# Implementation Of Clustering Based Mechanism On Location Aided Hybrid Routing Protocol

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## Abstract

*In this paper a clustering based approach is applied on location aided hybrid routing protocol for MANET. The location aided or position based protocols belongs to the category of hybrid routing protocol which combines the advantages of both proactive and reactive protocols. The position based routing protocols use position information and GPS for routing. In this approach chain hierarchy is used between different sensor nodes which send the data through single hoping to the cluster head and then to sink that is the master node. The clustering procedure speeds up the route determination process.*

## 1. Introduction

Infrastructure less wireless network is a network of mobile nodes without having any central controller. In wireless communication systems, there is a demand for the rapid deployment of independent mobile users. Significant examples include establishing survivable, efficient, dynamic communication for emergency/rescue operations, disaster relief efforts, and military networks. Such network scenarios cannot rely on centralized and organized connectivity, and can be conceived as applications of Mobile Ad Hoc Networks. The usage of physical positions of the nodes can considerably improve the efficiency of routing techniques for mobile ad hoc networks. This mainly leads to a much reduced routing overhead and an increased packet delivery rate. Position- Based Routing is possible through the availability of small inexpensive GPS receivers and techniques for finding the relative coordinates based on signal strengths. .A MANET i.e. Mobile Ad-Hoc Networks is an autonomous collection of mobile users that communicate over relatively bandwidth constrained wireless links. Since the nodes are mobile, the network topology may change rapidly and unpredictably over time. The network is decentralized where all network activity including discovering the topology and delivering messages must be executed by the nodes themselves i.e. routing functionality is incorporated into mobile nodes. The set of applications for MANETs is diverse, ranging from small and static networks that are constrained by power sources to large scale mobile highly dynamic networks. The design of network protocols for these networks are a complex issue. Regardless of the application, MANETs need efficient distributed algorithms to determine network organization, link scheduling, and routing.



## 2. Types of Routing Protocols

### 2.1Proactive Routing Protocol

A proactive multicast routing protocol is called ‘‘table-driven” multicast routing protocol.[2] In a network utilizing a proactive routing protocol, every node maintains one or more tables representing the entire topology of the network. These tables are updated regularly in order to maintain up-to-date routing information from each node to every other node. To maintain up-to-date routing information, topology information needs to be exchanged between the nodes on a regular basis, leading to relatively high overhead on the network. On the other hand, routes will always be available on request. There are some typical proactive multicast routing protocols, such as CAMP, LGT and AMRIS.

### 2.2Reactive Routing Protocol

A reactive multicast routing protocol is also called ‘‘on-demand” multicast routing protocol. Reactive protocols seek to set up routes on demand. If a node wants to initiate communication with a node to which it has no route, the routing protocol will try to establish such a route. Reactive multicast routing protocols have better scalability than proactive multicast routing protocols.[17] However, when using reactive multicast

routing protocols, the source nodes may suffer from long delays for route searching before they can forward data packets. ACMP and CQMP are examples for reactive routing protocols for MANETs.

## 2.3 Hybrid Routing Protocol

Hybrid routing algorithms aim to use advantages of table driven and on demand algorithms and minimize their disadvantages. Position based routing algorithms that are classified in the hybrid routing algorithms category include the properties of table driven and on demand protocols and are usually interested in localized nodes. Localization is realized by GPS that is used to determine geographical positions of nodes. Position changes which occur because of nodes mobility in MANET cause changes in routing tables of nodes. The GPSs, which are embedded in nodes, are used to update information in tables in position-based algorithms. That makes position-based algorithms different from the table driven and on demand algorithms. Multi Point Relaying (MPR) based algorithms, position based algorithms, Directional Routing Algorithm (DIR), most Geographic Distance Routing (GEDIR) is few examples of hybrid routing protocols.

## 3. Position Based Routing Protocols

Position-based routing algorithms eliminate some of the limitations of topology-based routing by using additional information. A location service is used by the sender of a packet to determine the position of the destination and to include it in the packet's destination address.[9] Position-based routing thus does not require the establishment or maintenance of routes. Location services can be classified according to how many nodes host the service. The position information can be collected in different ways .It can be collected from the direction and strength of the received wireless signals and through interfacing with a low-power Global Positioning System (GPS) and a satellite updating the positions of the nodes by sending signals to this GPS device.

## 3.1 Position based Protocol (LAHRP)

The location aided hybrid routing algorithm. The proposed method aims to efficiently use the bandwidth by reducing the routing overhead. The battery life is efficiently used by reducing the amount of data to be held and the number of operations to be done for routing by any node in network. The principles of both on demand and table driven algorithms have been utilized. In the proposed algorithm, a central node, in other word a master node is assigned. When nodes require sending data to a target node, they take the location of target node and the route to achieve it from master node. Accordingly, they send their data through that route. At this stage, the proposed algorithm differs from infrastructure wireless networks since data is sent via central station in infrastructure wireless networks. However in proposed algorithm, master node, behaving as if it is central node, help only while finding the route to achieve the target.

## 4. Proposed Algorithm

The proposed method aims to efficiently improve the working of location aided hybrid routing algorithm by the use of clustering technique. The sensor nodes are clustered geographically which helps in the formation of cluster heads and the data packets are transferred to the sink node i.e. the master node. The cluster head is elected at the various pause times as per mobility rate. The sensor node which is farthest from the sink node will have maximum battery. This method aims to achieve better results than the previous algorithm in various parameters.

## 4.1The Environmental Parameters

- Simulation Area -500m x 500m
- No of sensor nodes deployed-50
- Simulation time- 100 seconds
- Pause Time - 10, 20, 40, 60, 80,100 seconds.
- Moving speed -20m/s.
- Number of sessions- 20

## 4.2 The Proposed Routing Steps

A simulation area of 500m x 500m is taken for the proposed work.

- 50 sensor nodes are deployed in this region.
- The area is divided into 10 equal partitions called grids or clusters.
- Sink node (ie master node) is centre of simulation area.
- Sink node ie master node will be at centre of the simulation area forming an angle at 360 degree so that each grid angle is at 10 degrees.
- Each grid will elect a cluster head with respect to the mobility rate of pause time.
- Cluster head will be elected with the minimum distance from the sink so that cluster head can

directly send data to sink node with single hop.

- Positions of nodes are not changed as one node replaces another one but the original positions are again same.
- Chain hierarchy will be used in each clustered grid so that data packets could be send within single hop to cluster head and then to the sink node.
- The sensor node closet to the sink will transfer the data to the sink at the end.
- The information is send by the master node to the base stations.
- By the use of these kinds of networks we can gather information from remote areas where there are communication problems.
- These kinds of networks are beneficial to gather information in war areas.

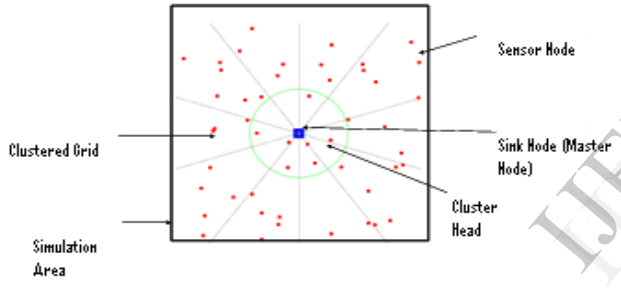


Figure No. 1 Simulation Scenario

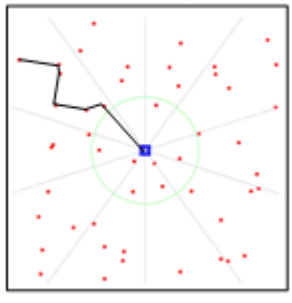

Figure No-2 Chain Hierarchy

## 4.3 Working of the Algorithm

Simulation is done with MATLAB 2011b on computer system with hard disk of 160GB, having 2 GB RAM and a dual core processor. In this simulation, 50 mobile nodes move within an area of 500m x 500m in size. The duration of each run is 100 simulated seconds. The mobility rate is changed by setting different values to pause time as 0, 10, 20, 50and 100 simulated seconds. Here, a pause time of zero means continuous mobility and 100 seconds reflects stable nodes. The maximum moving speeds can be20m/s. We run simulations covering each combination of pause time and moving speed. For the traffic model, we use 20 simultaneous sessions.

## 4.4 Performance Metrics

**The Average end-to-end delay**: It's defined as time taken by a packet to reach from source to destination that is the time the packet is received minus the time it was generated at source.

**Normalized Routing Load:** It is defined as the number of routing packets "transmitted" per data packet" delivered" at destination. Each hop-wise transmission of a routing is counted as one transmission. It is the sum of all control packet sent by all node in network to discover and maintain route.

NRL = Routing Packet/Received Packets

**Energy Consumption:** It is defined as the amount of energy used using simulation runs.

## 5. Simulation Results

The simulation results are discussed below.

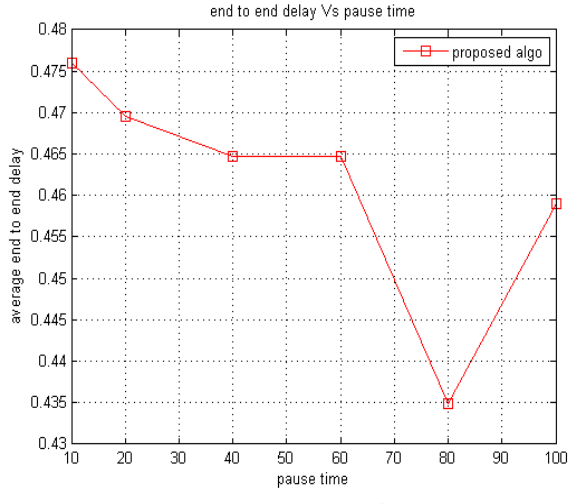


Figure-3Average end to end dealy of proposed algo

The simulation results showed better resuts as compared to the exixting algorithm.It is noted that there is reults are much improved in terms of end to end delay,normalized routing load.Energy consumption during this simulation process is also calculated.The figure -3 represents the end to end delay of the proposed algorithm. The figure -4 represnts the average end to end delay of the existing algorithm.It is calculated through the twenty simultaneous sessions with the varying pause time.There is significance difference in the results as chain hierarchy is used between the different senosrs nodes in the clustered grids.The data is sent through single hoping instead of multiple hoping.

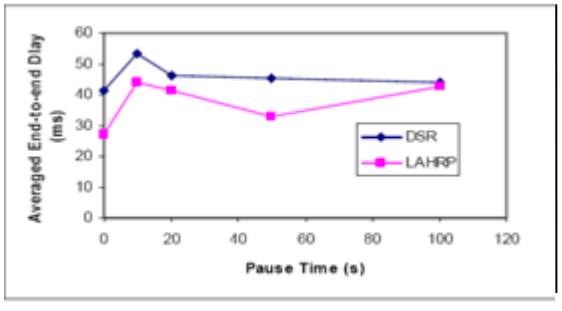


Figure-5 Avergae end to end delay of exisiting algorithm

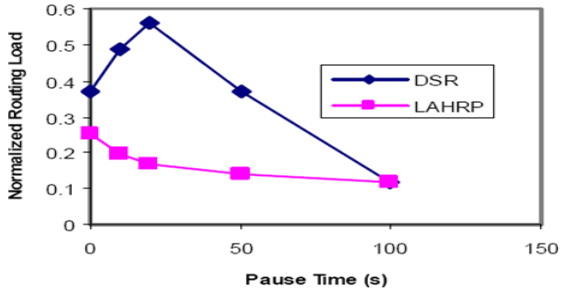


Figure-4 Normalized routing load of exisiting algorithm

The figure -5 represents the normalized routing load of the existing algorithm and the figure-6 represents the normalized routing load of the proposed algorithm. Is calculated in simulation process through twenty simultaneous sessions with varying pause times.The values of the different metrices are represented in the form of the graph and compared with the values of the existing protocol.

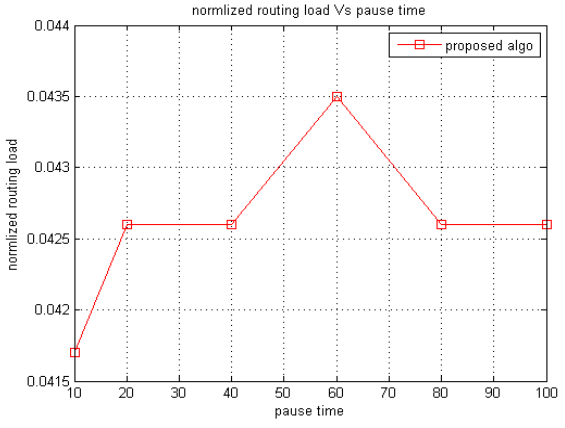


Figure-6 Normalized routing load of proposed algorithm

The figure-6 shows the graph of the energy consmuption .It shows the total energy consumed during simulation process.

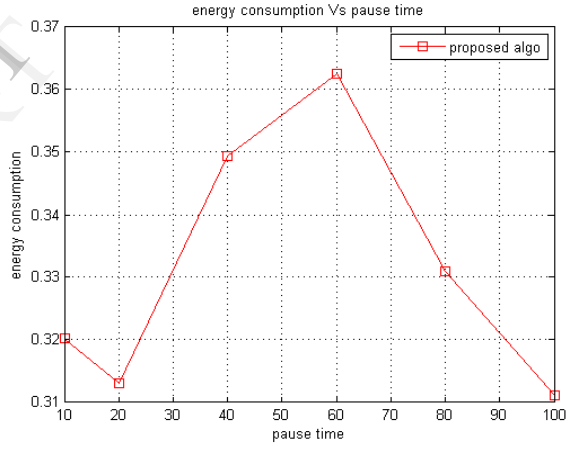


Figure-7 Energy consumption graph of the proposed algorithm

Here is comparison of the performance metrices of the

| S. No. | Metrices | 10 | 20 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|---|---|
| 1. | Average end to end delay | 42 | 40 | 38 | 35 | 40 | 42 |
| 2. | Noramlized Routing Load | 0.25 | 0.24 | 0.18 | 0.17 | 0.16 | 0.12 |

Figure-8Perfomance metrices of the earlier protocol

| S. NO | Metrics | 10 | 20 | 40 | 60 | 80 | 100 |
|---|---|---|---|---|---|---|---|
| 1. | Average end to end delay | 0.476 | 0.4696 | 0.4647 | 0.4349 | 0.459 | 0.4598 |
| 2. | Noramlized Routing Load | 0.0417 | 0.0426 | 0.0426 | 0.0435 | 0.0426 | 0.0426 |
| 3 | Energy Consumption | 0.3202 | 0.313 | 0.3494 | 0.3626 | 0.3309 | 0.3112 |

Figure-9 Perfomance metrices of the propsed protocol

existing protocol and the proposed protocol.

## 6. Conclusion

The clustering technique is applied on the location aided hybrid routing algorithm. After the clustering procedure of the network it gave better results in terms of average end to end delay and normalized routing load. The simulation area is divided into various grids and chain hierarchy is used between the various sensor nodes in each grid. By the use of chain hierarchy the data is sent is to the sink node through single hoping rather than multiple hoping which increases its efficiency.

On the other hand the mobility between the different sensors could also be considered which can improve its efficiency and overall working of the algorithm.

## 7. References

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