

Minimized Routing Protocol in Ad-Hoc Network with Quality Maintenance Based on Genetic Algorithm: A Survey

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Abstract- Mobile ad-hoc network networks are self-organizing network having a concise radio range and limited bandwidth without having the any specified infrastructure. The topology of the ad hoc network may change suddenly. At this type of situation, is finding the shortest path (SP) between source and destination nodes within a specified time so as to satisfy the Quality of Service (QoS) with security. For finding the shortest path between the sources to destination, we will use the genetic algorithm (GA) with backups of routes and authentication with having, minimum power consumption and congestion. This type of routing technique will reduce the reroute discovery if failure occurred in the path. It will take the less time in resending the packet to the destination and the throughput will be high in the Mobile Ad-Hoc Network (MANET). In this paper, we will also discuss the routing protocols, its classifications, advantage and disadvantages of the routing protocols in Mobile Ad-hoc network (MANET).

Index Terms- MANET, Routing protocols, Genetic Algorithm (GA), Backups, Bandwidth, Power consumption.

I. INTRODUCTION

MANET has the dynamic nature caused by the mobility of nodes. Mobile Ad-Hoc Network is having the properties of that type of network which are not physically connected. It leads to poor route discovery because there is not any specified topology or infrastructure. Wireless Network is based on the particular topologies. But in the wireless network, there is nit any physical connection and topologies are used only in the wired network. In these networks there is no fixed topology due to the mobility of nodes, interference, multiple path and path loss [16]. Genetic algorithm facilitates the good characteristics for finding the shortest path. Every node in the MANET should have backups if they will have the backup, power consumption and time consumption will be less backup give facility for storing the route. It will avoid the reroute discovery and traffic jamming or congestion in the network. MANET is consisting the dynamic nature so we follow the many dynamic routing protocols for searching the shortest path in the network. MANET is totally differing from the wired network. In wired network, there is exist any topology but Wireless communication medium has variable and unpredictable characteristics. Due to the unpredictable characteristics, the signal strength and propagation delay may

vary with respect to time and environment where the mobile nodes are [1].

In the paper section-A explain the routing protocol family and section-B explain the Genetic Algorithm, Range and Bandwidth and Section-C explain the Back up and authentication.

II. SECTION-A

CLASSIFICATION OF THE MOBILE AD-HOC NETWORK PROTOCOLS:

1) FLAT ROUTING:-

PROACTIVE (TABLE-DRIVEN):-

- ✓ FSR
- ✓ FSLs
- ✓ OLSR
- ✓ TBRPF

REACTIVE (ON-DEMAND):-

- ✓ AODV
- ✓ DSR

2) HIERARCHICAL ROUTING:-

- ✓ HSR
- ✓ CGSR
- ✓ ZRP
- ✓ LANMAR

3) GEOGRAPHIC POSITION ROUTING:-

- ✓ GEOCAST
- ✓ LAR
- ✓ DREAM
- ✓ GPSR

1) FLAT ROUTING PROTOCOL:-

Flat routing, each node perform the routing functions. All nodes are on the same level in the network. Every node in the network maintains the global routing information rather than its neighbour's information [24].

✓ PROACTIVE:-

A proactive routing protocol is table driven protocols. Using a proactive routing protocol, nodes in a MANET continuously evaluate routes to all reachable nodes and attempt to maintain consistent up to date routing information [2].

- **FSR (FISHEYE STATE ROUTING IN MOBILE AD-HOC NETWORK):-**

FSR is based on the multilevel (not hierarchical) fisheye scope to reduce routing update overhead in large networks. It maintains the neighbour's information [30].

- **FSLs (FUZZY SIGHTED LINK STATE ROUTING PROTOCOL):-**

This routing protocol achieves lower routing overhead and delay, without affecting other metrics, such as packet delivery ratio. An FSLs protocol is that distant nodes do not need to be informed about link state changes as frequent as nearby nodes [38].

- **OLSR (OPTIMIZED LINK STATE ROUTING):-**

This type of protocol is proactive protocol (table-driven). It concise the size of the information. It is reducing the retransmission jam or congestion because it spread the packets in whole network [31, 32].

- **TBRPF (TOPOLOGY-BASED RESERVE PATH FORWARDING):-**

It is also a link state routing and proactive routing protocol. Each node, using a Dijkstra's alike algorithm, computes a source tree that is based on partial topology information stored in a topology table. The source tree provides the shortest paths to all reachable nodes. LSP dissemination are sent over 'source trees'. A combination of periodic and differential updates is used to keep all neighbour informed [32].

- ✓ **REACTIVE :-**

Reactive routing protocol is also called the on-demand routing protocol. In a reactive routing protocol routing paths are searched only when needed. A route discovery operation invokes a route determination procedure. The discovery procedure terminates when either a route has been found or no route is available after examination for all route permutation.

- **DSR (DYNAMIC SOURCE ROUTING):-**

It is discover the route by sending the request (RREQ) to neighbour and neighbour send the reply (RREP) to the source and update own route cache memory because it is not table driven protocol.

- **AODV (AD-HOC ON DEMAND DISTANCE VECTOR):-**

An Ad-Hoc network is the co-operative engagement of a collection of mobile nodes without the required intervention of any centralized access point. Route finding is based on a route discovery cycle involving a broadcast network search and a unicast reply containing discovered paths. It maintains the route if a route is not use in lifetime than it will be expire and save the route cache space. If the route is already existing it send the packets otherwise source discovers the routes [2, 3].

- ✓ **HIERARCHICAL ROUTING:-**

Hierarchical Routing protocol is used for scalability purpose. The scalability, with respect to increasing node count, of hierarchical routing in MANETs. The performance metric

under consideration is the control overhead per node required by hierarchical routing. This assessment considers only the overhead due to the maintenance of routing tables and hierarchical clustering. The overhead due to location (or address) management is considered elsewhere [39].

- **(HSR) HIERARCHICALLY SEGMENTED ROUTING:-**

This routing is very good routing protocol. It provides many facilities. It provides a good scalability. If network is vast. In this situation it gives a low overhead facility. It also gives the low end to end delays, seamless connectivity and quality of service.

- **CGSR (CLUSTER GATEWAY SWITCH ROUTING PROTOCOL):-**

It is multichannel operations in the network. It facilitates the code separation among the clusters. There is some algorithm are used for electing the cluster head. When two cluster head come in contact or cluster is out of range from all other cluster heads, by using LCC (Least cluster change) can cluster heads only heads changed. If source is sending a packet to the destination then it will send the packet to first cluster head that come in route and it will send to the another cluster head until the destination node's cluster head is reached [35].

- **ZRP (ZONE ROUTING PROTOCOL):-**

It is a hybrid routing protocol for MANET. It is able to proactively maintain routes within a local region of the network called as routing zone. It can improve the efficiency of a reactive route query/reply mechanism. The ZRP can be configured for a particular network through adjustment of a single parameter, the routing zone radius [36].

- **LANMAR (LAND MARK ROUTING PROTOCOL):-**

Each node knows the routes to various "landmarks" at different hierarchical levels. LANMAR combines the features of fisheye state routing (FSR) and landmark routing. Main facility of this routing protocol it nodes that can move as a group and by land marking is reduce the routing update overhead [37].

- ✓ **GEOGRAPHIC POSITION ROUTING:-**

The local topology is updated in a timely manner according to network dynamics and traffic demands. Our route optimization scheme adapts the routing path according to both topology changes and actual data traffic requirements. Each node can determine and adjust the protocol parameter values independently according to different network environments, data traffic conditions and node's own requirements.

- **GEOCAST ROUTING PROTOCOL:-**

The goal of a geocasting protocol is to deliver data packets to a group of nodes that are with a specified geographical area, i.e., the geocast region. In an ad hoc environment, there are numerous scenarios which would benefit from geocast communication (e.g., to Broadcast emergency information within

a mile radius of a fire or to broadcast a coupon for coffee within a block of a Starbucks) [40].

- **LAR (LOCATION AIDED ROUTING):-**

LAR is a flood based routing algorithm, like DSR, that uses location information in order to reduce route search space and thereby minimises route control traffic. It assumes that each node obtains its location information using a GPS (global positioning system). In LAR a node forwards route request packets only to the nodes that reside inside the route search space (also referred to as the request zone). Any node outside the request zone ignores such packets. If route is not discovered within a suitable timeout period, the request zone is expanded. Two schemes have been considered in LAR to determine a request zone.

- **DREAM (DISTANCE ROUTING EFFECT ALGORITHM FOR MOBILITY):-**

Dream uses location information using GPS (Global positioning system) to provide loop-free Multi-path routing for mobile ad-hoc networks. Each node in DREAM maintains a location table that records location information of all Nodes. DREAM minimises routing overhead, that is, location update overhead, by employing two principles referred to as the "distance effect" and the "mobility rate". The "distance effect" states that the greater the distance between two nodes the slower they appear to move with respect to each other. Thus nodes that are far apart need to update their location information less frequently than the nodes closer together. This is realised in DREAM by associating an age with each location update message that corresponds to how far from the sender the message can travel. The "mobility rate" states another interesting observation that the faster a node moves, the more frequently it needs to advertise its new location information to other nodes.

- **GPSR (GREEDY PERIMETER STATELESS ROUTING):-**

This routing protocol is energy efficient protocol. The greedy forwarding mode as follows: a forwarding node first determines a candidate set of neighbour nodes – the nodes that lie closer to the destination than itself. The weight of each such candidate neighbour node is then computed to be the sum of the fraction of the initial energy currently available at the neighbour node and the progress (i.e., the fraction of the distance covered between the forwarding node and the destination) obtained with the selection of the neighbour node. The candidate neighbour node that has the largest weight value is the chosen next hop node to receive the data packet. This procedure is repeated at every hop where greedy forwarding is possible. In case, greedy forwarding is not possible, similar to GPSR, energy efficient GPSR switches to perimeter forwarding [29].

III. SECTION-B

RANGE OR BANDWIDTH IN MANET

Mobile Ad Hoc network is a self configuring and self organizing multihop wireless network, where the structure of the network changes dynamically [15]. Dynamically change creates problem in the network. Mobile Ad hoc Networks are consisting of mobile nodes having limited radio range and bandwidth without having any fixed infrastructure. Geometric routing or position based routing is beneficial for searching the shortest path in limited radio range and bandwidth between sources to destination. Geometric routing each mobile node knows its position and the positions of their neighbour nodes using location service of the GPS modems by satellite attached with each mobile node [10 and 11]. By using the position based routing can reduce the packet delay in lower bandwidth in MANET.

GENETIC ALGORITHM IN MANET

Genetic Algorithm is proposed by the John Holland in 1970 [10, 13, 19, 20 and 21]. Genetic Algorithm is used in MANET for searching the shortest path or minimized path from source to destination. Genetic Algorithm is based on the biological neural network. It works on the survival of fitness rule.

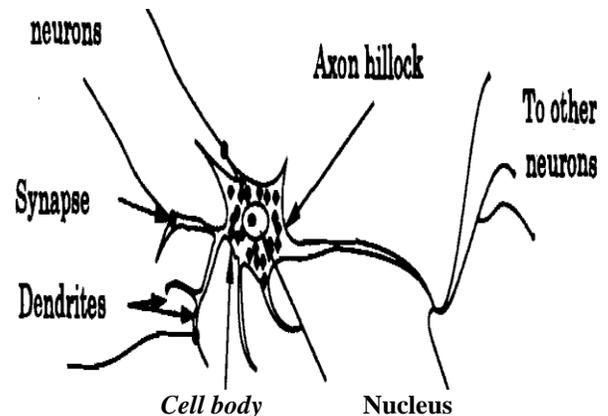


Figure. [19]

NEURONS:-

The basic unit of the unit is called the neuron or nerve cell. **Neurons** are pathways for electrical messages to pass through. They usually transmit these messages between a receptor (something that picks up a stimulus. A stimulus includes things such as temperature, pressure, pain etc.), the brain and an effector.

NUCELUS:-

Nucleus is the part of the cell body. The nucleus is found inside each cell within a double membrane called the nuclear envelope, and is the 'organelle' (little organ) that controls all functions of that cell. The nucleus contains the DNA, which are the instructions which tell the cell what kinds of enzymes and hormones to create and how to function.

CELL BODY:-

Cell body is consisting in the Neuron. The cell body is apart of a cell nerve that contains the nucleus but it does not contain the dendrites or the axon. It produces all proteins and contains organelles.

DENDRITES:-

Dendrites are connected with the cell body. Dendrites are consisting the synapse which is used for signal transferring to another neuron.

SYNAPSE:-

Synapse send the signal to another as a transmitter and another will receive the signal as a receiver.

AXON HILLOCK:-

An axon hillock is the region of the axon closest to the cell body where the action potential often originates. An axon hillock is the prominence on a nerve-cell body from which an axon arises. There is also a person Axon Hillock on Lindedln.

OPERATIONS OF THE GENETIC ALGORITHM

- 1) **INITIAL POPULATION.**
- 2) **SELECTION.**
- 3) **CROSSCOVER.**
- 4) **EVALUATION OF THE FITNESS.**
- 5) **MUTATION.**

INITIAL POPULATION:-

The GA starts with a group of chromosomes known as the population. The population has N_{pop} chromosomes and is an $N_{pop} \times N_{bits}$ matrix filled with random ones and zeros generated using

Pop=round (rand (N_{pop} , N_{bits}));

Where the function (N_{pop} , N_{bits}) generates an N_{pop} , N_{bits} matrix of uniform random numbers between zero and one [22]. Genetic Algorithms (GAs) work best when building short, low-order Population containing the optimum or desired near optimum are expected to grow, hereby permitting crossover to generate the desired solution or solutions [17].

SELECTION:-

By Selection process, offspring are generated. Offspring are generated by the parent. Parent can be that chromosomes that have the best fitness in all population.

CROSSOVER:-

In the crossover process, one or more than bit of chromosomes changed and generate a new population.

EVALUATION OF THE FITNESS:-

Fitness function is used for neglecting of that type of population which are not long time survival. It separates the relevant and irrelevant population [13]. Many formulas are used for finding the fitness value of the chromosomes in the population. The fitness function plays a very important role in

guiding GA/P to obtain the best solutions within a large search space [12]. Bad fitness functions, on the other hand, can easily make GA/P get trapped in a local optimum solution and lose the discovery power.

MUTATION:-

Finally, the mutation operator alters randomly some bits of the new strings [5]. GA can converge too quickly into one region of the cost surface. If this area is in the region of the global minimum, that is good. However, some functions, such as the one we are modelling, have many local minima. If we do nothing to solve this tendency to converge quickly, we could end up in a local rather than a global minimum. To avoid this problem of overly fast convergence, we force the routine to explore other areas of the cost surface by randomly introducing changes, or mutations, in some of the variables. For the binary GA, this amounted to just changing a bit from a 0 to a 1, and vice versa. The basic method of mutation is not much more complicated for the continuous GA [22].

IV. SECTION-C

BACKUP AND AUTHENTICATION

If each node in the network has the route history or backup then the overhead can be removed. Because if the failure will occur, from node creating a failure by which that node from backup another route can find and solve the overhead problem and time [10, 9]. ZRP (Zone Routing Protocol) facilitates the authentication facilities [36].

V. CONCLUSION

Ad Hoc network have a dynamic nature. It have the lot problems like mobility nature of nodes, power consumption, delay in information, authentication etc. at the time of communication. By using many routing protocols can resolve these types of problems. Backups can solve the many problems like power consumption, energy efficiency, delay in messages, network overheads. And ZRP protocol gives the authentication protocol. By Genetic algorithm can find the shortest path in a less time. Genetic algorithm is work faster than the routing protocols [9, 10].

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