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Power Aware Protocols for Stability in LBR using GPS

Rajesh[1], [1]ECE, SRMIET , Khora Bhura India

Pushpraj[2] [2]Asst. Prof. ECE, SRMIET, Khora Bhura India

Abstract -A Mobile Ad-Hoc Network (MANET) is a self-organizing collection of wireless mobile nodes that form a momentary network without using any centralized management or central access point. In this paper we introduce a Location Aided Routing Protocol for MANETs that deals with power. This routing protocol makes the path from source to destination by using existing power of the path. By using this concept we provide an most favorable path between source to destination for communication in terms of power.

Keywords- MANET, RREQ, RREP, GPS, LAR, MOBILES NODES, ILAR, PDR, DALAR

I. INTRODUCTION

An mobile ad-hoc network is a collection of mobile devices or nodes that can communicate between source to destination, without a fixed infrastructure or central administration. A mobile Ad-hoc network is expected to fulfill the dream of a seamless network architecture and to play an important role in next generation wireless networks and services. Thus, the task of efficient routing the data packets in terms of Quality of Service (QoS) and energy consumption becomes very important parameter of routing protocol. Earlier reactive routing protocols were based on flooding the Route Request (RREQ) in all directions irrespective of the location of the destination node. It increase bandwidth consumption of the network where as table driven protocol maintains large amount of information as well as they perform large computations in order to select the best node which results in premature loss of battery life. This Location Aided Routing Protocols reduced the bandwidth consumption by reducing the area of flooding. These location based protocols uses the GPS to find the direction of propagation of the packets. By finding the direction of propagation we can decrease the bandwidth consumption. In this paper, we are introducing a power aware routing approach which helps to decreasing the routing overhead by utilizing the concept of global location information and provide optimal path in terms of bandwidth. The proposed protocol Enhance Location Based Power Aware Routing (DALAR) protocols use location information to minimize the Request Zone to reach the destination node with a certain amount of bandwidth.

II. RELATED WORK

There are many location based routing protocol that provide path from source to destination in terms of Quality of Service parameter. These routing protocol uses following parameter.

1. EXPECTED ZONE

Consider, source node S wants to send the data packet to destination node D at time T [8]. Assume that S knows the location of D at time Tj. Also it also knows velocity (VD) of D with which D is traveling. Maximum distance traveled by D in any direction can be calculated as**:**

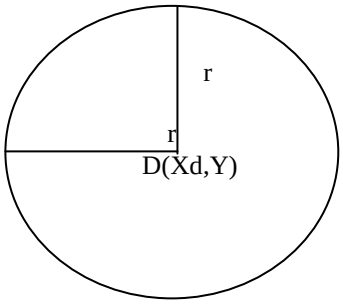


Figure 1.1 Expected Zone

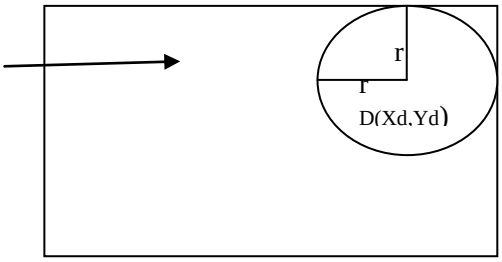
$$r = V_D(T - T_j)$$

2. REQUEST ZONE

Request zone is the area where the request packets are sent or broadcast to find a path from source to destination. In the traditional routing algorithms it is the complete network [11]. For e.g. In DSR, AODV, etc. Route Request packet is broadcasted in all directions to find the optimal path from source to the destination node. Location Aided Routing tries to minimize the request zone by confining it to the smallest rectangular area containing both sender as well as receiver.

3. GLOBAL POSITION SYSTEM

Global Position System is a system of satellites [8], ground control stations, and receivers that allows users to determine their position. By capturing and storing that position, GPS receivers "digitize" spatial data as they walk, drive, or otherwise navigate the land. Receivers differ in their capability to receive and process GPS signals and users can have a huge affect on accuracy depending on the methods used to collect and process data.



4. ROUTING PROTOCOLS

The most critical challenge in position-based routing protocols has been the design of efficient location services that can track the locations of mobile nodes and reply to location queries. There have been many location service schemes presented in [6]. A practical class of location service is the virtual home region location service that is low in complexity, high in efficiency and with admissible robustness. In a virtual home region location service, nodes within a geographical area, or their virtual home region, maintain the location information of other nodes. Nodes update their virtual home region on their current location as they move. In this section, we describe four representative virtual home region location services in the literature.

ADLS [11] adopts an adaptive demand-driven approach in creating and maintaining multiple virtual home regions to improve resource efficiency of SLALoM. In ADLS, the network geographic area is divided in a similar way as in the SLALoM scheme, but each node maintains only one primary home region in the initial condition. When a node becomes aware of the querying nodes that are not in the same order-2 square as its primary home region, secondary home regions could be created in the order-2 squares of the querying sources. Each secondary home region is then maintained only for a limited lifetime. For example, when node D gets data packets from node S, it will be aware of the demand for its location information from S's current order-2 square which is not in the same order-2 square as its primary home region. Then D will create the secondary home region in S's current order-2 square by sending an update message, other node in the same order-2 square could query the secondary home region to get the latest location of D. Figure 1(c) gives an illustration. A concern for ADLS is that the query pattern of nodes may not be anticipated. In other words, nodes in the same order-2 square may rarely query the same destination node, and as a result, a waste of resources just like SLALoM to maintain those secondary home regions would be inevitable. In addition, when a query fails in a secondary home region, the proxy node then relays the query to the destination node's primary home region. The problem of traversing long distance to discover the destination node's location in SLURP is still present in ADLS.

Energy aware location based routing technique use location information by using GPS system and additionally takes a grid method. In this routing protocol each node has GPS in Ad-Hoc network divided by virtual grid [12]. This assumption means that each node knows the location of itself and where they are included in the grid network. To store the information of neighborhoods, nodes in each grid communicate with their neighbors by beacon message which includes node ID, physical location, and energy. From this communication, node which has the major energy becomes grid header. And header node is changed when the rest of its energy equals to 1/2 of second node. Due to large amount of battery backup Grid headers communicate each other by longer period than the one of general node. The data sent by each grid header includes information of all nodes in its grid. So grid header can maintain the information of entire nodes.

LARDAR uses the concept of Triangle zone and the angles α and β. The protocol LBPAR uses the concept of triangle zone [2]. But instead of using the angular values in route request packet as in LARDAR it using the concept of slopes of line which can be calculated using the following formula

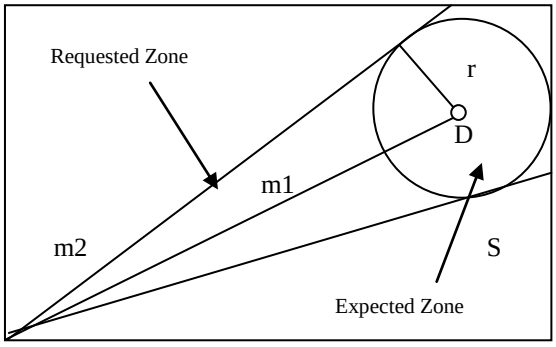
$$mp = (XP - XS) / (YP - YS)$$

The Base objective of LBPAR is to find an most favorable path in terms of bandwidth consumption along with the decrease in power loss of a node. In this routing protocol route discovery process starts when source node S initiates a request to send the data packet to destination node D. in above equation m1 and m2 are the slopes between source to destination. D(XT,YT) are the points where the tangents drawn from source to the expected zone touches the expected zone. By using mathematical calculation it is clear that m1 and m2 will be the maximum and minimum slopes for any line drawn between the source and any point in between these two tangents. These two slopes [10] can be calculated from the following quadratic equation:

$$mXd - mXs - Yd + Ys = r * (1 + m^2)^{1/2}$$

Source to node S broadcast a route request packet discover the path. Format of RREQ packet on getting the RREQ packet node 'N' calculates the slope m_n using its own location co-ordinates and source location co-ordinates. If its slope lies between the max and min slope i.e. (m1 ≥ m_n ≥ m2) then node will again broadcast the packet otherwise node

discard the packet. LAR routing protocol is use to routing packets between mobile nodes in an ad-hoc network using the Global Positioning System.



This protocol considers various parameters like bandwidth necessity and battery life of all the in-between nodes on a path. Enhancement in the battery life tends to high probability of routing path. Based on estimation of LBPAR is proved to be a better protocol as it helps in lowering the bandwidth consumption of the network and also helps in increasing the battery life by decreasing the number and complexity of calculations.

III. PROBLEM DEFINITION

The Location Aided Routing protocols use location information to minimize the area of Request Zone to find path between source to destination. The availability of small, low-power global positioning system(GPS) receivers for calculating relative coordinates make it possible to apply Location-Aided routing (LAR) algorithms in MENAT. LAR is an on demand routing protocol which uses the location information to identify the request zone and expected zone. These protocols have problem when source want to send data to destination then source does not have any information about the path that how much amount of time current path alive or required bandwidth is available on current path or not.

IV . PROPOSED WORK

This protocol is use to improve the packet delivery ratio from source to destination because it offer the optimal path in terms of bandwidth and power. This protocol has two concepts one is bandwidth and second is power. In first approach our protocol checks available bandwidth of the node and compare with a threshold value of bandwidth which is required for communication between sources to destination. This threshold value is decided by the source node for communication. This value is use to check available bandwidth of the node on current path. If node qualify the value of threshold then it consider in the path otherwise discard rout request packet. Second approach is based on the available power of the node. In this concept every node enters the available power in the rout request packet.

Algorithm for Rout Request Packet

Algorithm for Rout Request :

```
If(Destination ID == Node ID)
{
   Consume packet;
Reply RREP;
}
Else if (TTL>0)
   {
          Calculate Mn;
   If(M1 > Mn > M2)
      If(AB>= Th_B)
      {
             Enter the address to the
visited node list;
             Enter available power into
AB_power list;
             Flood the RREQ;
         }.
}
Else (TTL <= 0)
{
Drop the packet;
}
```


Algorithm for Rout Reply from Destination to Source:

Algorithm for Rout Reply :

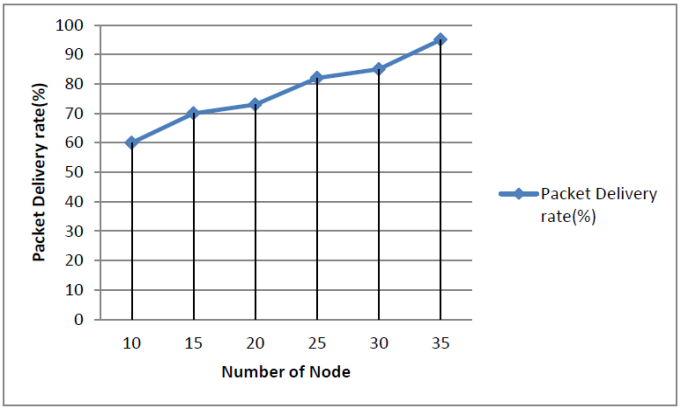
```
If(Destination ID == Node ID)
{
   Consume packet;
   Calculate minimum available power
by using visited node list & available
power list.
        Send RREP to Source with path
alive time ;
}
```

V. SIMULATION

In order to validate the proposed protocol and show its efficiency we present simulations using MATLAB. MATLAB is a very popular network simulation tool. MATLAB is an advanced software package which was developed to perform numerical calculations on vectors and matrices. The network area is 150 pixels x 150 pixels that include variable number of mobile nodes ranging from 10 to 35. The radio transmission range is assumed to be 20 pixels. The scenario of nodes mobility is generated randomly based on random way point model where a mobile node moves to a new position and pauses there for time period between 0 to 10 seconds, then node move to another position.

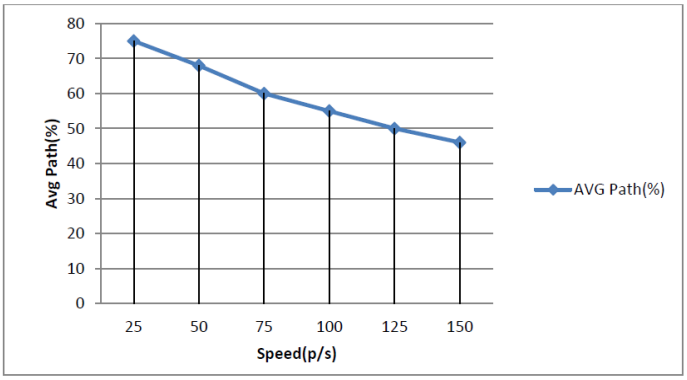
Packet delivery ratio

Figure shows the packet delivery ratio with different number of node. It provide the information about packet delivery ratio increase when number of node increases .



Average path found ratio

Figure shows the Mobility of nodes is increases then the average number of path decreases. When mobile node speed is zero then the path between the sources to destination is found for all nodes. But when speed is increase then the average number of path is decreases continuously



VI. CONCLUSION & FUTURE WORK

In wireless ad-hoc networks, there are several uniqueness different with wired networks. The differences are varying of network topology, limited resources like bandwidth and energy and so on. LAR (Location-Aided Routing) which is one of the most prominent locations based routing methods that uses information about the location of mobile node through GPS technique. Our new protocol "Stability in Location Based Routing" considers both areas of power and bandwidth. It provide stable path in terms of power and bandwidth from source to destination. First method proved stability by using minimum power available node on current path and second method provide stable path in terms of band width.

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