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Review Paper on routing algorithms used in Hybrid Routing

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Abstract

Recently, several fully distributed (localized) GPS based routing protocols for a Mobile Ad hoc Network are introduced.

In this paper we are discussing the routing algorithms which are used in Hybrid Routing realized by GPS that is used to determine Geographical Positions of nodes. As the Hybrid routing algorithms include the properties of table driven and on-demand protocols which are used in localization of nodes. Localization realized by GPS that is used to determining geographical positions of nodes.

Keywords

Ad hoc, MANET, wireless network, wireless routing, DIR, MFR, GEDIR, MPR.

Introduction

Mobile Adhoc networks (MANET) are wireless network, which enable potentially mobile devices to communicate with each other without the need of any pre-existing infrastructure e.g. access to common media in order to keep energy consumption as low as possible. Thus, nodes typically cannot send messages to distant nodes directly but need to route message through MANET using other nodes in between as relays. Nodes are considered to be rather mobile at different movement speed. This results in a fast changing very unstable MANET routing in which neighbors of a node change in a matter of second. Mobile nodes are not distributed uniformly. The density of nodes is not constant over time or space.

In wireless networks that do not rely on a fixed infrastructure to set routes, the first metric to be compared refers to the lowest value, as compared in Ad Hoc on demand distance vector (AODV). Since most of the users are currently connected by means of wireless links, it is important to investigate algorithms and metrics to increase reliability and performances over multi-path dynamic wireless network.
1) Multipath due to wireless diversity.
2) Dynamic due to user's behavior.

Routing algorithm in ad hoc network:-

1) Table Driven routing algorithm
   DSDC (Distance sequenced vector)
   CGSR (Clustered Gateway Switch Route)
   WRP (Wireless Routing protocol)
2) On demand routing algorithm
   DSR (Dynamic source routing)
   AODV
   TORA, ZRP
3) Hybrid Routing Algorithm
   MPR, DIR, MFR, GEDIR, DREAM, V-VEDIR.

MPR (Multi Point Relaying)

Multipoint relays have been introduced in the proactive protocol, OLSR in order to optimize the flooding overhead of control traffic it simply explains a reactive protocol called as MPRDV (Multipoint relay distance vector protocol). Route repairs are performed by new route request flooding. In MPRDV route request and route response are all flooded via Multipoint relays (MPR). Each node must select a MPR set among its neighbor. The set must cover two hop neighborhood of the node. Smaller the value in the MPR set, the better it is. Although the optimal MPR set is an NP hard problem, there exists simple heuristic, that approach optimally with a good factor. In some networks model the number of multipoint relay for given is O (logM) where M is the neighbor size of node.

DIR (Directional Routing Algorithm)

DIR is a flooding routing protocol that concentrates on a specified zone using location provided by location service. It restricts the broadcasts region to all nodes and does not require maintenance of a separate neighbors table. DIR determine the location of the current node that will direct the packet towards the destination even though uses all these information to determine the distance or area covered, it requires trigonometric computation which will further incur

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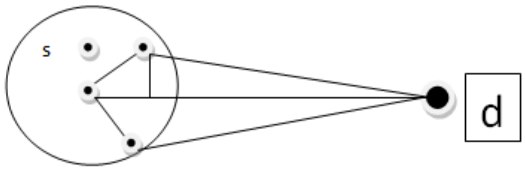
delay if computed in kernel space.

MFR (Most forward with Radius)

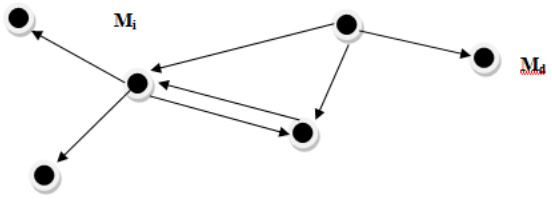
Most forward with radius (MFR) was first position based routing algorithm in which a packet with destination D is forwarded to the next neighbor in forward direction maximizing the progress towards destination D (e.g. fig 1). The widely used Greedy forwarding strategy proposed by Finn applies the same principle but considers distance instead of progress i.e. a node forwards a packet to the neighbor with smallest distance 'd' to the destination of signal strength cannot be adjusted. It is a good choice to maximize the advances in each step, since it attempts to minimize the number of hops, a packet has to travel, even if signal strength is a fixed parameter, sending a packet to a distant neighbor in border area of transmission range results in a higher probability of packet loss due to signal attenuation and node mobility.

In DIR where source or intermediate node forwards a packet to neighbor node lying in closest direction, compared to the line connecting sender and destination. In fig1 node C is in closest direction regarding the line connecting node S and destination D. By applying this methodology in each routing step DIR routing attempts to minimize the Euclidean path length a packet has to travel.



GEDIR (Geographic distance routing)

In GEDIR routing protocol, a source mobile computer $\mathbf{M_s}$, and each intermediate mobile computer to a destination mobile computer $\mathbf{M_d}$ as a next hop mobile computer and forwards a route request control. Message Rreq if a mobile computer $\mathbf{M_i}$ receives Rreq message destined to $\mathbf{M_d}$ from previous hop mobile computer $\mathbf{M_{i-1}}$, $\mathbf{M_i}$ calculates distance $|\mathbf{M_iM_d}|$ from each neighbor mobile computer M of $\mathbf{M_i}$ to $\mathbf{M_d}$ and forwards the Rreq message to M with minimum distance $|\mathbf{MM_d}|$, if M is nearer to $\mathbf{M_d}$ than M i.e. $|\mathbf{MM_d}|<|\mathbf{M_iM_d}|$. The Rreq message is not broadcasted but unicasted and M becomes a next hop mobile computer of M; GEDIR routing detects message transmission route with almost same number of intermediate mobile computers. GEDIR does not guarantee detection of a message transmission route even if it exists. If all neighbor mobile computer of $\mathbf{M_i}$ is farer from $\mathbf{M_d}$ than $\mathbf{M_i}$. M cannot determine a next hop mobile computer is not too low.



DREAM (Distance routing effect algorithm for mobility)

DREAM protocol is a restricted flooding communication protocol used in unstructured architecture. Each node may maintain a location table about the position of all node of network and frequently flood a location packet called control packet to update the position information maintained by its neighbor each location packet submitted by a node. A to other node to update their location table contains A's coordinate along with its speed and time the location packet was transmitted. DREAM uses the principle of distance effect in which the location table update frequency is determined by distance of registered node. In other words, the closer to another node, more update sent to this node. The frequency of sending a control packet is adjusted based on moving speed of source node.

Location based Hybrid routing

Usually algorithms used in MANET are of three types which are table driven routing, on demand routing and hybrid routing. Hence Location based hybrid routing is one of the class which lies in main category of hybrid routing.

The working of location based hybrid routing has one pivotal or central node or base stations in any infrastructure wireless networks if two nodes are opened at same time then two master node form and hence these nodes compares MAC address in first packet they look from each other and the node whose MAC address low value from the current master node is being assigned as the master node.

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Then the new master node broadcast packet in regular intervals and informs all other nodes rather than itself that it is master node and this information is being broadcasted with the help of packets and these informing packets are called as master informing packets (MIP). Hence new master node is being updated by all information regarding all existing node in network and all other nodes leaving master node send their information packets about the node density, battery life, geographical position (x, y, z coordinates).

Hence packet contains (destination address + source address + area_id) area_id is used for, in order to update the related line of location information matrix that master node will form. The receiver address is the current address of the node that sent updating data. Sender node increases area_id in the packet each update. In this format of updating information is processed as a row element in A matrix kept on master node. If updating information is taken from same node formerly or previously id values are compared. The packet with higher id value is recorded, previous record is being changed and follows:

$$A = \begin{bmatrix} X_1 & Y_1 & Z_1 & B_1 & D_1 & ID_1 \\ X_2 & Y_2 & Z_2 & B_2 & D_2 & ID_2 \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ X_K & Y_K & Z_K & B_K & D_K & ID_K \end{bmatrix}$$

Hence the above matrix 'A' is being made by the master node in which location information is being defined on the three axis (X_i, Y_i, Z_i), where b_i represents the battery life, d_i represents the density and id_i is the node update sequence number in column matrix.

Hence master node presents for K node info

$$J_{i,j} = \sqrt{(X_j - X_i)^2 + (Y_j - Y_i)^2 + (Z_j - Z_i)^2}$$

Hence with the help of above calculation which is being done by the master node in which distance between each node is being calculated by using the values of 3 columns in matrix 'A'. Hence another matrix 'B' is being obtain When the distance between the node is being calculated like two node node i, node j. Hence distance between from i to j and j to I will be same, hence the matrix 'B' is being

$$B = \begin{bmatrix} I_{11} & I_{12} & I_{13} \ldots\ldots\ldots I_{1K} \\ I_{21} & I_{22} & I_{23} \ldots\ldots\ldots I_{2K} \\ \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots \\ I_{K1} & I_{K2} & I_{K3} \ldots\ldots\ldots I_{KK} \end{bmatrix}$$

calculated and transferred to matrix 'C'. Hence the number of the row that has smallest value element of 'C' matrix is equal to the number of node that is in the middle or center of the networks.

$$C = | t1 \;\; t2 \;\; t3 \;\; t4 \ldots\ldots\ldots tk |$$

$$C_{i=} \sum_1^k \ln, i$$

a) New master node broadcasts packet to other node and then new master node request the "master seeker" node or candidate node to become the master node if candidate node master seeker replies "Yes" then it is being declared as the new master node and updates its all information, if answer is "No" the master node asks with the other or next master seeker node2 or candidate2 node to become the master node.

b) New master node updating packets that will come from other nodes are collected in 'A' matrix as the previous master node did. New master node repeats the steps to all other nodes.

c) Then all other remaining node send their updated information like their battery life threshold, Overload in deciding route information, density. Hence in matrix A their id value is being sent, value that is one bigger than previous in the update packet they sent.

d) Then any node wants to send the information to destination node master node assigns a cost value to the destination. Master node assigns a cost value to the intermodal border with fuzzy logic by using A matrix when requesting relating to a destination comes to itself. In this way a graph consists of nodes and border forms. G matrix is formed in order to keep the cost value of graph. Hence then master node selects the shortest value path with optimization technique between the source and the destination nodes. The path has lowest cost is determined by using Dijksta or Bellman Ford algorithm.

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e) Hence finally master node declares final evaluated value, when any node will demand routing path from master node, it sends a "route request packet "(REQP) to master node . Master node send "Route reply packet (RREP)" to node which requested a route. Master node answers to the node by optimizing the result from matrix 'C'. If master node far from central or middle position or battery life falls down a threshold it transfers its master authority to other node which has minimum row total value is in 'B' matrix. Node decides to be a master node or not in accordance with battery lives and densities. Secondary master node is assigned in order not to make network stay without a master. Master node selects the nearest nodes to itself as the seeker node in some periods. The frequency of data sending to secondary master or master seeker node is four times of interval of master node broadcast sending packet.

Conclusion

Hence in this paper, we study the routing algorithms used in hybrid routing, these all algorithms based on the lifetime of the wireless links and successful delivery message and where location based hybrid algorithms mainly focuses on reducing the overload on the mobile devices, which occurs in determining the route to send information from source to destination node and reduces battery life, as much battery gets reduced in searching of the route from source to destination as in ad hoc network probability of message delivery decreases as the number of node in the network increases.

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