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RESEARCH ARTICLE

Mobility and Distance Based Geographic Routing in MANET with Minimal Location Update

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Abstract-Geographic routing is a technique to deliver a message to a node in an adhoc network over multiple hops by means of position information. Each node updates its own position by the use of GPS or any localization techniques and forwards the data to the node closest to the destination. All nodes send a beacon known as location update message to its one hop neighbors. The most commonly used geographic routing algorithm is Greedy Perimeter Stateless Routing Protocol (GPSR) where communication is unicast. In our proposed work, the frequency of updating the location is dynamic which is based on mobility dynamics and over hearing the transmission by its neighbors. We also use dual path communication with dynamic position update where the selection of neighbors is based on the most optimal neighbor and the node which have low mobility thus increasing the QoS.

Keywords: MANET; Geographic routing; GPSR algorithm

I. INTRODUCTION

Due to the highly dynamic change in the network topology of adhoc networks, geographic routing has become more popular as the entire state of the network is not required for forwarding data. Nodes need to be aware only of their local topology. With the increase in efficiency and accuracy of location device geographic routing[1] nodes can select the neighbor closest to the destination. Neither routing tables nor route discovery activities are necessary for forwarding data[2],[3],[4]. All geographical routing protocol needs information about the position of the final destination and the node's neighbor. The destination position of the nodes can be obtained from location service and the neighboring nodes

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position is determined by the exchange of beacons. The position updates are broadcasted to maintain the accurate neighbor list. However, if a beacon is lost the resulting topology becomes in accurate as beacons are not retransmitted. Clearly, fixed interval beaconing consumes more resources and it is better to update the positions only when there is abrupt movement of nodes in the network. Fixed beaconing interval is not needed when nodes exhibit low mobility. Many studies[5] have shown that geographical routing scales better than topological based routing such as DSR[6] and AODV[7].

In this paper, we propose Dynamic Position Update Strategy with Dual path routing where the beacons are broadcasted only when the difference between the predicted nodes position and the actual position exceeds a particular threshold. Further, position is also updated if it overhears a new transmission within its transmission range which helps it to maintain an accurate neighbor list. It also reduces false neighbor and unknown neighbor problem to a certain extent. Dynamic Position Update reduces the control overhead and dual path routing increases the reliability and packet delivery ratio.

II.RELATED WORK

In geographic routing, nodes need to be aware of the location of its neighbor and have to maintain their position[8],[9]. Initially, static fixed interval updation of location was used. If time out occurs the node assumes that the neighbor has moved out of the coverage area and removes it from the neighbor list. Some of the optimization techniques to update the location are based on speed and reactive updation[10]. In speed based updation, the position is updated when it has travelled a distance 'd'. The slow moving nodes may not notice the fast moving nodes due to the infrequent updation which affects the topology accuracy[11]. In reactive updation scheme, beacon is broadcasted when a node has data to be sent. Thus, an accurate local topology can be maintained as the cost of high updation when the traffic in the network is high. Since MANET consist of nodes in which the energy may get exhausted, energy conservation is crucial to maintaining the life-time of such a node

III. PROPOSED WORK

A. DYNAMIC POSITION UPDATE

We assume that all nodes know their own position and the velocity in which they travel. The location update packets contain the location and velocity of the node.

1) Position Update based on Mobility

When each node receives the beacon, it updates its neighbors position and velocity in its neighborlist. Quanjun Chen et al, has shown that the predicted position can be calculated by,

$$X^i_p = X^i_l + (T_c - T_l) * V^i_x$$

$$Y^i_p = Y^i_l + (T_c - T_l) * V^i_y$$

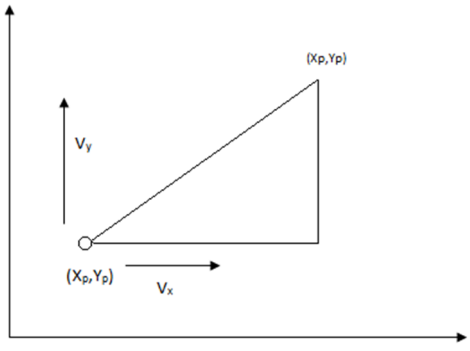

Fig 1. An example illustrating the position update based on mobility

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TABLE 1
NOTATION FOR POSITION UPDATE BASED ON MOBILITY

Variable	Definition
X^i_l, Y^i_l	The coordinate of nodes at time T_l
V^i_x, V^i_y	The velocity of nodes along the direction of the x and y axes at time T_l
T_l	The time of the last beacon broadcast
T_c	The current time
X^i_p, Y^i_p	The predicted position of node i at the current time
X^i_a, Y^i_a	Actual position of the node

The predicted position is compared with the actual location. If the deviation is above a particular threshold it triggers the beacons to be broadcasted. The deviation is calculated by,

Deviation= $\sqrt{(X^i_a - X^i_p)^2 + (Y^i_a - Y^i_p)}$

2) Overhearing

Whenever a new node overhears transmission it checks its neighbor list. If it is a new neighbor it broadcasts its location to its neighbors and they update their neighbor list. Overhearing helps to maintain an accurate local topology. It is measured by to metrics:

Unknown neighbor Ratio: Ratio between the new neighbors that a node is not aware and the total number of neighboring nodes within node's coverage area.

False neighbor Ratio: Ratio between the number of nodes in the neighbor list but not within the coverage area and the number of nodes within its coverage area.

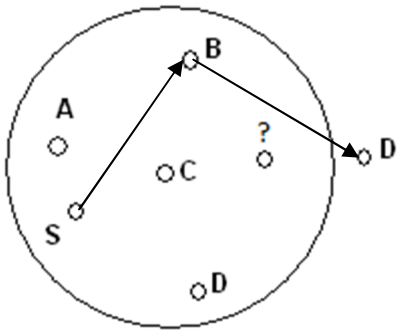

Fig 2 .Example of unknown neighbor problem

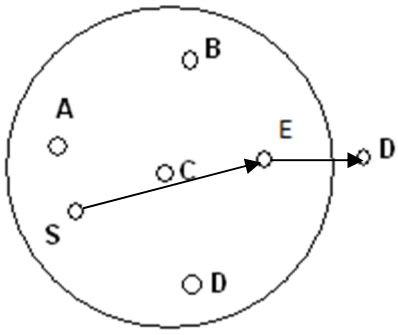

Fig 3. Example of Overhearing

In figure 2, the source S wants to transfer data to D. The most optimal is not known by the source and hence forwards the data to the non-optimal forwarding node. In figure 3, the new node overhears the transmission and sends beacon to its neighbors. The neighbor list of all nodes is updated and the new node is used as a forwarding node if it is found optimal.

B. FORWARDING STRATEGY

MANETs are prone to numerous types of faults including,

Transmission errors: Since the wireless medium is unreliable the transmitted data may be received in error.

Node failures: Nodes may leave the network either voluntarily or when their energy supply is exhausted.

One of the most efficient forwarding strategies is GPSR which follows greedy forwarding along with face routing with dynamic selection of neighbors. There is no fixed path for forwarding data. Greedy routing selects the neighbor which is closest to the destination. Face routing is used whenever there is a void region. But in GPSR only unicast transmission is possible. In this, we propose a dual path forwarding strategy in this the forwarding nodes are selected based on the optimal neighbor and the node with low mobility. Even if the most optimal neighbor moves out of the coverage area the low mobility node can forward the data thus avoiding unnecessary retransmission. If there are a number of low mobility nodes then the forwarding low mobility node is selected with probability 'p'[12]. If a node forwards data the node in the other path overhears it and cancels the forwarding task. From a fault tolerance perspective, dual path routing can provide route resilience. Here, node E is the optimal neighbor and D is the node with low mobility. Node E forwards the data to the destination. Node D overhears it discards the data after it has been forwarded.

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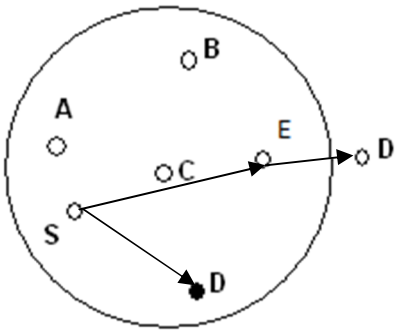

Fig 4. Example of Dual Path Forwarding

IV.CONCLUSION

In this paper ,we have analyzed the need for adapting to location update dynamically in geographic routing. We have proposed Dynamic Position Update Strategy which is based on mobility and overhearing. Position update based on mobility helps to reduce the beacon overhead. Overhearing helps to maintain the accurate topology and dual path forwarding helps to improve the QoS to a certain extent.

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