDMM) is proposed with the two-hop relay algorithm that involve a parameter called the degree of freedom [3]. Cell partition based time division multiple access scheduling scheme which derive the throughput lower bounds and also average delay. The cell partition based time division multiple access (TDMA) scheduling scheme improves the throughput-delay tradeoffs under the Reference Point Group Mobility [4]. Simple round robin scheduling algorithm achieves the upper bound with joint coding-scheduling algorithm. The joint coding/scheduling algorithm achieves a near-optimal throughput. Virtual channel is used to transfer the packets [5].

This paper introduces five mobility scheme ie capacity achieving scheme, three-hop routing scheme 3HR, two hop relay scheme, TDMA Scheduling, joint coding-scheduling algorithm 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.

III) 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, delay and throughput. Jinbei Zhang et al. [1] have proposed capacity achieving scheme for two-dimensional i.i.d. with fast and slow mobility, two-dimensional hybrid random walk, one-dimensional i.i.d. with fast and slow mobility, and one-dimensional hybrid random walk models on Upper bound and Lower bound. This scheme uses cell partition with broadcasting and time division that divide the network into many non overlapping cells. Chen Wang et al [2] has proposes an effective three hop scheduling routing scheme under the correlated mobility model with f-cast relay. And then develop the closed-form expressions of both per node throughput capacity and expected end-to-end delay. Routing scheme 3HR-f and scheduling algorithm increase of packet redundancy f, and decrease the delay. Cheng Wang et al [3] have proposed the two-hop relay algorithm that improves the capacity and delay tradeoffs for MANETs and these schemes follow a simple threshold-based principle to improves the performance in terms of the capacity-delay tradeoffs. And also shows the impact of rate adaptation using the generalized physical model. Jiajia Liu et al [4] has proposed the cell partition based time division multiple access (TDMA) scheduling scheme to improves the throughput-delay tradeoff under the Reference Point Group Mobility for upper and lower bound scaling. Shan Zhou et al [5] has proposed the join coding/scheduling to achieve the throughput with the two-hop relay algorithm under the various mobility models for upper bound and improves the capacity-delay for multicast large scale network. Also provide the simple round robin routing scheme to achieve the upper bound scale.

IV) 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 capacity achieving scheme, three-hop routing scheme 3HR, two hop relay scheme, TDMA Scheduling, joint coding-scheduling algorithm.

Capacity achieving scheme using multicast transmission for different mobility models under homogeneous and heterogeneous network. This scheme achieves the capacity close to upper bound using broadcasting and time division for different

mobility models in two network. This scheme is used with the two-dimensional i.i.d. mobility model for upper and lower bound, two-dimension hybrid random walk model, one-dimensional i.i.d. mobility model for upper and lower bound, one-dimensional hybrid random walk model for homogeneous and heterogeneous network [1]. Two time scale of mobility ie fast mobility and slow mobility are used to achieve the capacity for above models. In this scheme, network is divided into many independent cells which only allow transmission in that cell. When cell is active the source node transmits the packets to other node in the same cell for specific amount, receiving node act as relay node for packet then such relay node send the packets to destination node using duplication and capture cell concept. If there are multiple relay nodes, then select only one node that is called as representative relay.

The main idea of 2HR-f routing algorithm under the i.i.d. mobility models is that, the source node delivers at most f copies of a packet to distinct relay nodes, while the destination node may finally receive the packet from one relay node. To support the correlated mobility model, the three-hop relay routing algorithm with f-cast (3HR-f) is proposed which generalizes both the multi-hop routing and the f-cast routing. The main procedure of this scheme is that the source node first transmits at most f copies of a packet P to the encountered relay groups, and then the relay groups deliver the packet to the destination group. Within the destination group, the message is delivered directly to the destination node by some node holding a copy of it. Without loss of generality, packet flows as s→d. Let S denote the group containing source node s, and D denote the group containing destination node d. The groups other than S and D are potential relay groups of the flow s→d as transmission process from s to d consists of three hops [2]. 3HR-f method focus on closed-form expressions of throughput capacity and packet delay in a MANET with correlated mobility model for packet relay inter- and intra -group

Two-hop relay scheme with the two mobility modes as hybrid random walk mobility model (HRWMM) and another type is discrete random direction mobility model (DRDMM). Under the two-hop strategy, each packet z for session k, the complete relay path can be denoted by Pk,z. There are generally three phases under the two-hop strategy [3] i) S→ R phase, during which the source node transmits the packet z to a relay node. ii) Waiting phase, during which relay node holds the packet z until it meets the destination node within a distance of dS. iii) R→D phase, during which relay node transmits the packet z to destination node. The durations of S→R and R→D phases are of the same order as the contact time with the parameter dS. The S→R and R→D phases are the contact intervals, while the waiting phase is the waiting interval So using this algorithm network capacity and delay tradeoffs can be effectively achieve and also shows the impact of rate adaptation using the generalized physical model.

TDMA scheduling is the cell partition based time division multiple access (TDMA) scheduling scheme which derive the throughput and also average delay. In the TDMA scheme, the unit is equally divided into square cells with side length. The node in a cell can only transmit to nodes in the same cell to adjacent cells, then the transmission range recall that all group center that are uniformly distributed and nodes in each group move according to the i.i.d. mobility model with the a disk area of radius R [4]. For a cell at a time slot, the probability (PE) is the cell contains at least one node. When all the nodes become active and support data transmissions simultaneously at a time slot, and node in an active cell is transmitting to other node. According to the protocol interference model, data reception at destination node becomes successful. Since the distance between source and destination node is no bigger than any active cell. The

per node transmission range *r* is larger than the radius of each group region *R*.

Simple round robin scheduling algorithm achieves the upper bound with joint coding-scheduling algorithm. In simple scheme, the sources broadcast their packets to all the mobiles in the network in a round-robin fashion. It is easy to see that under this simple algorithm, the throughput per multicast session and the delay. Then joint coding algorithm is proposed which code the data packets into coded packets using rate-less codes that is raptor codes. Q data packets are coded using the Raptor codes [5]. The receiver can recover the Q data packets with a high probability after it receives any Q distinct coded packets. The joint coding scheme is implementer for random walk and random waypoint mobility models. So this method improves the capacity and delay using multicast with virtual channel.

V) ANALYSIS AND DISCUSSION

The capacity achieving scheme shows that how capacity delay tradeoffs achieve using unicast traffic pattern and also shows using multicast traffic pattern for two dimensional iid fast mobility model. One dimensional mobility model provide high inter contact rate so achieve larger capacity than two dimensional model. One dimensional model act as hybrid mobility model in which node send packets into two dimensional mobility models [1].

Three hop routing scheme with f-cast relay shows how packet redundancy affect the throughput capacity and delay in correlated mobility model. With the increase of the packet redundancy f, the end-to-end delay first decrease and then increases to achieve the minimum delay [2].

To achieve the capacity-delay tradeoffs, proper settings of packet redundancy f is require. Two hop relay scheme for hybrid random walk model and discrete random direction model gives the capacity delay tradeoffs. It shows the less-loss of capacity in exchange for more-gain of delay [3].

TDMA scheduling scheme shows the throughput and delay tradeoffs analysis for two regime ie v=0 which neglect the delay and focus only on average service time at each hop and v>0 which gives the analysis for various values to provide better performance [4].

Joint coding scheduling scheme for large scale mobile ad hoc network shows how improve the performance in terms of capacity-delay tradeoffs using multicast traffic pattern for different mobility models with different number of session, different delay constraint and with different session sizes [5].

Mobility scheme	**Advantages**	**Disadvantages**
Capacity achieving scheme	It maximizes the overall throughput per multicast session under fast and slow mobility model.	Mobility of node can be restricted only to the horizontally and vertically.
Three hop routing scheme 3 HR	This method improves the throughput and the network capacity and decrease the end-to-end delay.	Network is stable only when λ is smaller than μ, and when λ becomes closer to μ, the delay increases boundlessly.
Two hop relay scheme	Provide more flexible tradeoffs between capacity and delay with HRWMM and DRDMM model.	This method considered only unicast sessions rather than any other traffic sessions such as multicast, broadcast, convergecast, anycast and manycast.

TDMA scheduling scheme	This method improves the throughput-delay tradeoff for reference group point model.	The only drawback is that this method is not suit for the pure relay nodes which have no traffic to deliver or receive.
Joint coding scheduling algorithm	This method improves the throughput, capacity and decreases the end-to-end delay. Also provide multicast transmission of packets using the virtual channel.	It always requires the high transmission range and does not support the multicasting transmission of packets for heterogeneous network.

TABLE 1: Comparisons between different mobility models.

PROPOSED METHODOLOGY

Link Failure Detection and Local Route Repair

The relative mobility of neighbor nodes results in the link breaks between them. Relay Node would set the route leading to its neighbor node as invalid and relay node instead of sending RERR back to source node carries out local repair. For the local repair, If next relay node receives RREQ and has a route to destination node, it will return RREP and establishes a route entry in its routing table with destination node. In this way Local Route Repair process is completed. The REPLY is sent back to the source node, which contains number of hop information. The source node sends the data using the shortest route.

Acronyms

LFTHRSH- Link Failure threshold

LFF – Link failure frequency

RERR – Route Error

Link Failure Detection and Local Route Repair Algorithm:

1. Node checks neighbor Table periodically

IF link strength is < threshold values then set LFF of the link to one

Else do not set LFF

2. Node checks LFF of the link

Send RERR

Perform Local route repair

3. Do not send RERR

4. set the LFF of the link to zero

In this way the above algorithm improves the throughput and reduces overhead using the LFTHRSH Link Failure threshold and LFF – Link failure frequency.

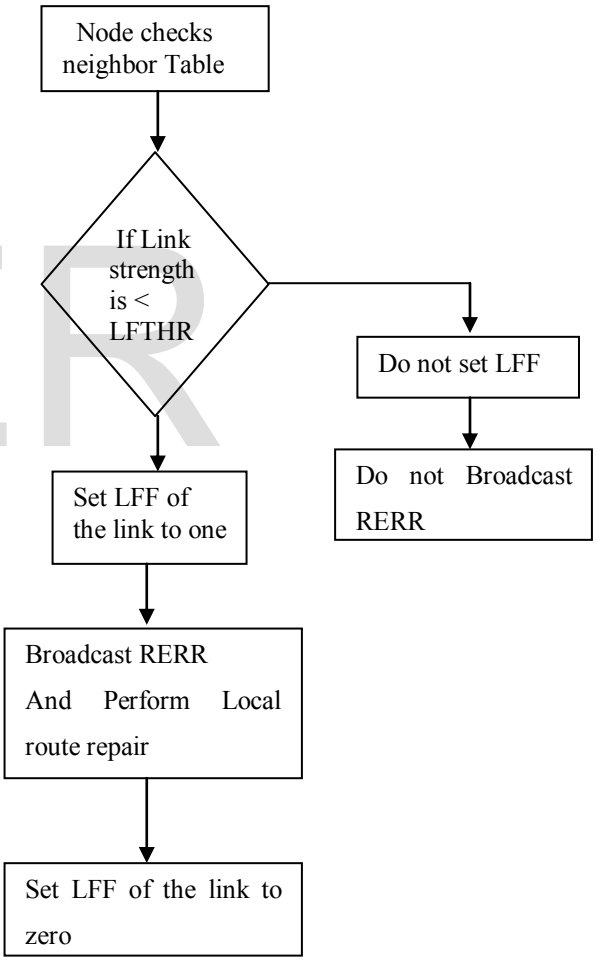

Fig 1: Link Failure Detection and Local Route Repair

OUTCOME POSSIBLE RESULT

The proposed method –Link Failure Detection and Local Route Repair" will be successfully improves the throughput with link failure.

VII) CONCLUSION

This paper focused on the study of various mobility scheme i.e. capacity achieving scheme, three-hop routing scheme 3HR, two hop relay scheme, TDMA Scheduling, and joint coding-scheduling algorithm. But there are some problems in routing packets so to improve this –Link Failure Detection and Local Route Repair algorithm" is proposed here.

FUTURE SCOPE:

From observation, the scope is planned to be studied in future work that include the new neighbor coverage based probabilistic rebroadcast protocol for reducing routing overhead in MANETs.

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