Reducing the Effect of Mobility on Topology Control using DSR Cache

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ABSTRACT
The high mobility causes rapid change in the topology, may leads to link breakage. It needs extra time to rebuild the paths. Also the packets are dropped due to breakage in the link. In this paper, DSR cache is used to store and reuse the paths, decreasing the time required to rebuild the path. The proposed algorithm can be used to reduce the effect of the high mobility and also reduce the end to end delay, by using available paths. The route discovery and maintenance can be easy with the help of periodic hello message and already present routes in the cache.

General Terms
Mobile ad-hoc networks, effect of high mobility, route discovery and maintenance using DSR cache, local graph generated by neighboring nodes, etc.

Keywords
MANETs, mobility, DSR cache, route discovery, local graph, hello message, etc.

1. INTRODUCTION
Mobile Ad-hoc Networks contain the wireless mobile nodes without any infrastructure, which are operated over distributed network and depend on dynamic multi-hop topologies for transmission of data [1, 2]. The absence of any centralized control makes these networks good for various distributed applications, such as communicating over wireless range, network access, and disaster operations, military operations [2]. Each node can move freely throughout the entire network. But the high mobility of node is the basis of often change in topology, may also cause in link breakage. Due to the link breakage, a node can be disconnected from the network, or it may break the network into the partitions. Also it may negatively affect the route maintenance and throughput, and cause unnecessary delay in data dissemination [2, 3]. The high node mobility and nodes joining and leaving the network can cause the network partitions. It can disturb the distributed network control [2]. The topology control is very important approach to control the effects occur due to high mobility [1]. The DSR cache can be used to store the discovered path, and related information [4]. The more network density may make the MANET always connected. Network density can be based on the number of nodes in the range of a respective node [5]. Generally, the two nodes are said to be directly connected if one is in the other's wireless range. And if they are either directly connected or a sequence of one or more directly connected nodes are present between them [5]. It is very important to discover live neighbor nodes in MANET. For discovery of live neighbor node, periodically exchanging hello messages can be used for communication between the neighbors [3]. The end to end data transfer, throughput are some of the important salient research challenges [6].

In this paper, a DSR cache is used to store and reused the obtained path for the transmission of the data packet. If there is no any active path available in the cache, then the path is discover using the hello message broadcasting in the network. The current moving speed of a node can be calculated. By using this the probability of the node going leave the transmission range of a particular node can be calculated. Then time interval of hello message can be calculated to broadcast the message in the maximum range of a particular node. The hello message is used to send in the maximum range of the node to check the neighbor connectivity. Then the local graph is built according to the neighbors present in the maximum transmission range. Using this approach, the local and global connectivity can be achieved and the time to find a new path every time is reduced.

2. BACKGROUND
The k-edge connected topology control algorithm used to provide the certainty of connectivity. The dynamic method is described in [1], which used the k-edge connected topology control algorithm. The local graph is generated connecting neighboring node in maximum transmission range. The suitable value of k is determined for each local graph. It is used to ensure the mandatory connectivity ratio of the whole network. It can improve the practicality and scalability of current k-edge connected topology control algorithms. It provides the guarantee of network connectivity. The robustness in packet losses and network partitions should be there, so that reducing of control load in address database is carried out in [2]. A lightweight protocol is proposed to configure the nodes in the MANETs based on the distributed addresses. It overcome the problems such as the address collisions, frequent partition, and joining/leaving nodes. All the address collisions are resolved and reduces the control traffic using this protocol comparing with previously existing protocols. For finding the live neighbor node in the network, the hello messaging scheme is very important. The adaptive Hello messaging scheme is proposed in [3] to defeat needless Hello messages without reducing the capability to detect the broken links. It also reduces the energy consumption and network overhead short of any clear change in throughput. The DSR routing cache is mostly used to use the previously existing routes to send the data, and store the node information related the route. The new algorithm using DSR routing cache techniques is proposed in [4]. The improved routing between mobile nodes is obtained to reduce the effect of mobility. It used to solve the link broken problem. The improvement in the low delay, stable link in routing is achieved and also the better performance is obtained in terms

of route discovery time. It indicates that DSR cache perform well considering DSR standard and had a high quality of packet delivery. An eventually relinquishing protocol and an eventually quiescent protocol are proposed in [5]. In the eventually relinquishing protocol does not required to store messages for long. It is used for bidding at covenant time. The eventually quiescent protocol used to halts furthering messages after a while. It is used for finishing the process. Additional challenges are possess by using these two protocol for consensus, when there is possibility of nodes to crash in network. Consensus latency and packet overhead decrease significantly smooth for a modest growth in network density.

3. PREVIOUS WORKDONE

Hiroki et al. [1] proposed a dynamic method to efficiently provide the k-edge connected topology control algorithm. The suitable value of k for each local graph in particular node's transmission range is calculated on the basis of local information. It also ensure the essential connectivity of the whole network. The previous algorithms were not practical in MANET, as the nodes moves at different speed and determination of the value of k should be known. The solution can enhanced practically and able to flexible and scalable considering present k-edge connected topology control algorithms. It also gives the guarantee of the network connectivity. Natalia et al. [2] proposed a lightweight protocol that configures mobile ad hoc nodes based on a distributed address database stored in filters. It reduces the control load and makes the application robust to packet losses and network partitions. The previous methods suffer from the address collisions, frequent partition, and joining/leaving nodes. The solution can improve the performance of the protocol, considering joining nodes, partition merging events, and network initialization. It shows that the protocol resolves all the address collisions and also reduces the control traffic when compared to previously proposed protocols. Han et. al. [3] proposed an adaptive Hello messaging scheme to conquer excessive Hello messages without reducing the capacity of detecting the broken links. The results show that the proposed scheme reduces energy consumption and network overhead without any categorical difference in throughput. Ayoob et al. [4] proposed the new algorithm using DSR routing cache techniques. It improves the routing between performances among the mobile nodes to reduce the effect of mobility. It also can solve link broken problem. It shows the low delay, stable link in routing and better performance in terms of route discovery time. It indicates that DSR cache outperformance DSR standard and had a high quality of packet delivery. Alekeish et. al. [5] proposed two protocols. An eventually relinquishing protocol and an eventually quiescent protocol. The eventually relinquishing protocol does not store the messages for long time. It is used for bidding at consensus. An eventually quiescent protocol stops promoting messages after sometime. It is used for concluding consensus. Use of these protocol pretenses extra encounters for consensus, when risk of nodes that can crash. Consensus latency and packet overhead are both decrease considerably even for an unassertive growth in network density. Zehua et. al. [6] suggested PSR (proactive source routing). It compact with network topology in better way. In this approach, each node preserves a breadth first search spanning tree of the network rooted at itself. It uses the data information which is required to interchange between the neighboring nodes for updating the network topology information.

4. EXISTING METHODOLOGY

4.1. K-edge connected algorithm

A *k*-edge connected algorithms [1] is proposed to determine the value of *k* for each local graph based on local movements while preserving the essential connectivity. Each node periodically broadcasts a "hello" message within its maximum transmission range, which contains information about its position and current moving speed. The "hello" message sending interval is referred to as the topology update interval. Later, each node collects information about positions and speeds of its neighboring nodes and builds its own local graph. The node uses a *k*edge connected algorithm with *k*-value decided based on the moving speeds of itself and its neighbors. After applying a topology control algorithm, each node finds its logical neighbors and calculates a new transmission range to cover them. It should be noted that the main focus is in topology control, i.e., how to determine the transmission range of each node in order to maintain network connectivity. Although flow control algorithms (which mitigate radio interference), routing techniques (which establish multiple paths), and security technologies have an important role in improving the reliability of mobile ad hoc networks.

4.2 Efficient DSR route cache

The DSR (Dynamic Source Routing) routing protocol [4] dependent on the cache memory for every node to store the routing path from source to destination. It is a new algorithm using DSR routing cache technique to improve the routing between mobile nodes to reduce the effect of mobility in link transmitting that can solve link broken problem. It increase the probability of packet reaches to the destination, and also resolve the case of cache size problem. It enhance the route discovery and time of delay and improve the performance by enhancing the DSR routing protocol.

5. ANALYSIS AND DISCUSSION

A method is proposed to solve particular problems of connectivity. It efficiently service *k*-edge connected topology control algorithms in MANETs. The proposed method automatically determines the proper value of *k* for each local graph based on local information while ensuring the necessary connectivity relation of the whole network. The results show that the dynamic method can enhance the practicality and functionality of the presently available *k*-edge connected topology control algorithms.

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There are various parameters are consider for k-edge connected algorithm as essential connectivity ratio, number of edge connectivity, moving speed, numbers of nodes and transmission range, etc. The essential connectivity can be achieved through the algorithm by determining the value of k. the hello message sent in the maximum transmission range to get the maximum node in the local graph. Which gives the number of nodes, i.e. the density of local graph. These all parameters shows the better improvement over the local and global connectivity related to the algorithm.

The packet size, simulation time, transmission area, throughput, and average delay are the parameters consider in evaluation of efficient DSR route cache. The evaluation is taken place considering the respective parameters to achieve the guarantee to reach the packet to destination.

The topology control algorithm provide the assurance of connectivity throughout the network and the efficient DSR route cache guarantee the reachability. There are respective advantages of the both methods but both are differ in others' advantage. The efficient DSR does not guarantee the connectivity, and the K-edge connected algorithm does not have ever the route present to the transmission, the route can be established through the local graphs to assume the globally connected nodes.

6. PROPOSED METHODOLOTY

The source node has to send the packet to the destination. The source node search for any available active route in cache to send the packet. If there is any active route present in the cache, that active route is taken for sending the packet. If there is no any active route then new route discovery is taken place. As the mobility is the important issue, it is essential to calculate the current moving speed and the direction of the node. Then broadcast the hello message to the neighboring nodes. The hello message consist of the message ID, timestamp, node id (NID), if node is source node to send the packet, then it also contain the source and destination id as SID and NID, i.e. the message sent from source node contains {msgid, timestamp, SID, DID,}. As the messages send and received from the neighboring nodes, build the local graph on the basis of hello messages. If the node ID as same as the destination ID send the data through that path otherwise the procedure is repeated until the destination is obtained. As the path is obtained, can be break due to high mobility, so it is necessary to find the probability of a node leaving transmission range on the basis of moving speed and direction. Calculate the time interval of hello message base on the probability, and after each time interval the hello message will be sent, thus if any node leave the graph then with the help of hello message it can be connected to the node locally to other node so that globally to the source node as the destination.

The figure 1 shows the maximum range of the particular node, respective nodes present in that range.

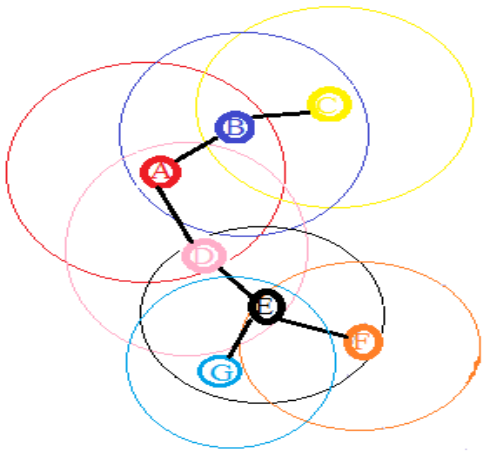
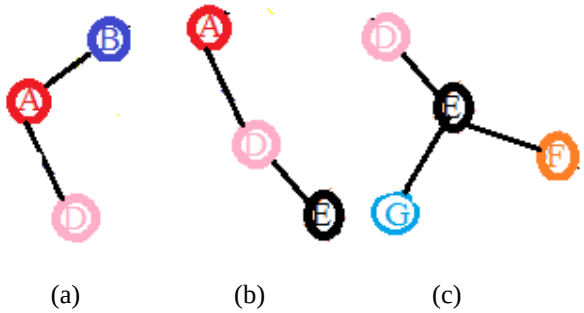


Fig 1: connected nodes in the network and respective transmission range.

The figure 2 shows the local graph of the nodes. If the node A want to send the data to the node F, then the path can be built using the following local graphs. The path from A to F can be as A-D-E-F.



(a) (b) (c)

Fig 2. The local graphs: (a) local graph of node A; (b) local graph of node D; (c) local graph of node E.

Algorithm:
The source node search for any available active route in cache to send the packet

1) If (YES), the active route is taken for sending the packet.
2) If (NO), New route discovery is taken place
   (a) Calculate the current moving speed and the direction
   (b) Do {
      (i) Broadcast the hello message (SID, DID) to neighboring node
      (ii) Build the local graph.
         If DID==SID
         Send the reply via the route request, save the route in cache
         }
         Until (DID==SID)
   (c) Calculate the probability 'p' of a node leaving transmission range on the basis of moving speed and direction.
   (d) Calculate the time interval on the basis of 'p', for sending the hello message in the maximum transmission range.
   (e) Send the hello message after time interval

7. POSSIBLE OUTCOMES AND RESULT

If the node has to send the data to another node, it need to build the route for transmission. By using the DSR cache, if any required active route is present in the cache then it can be directly used for the data transmission. So that the time required to build the route is minimized. If there is no any active route present in the cache, then it can be easily build by using the proposed algorithm. Once the route is build the route can be saved in the cache. The local information can be saved by using the local graph connecting the neighbor nodes, can be used for global connectivity. Using the speed and direction of nodes, the probability of node leaving the transmission range of a particular node can be obtained. It is used to generate the time interval for sending the hello message. The hello message is used to find the local connectivity, and stay connected with maximum transmission range with the neighboring nodes. So that the data can be send over the network. Due to this there is less possibility to rebuild the route, eliminating the time to rebuild the route. It

drastically decrease the end to end delay. Also assuring the reachability of packet throughout the network. So that the packet drop ratio will be reduced. The packet delivery ratio will be increased. Thus, the effect of high mobility can be control.

8. CONCLUSION

The high mobility and the packet delivery ration are some of the important issues in the MANETs. The high mobility can break the link and leads to packet drops. Many times the connected paths are not available, or leads to find the paths every time. The proposed algorithm can be used to reduce the effect of the high mobility and also reduce the end to end time delay, by using already existing routes in the cache. The cache can be used to store the paths related information. The route discovery can be easy by using hello message and available routes in the cache. The algorithm presented considering the equal speed of all moving nodes. The variable and distinct speed of each node can be used in future for better outcomes.

9. REFERENCES

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