EFFICIENT GEOMETRIC BASED GREEDY VIRTUAL FORCE ROUTING PROTOCOL IN MANET

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Abstract:- Mobile ad hoc networks (MANET) consists of autonomous systems comprising of multiple mobile nodes which acts as both as a host as well as a router . In mobile ad hoc network the network can be considered to behave as a graph. The nodes in the network try to find out the local minima using the greedy algorithm using dynamic programming. The source node keeps on finding those nodes which matches as the local minima of the network. Only those nodes will further broadcast the packets and create their zones in order to find out the local minima nodes in the other autonomous systems. We have used SWING Protocol to implement Force directed graph visualization and justify our method. This algorithm is called Virtual Force Greedy algorithm which uses graph theory approach and used to broadcast the packet to fewer destinations only thereby reducing redundancy. In this paper we try to improve the throughput of the network.

Keywords: Dynamic programming, greedy method, force based method, SWING protocol, autonomous systems, extra and intra routing.

I. INTRODUCTION

An ad-hoc network, is a network formed by nodes connected arbitrarily for some temporary time. Such networks offer a powerful paradigm for modeling open self configuring wireless networks. Obviously, a convergence of all these technologies with 3G/4G mobile networks will probably lead to various integrated solutions.

MANET is defined as autonomous collection of mobile nodes that communicate over relatively bandwidth restricted wireless links. The network topology may change rapidly and unpredictably overtime because the nodes are mobile. The origin of mobile adhoc networks can be traced back to DARPA packet radio network project in 1972. First generation of MANETs were used for different military scenarios for aiding combat operations around 1970 and packet radio networks was the first ad hoc networks. During the second generation from 1980 to mid 1990, named as survivable adaptive radio networks, developments were focused on next advancement of MANETs developed during their first generation. During the third generation of MANETs, notebook computers based on radio waves concept of commercial mobile ad hoc networks were invented. The network is decentralized so all network movement such as discovering the topology and delivering messages have to be executed by the nodes i.e., routing task will be integrated into mobile nodes.

A mobile ad hoc network is contains only wireless stations. Because of limited radio range source node and destination nodes require ,for communication , traversal of multiple hops. This is due to continuously changing topology. Some examples of ad hoc networking contains business associates distribute information during a meeting, emergency disaster relief after a hurricane or earthquake.

Now a days geographic routing algorithms are extensively studied because availability of various positioning services for example the global positioning system (GPS). Geographic routing is a promising candidate for large-scale wireless ad hoc networks due to its simplicity and scalability and takes advantage of the location information of the nodes are the very valuable for wireless networks. Since route management process is not required in geographic routing, it carries a less overhead compared to other routing schemes, like topology based routing protocols. Geographic routing protocols work on the situation that every node is aware of its own position in the network; via mechanisms like GPS or distributed localization schemes and that the physical topology of the network is a good approximation of the network connectivity. In other words, these routing protocols assume that if two nodes are physically close to each other, they would have radio connectivity in between them, which is true in many cases. Hence the

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protocols use node location information to route packets from source to destination. One main advantage of geographic routing schemes is the fact that there is no need to send out route requests or periodic connectivity updates. This can save a lot of protocol overhead and consequently, energy of the nodes. The main difference between MANETs and traditional networks is the energy limitation. Some operations such as environment surveillance need MANETs to run for a long time. So that extending the lifespan of MANETs is important for each MANET routing protocol. But , most geographic routing algorithms take the shortest local path, reducing the energy of nodes on that path easily. The nodes placed on the boundaries of holes may suffer from excessive energy consumption since the geographic routing tends to deliver data packets along the whole boundaries by perimeter routing if it needs to bypass the hole.

There should be a mechanism at node for robust communication of high priority messages. This can be obtained by keeping nodes all the time powered up which makes nodes out of energy and degrades network life time. Also, there can be a link or node failure that leads to reconfiguration of the network and re-computation of the routing paths, route selection in each communication pattern results in either message delay by choosing long routes or degrades network lifetime by choosing short routes resulting in depleted batteries. Therefore the result for such environments should have a mechanism to provide reliable,low latency and fault tolerant communication, quick reconfiguration and minimum consumption of energy.

MANETs characteristics

1)Distributed operation: The control of the network is distributed between the nodes.

2) Multi hop routing: if a node want to send information to other nodes which is out of its transmission range then the packet can be forwarded via other intermediate nodes.

3) Autonomous terminal: In MANET each mobile node can be function as both a host and a router.

4) Dynamic topology: In manet nodes are randomly

move with different speeds so that the network topology may change randomly.

Advantages of MANET

- MANETs are Self-configuring network.
- nodes are also act as routers.
- They are less expensive as compared to wired network.
- Improved Flexiblibility..
- mobile as hoc network is Robust
- The network can be set up at any place and time.

II. Literature review.

In this paper, Gaurav Sachan, D. K. Sharma, Karishma Tyagi, Abhimanyu Prasad2013[4] have proposed that Mobile ad hoc networks (MANET) are characterized by multi-hop wireless links and resource constrained nodes. One of the major issues in mobile ad hoc networks (MANETs) is link failures due to mobility. Because nodes in a MANET behave as routers for any ongoing packet communication and have limited transmission ranges, the communication links are broken, and packet losses occur. To improve network lifespan, energy balance is an important concern in such networks. Geographic routing has been broadly regarded as efficient and scalable. This paper explains basic concepts and functionalities of the energy constrained geographic routing based routing techniques and reviewed the work carried out in the areas of MANET.

In this paper Cong Liu and JieWu[5] have proposed that Routing is the foremost issue in mobile ad hoc networks (MANETs). A wireless environment is characterized by limited computational resources, small bandwidth and position based routing is attractive because it requires little communication and storage overhead. To guarantee delivery and improve performance, most position-based routing protocols, e.g. GFG, forward a message in greedy mode until the message is forwarded to a node that has no neighbor closer to the destination, which is called a local minimum. They then switch to a less efficient mode. Face routing, where the message is forwarded along the perimeter of the void, is one example.
Atekeh Maghsoudlou, Marc St-Hilaire[, and Thomas Kunz[6] have proposed that Geographic routing has become one of the most suitable routing strategies in wireless mobile ad-hoc network mainly due to its scalability. That is because there is no need to maintain explicit routes. The principle approach in geographic routing is greedy forwarding, which fails if the packet encounters a void node. Face routing and its variations have been proposed and widely studied in the literature as recovery strategies to handle voids. This paper presents an overview of different face routing algorithms as well as alternatives to face routing strategies.

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III. PROPOSED WORK

Our work handles the void problem with two new techniques.
Firstly, we construct a virtual small world network by adding virtual long links to the network to reduce the chance of a protocol encountering local minima in greedy mode, and thus decrease the chance to invoke inefficient methods.
Secondly, we use the virtual force method to recover from local minima without relying on face routing. We combine these two techniques to our new purely greedy routing protocol SWING.

Constants:

a) `m` = mass of vertex (all the same - probably set this to radius of node)
b) `k` = constant edge force.
c) `l` = length of edge at "energy minimal state".

Variables:

a) `d` = distance between two vertices.
b) `cl` = current length of edge.

Every vertex has a repulsion force on every other vertex which is: `m / (d^2)`. For every edge it exhibits a force both vertices "dragging" them in the direction to get the edge to the "energy minimal state"; so each vertex: `-k * ((l - cl) / 2)`.

Calculation of local minima :

The notations used to find our the correct path and reach the local minima include
c(I,j)=cost between I and j
and cost(i,j)= min cost path from vertex j which is present in stage I to destination t
formula is:

$$cost(i,j)=min[c(j,k)+cost(i+1,k)]$$

DISTANCE CALCULATION

Let Node is n, Transmission Range is R, X1 and Y1 coordinate of nodes, V is velocity , Direction is d1 and d2 , Time interval is t.

Distance travel by node D = vt

Calculate new coordinate with respect to old coordinate

X1' = x1+t(vcosd1)

Y1' = y1+t(vsind1)

Distance between two nodes at time t

D^2 = {(X1'- X2')+t(v1cosd1-v2cosd2)}^2 +{(y1'-y2')+t(v1sind1-v2sind2)}^2

MODIFIED APPROCH

Here, we have denoted Source Node by S, Destination Node by D and Neighbor Node by NN.

Step 1 node wants to discover a new route for D

Step 2 node will send hello packet to all its neighbors

Step 3 all nodes will reply hello packet and share information about their own location and info about their direct neighbors

Step 4 calculate distance from source to it's neighbor using formula of Euclidian distance

Step 5 on the basis of coordinate zone1 zone2 zone3 and zone4.

Step 6 in every Zone we select a node using greedy approach which will forward and RREQ packet to its neighbor

Step 6a. On the basis of distance we create zones so communication between zones node should also on the basis of distance, zones last node create gateway for communication.

Step 7 Insert all selected neighbor coordinate in RREQ packet and broadcast the RREQ packet.

Step 8 at the receiver node node will receive RREQ packet and whether it is selected node or not if it is selected then repeat this process from step 3 to step 7.

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Step 9 discards the RREQ packet.

Steps 10 if any intermediate node has the path to destination it will reply using RREP packet.

Step 11 repeat this process of route discovery until we get RREP or timeout.

IV. RESULTS OF SIMULATION

The parameters used in the simulation includes the following:

a) Routing overhead: It comprises of all those overhead that affect the normal flow of progress of the nodes.

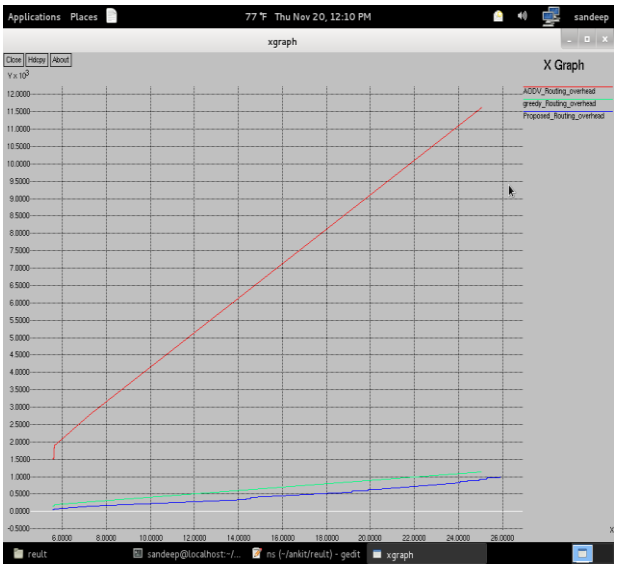

Fig 1:Routing Overhead

b) **Packet delivery ratio**: It includes all the packets that reach the destination without being allocated to wrong path . It is calculate d by dividing number of packets delivered to received at destination node.

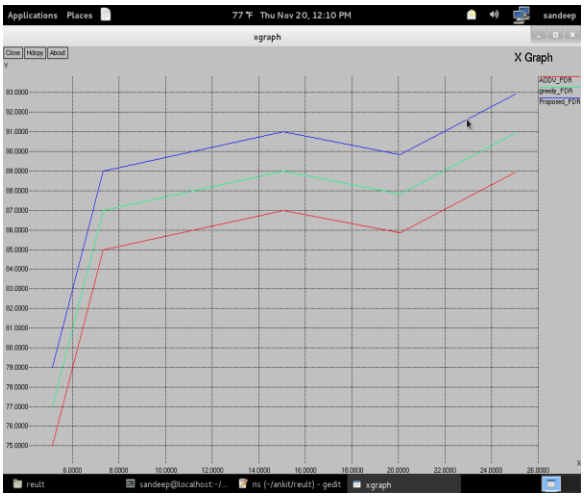

Fig 2:Packet Delivery Ratio

(c) **Number of dropped packets**: It includes all those packets that does not reach the intended destination as decided.

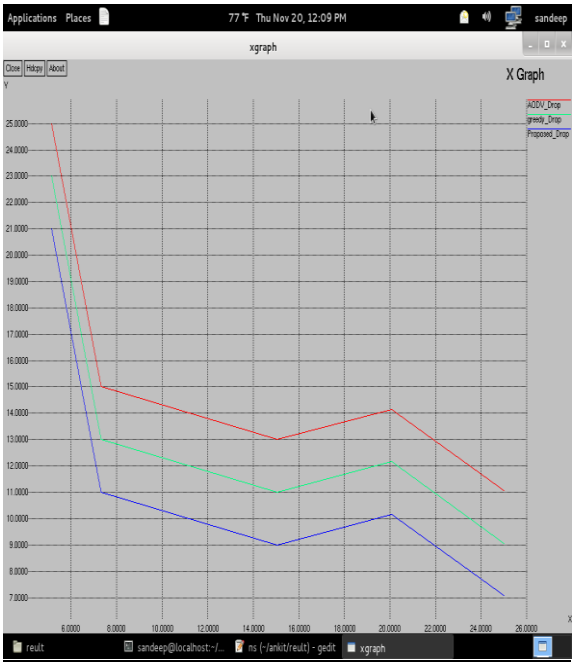

Fig 3:Number of Drop Packet

(d) **Throughput** : It indicates the efficiency that nodes encounter while path traversal .

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Fig 4: Throughput

V. CONCLUSION

The results of simulation clearly reveal that the applied algorithm proves as a better technique as compared to that used in SWING protocol. Firstly we have calculated local minima by multistage graph theory of the dynamic programming. The only such nodes are allowed to forward the packets using greedy method. Then different zones are searched for the local minima of other autonomous system. Finally routing is done to ensure the proper alignment of the protocol used. Simulation results prove that our strategy is better than the conventional methods.

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