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# Performance Enhancement of Multicast Routing Protocols ODMRP-MPR and MAODV with Genetic Technique for Mobile Ad-hoc Network

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**Abstract**
MANET is mobile ad-hoc network works in the area of wireless. While performing the communication, because of lack of various types of infrastructural elements routers and switching components etc will be having various security and successful communication issues. Various protocols in the category of reactive and proactive lies in the area of multicast and unicast exist. Their performance in terms of energy and throughput can be checked and compared. So that better category such as throughput and energy efficiency of protocol can be selected. ODMRP-MRP protocol will be selected which will be efficient in terms of performance perspective. In current research two protocols falls in the category of MAODV and ODMRP. ODMRP shows the better performance. It has shown the throughput enhancement of 61%, and the energy efficiency of 37%. That means ODMRP is better in both the perspectives. Based on ODMRP the improvement by using genetic based technique ACO (Ant Colony Optimization) is done. The results of throughput and remaining energy have shown the improvement of 49.53% and 63.035% respectively.

**Keywords:** MAODV, ODMRP, MANET, ACO

## 1 Introduction
With the development of network technologies and new applications, multicast has become a significant networking service. In mobile ad-hoc networks, multicast communication also holds an important position. Such applications as disaster discovery, search and rescue, and automated battlefields are typical examples of where ad-hoc networks are deployed. A mobile ad-hoc network is a group of wireless mobile nodes which self-organize into a network in order to communicate. Such networks can operate without fixed infrastructure or configuration. Because the nodes are dynamically linked in freeways, the most prominent feature of ad-hoc networks is frequently changing and undetermined topology of the network besides their nature of broadcast. What's more, the limited energy, low bandwidth and unreliable communication are vital factors affecting the performance. So routing protocols for wired network with little modification and adaptation don't suit ad-hoc networks. There are many new concepts and novel ideas emerged for the new requirement. Due to their inherent broadcast capability, wireless ad-hoc networks are well suited for multicast. Multicast routing is always built on top of unicast routing infrastructure in wireline network, but in wireless ad-hoc networks it's not the case. Many multicast routing protocols independent of unicast are even more efficient.

### 1.1 Manet Protocols
Mobile ad hoc network is a one class of wireless network consists of wireless mobile nodes which can communicate without any fixed base station. MANET is a multi-hop wireless network. Due to its fundamental characteristic like infrastructure-less, dynamic topology, self-manageable etc., we cannot uses those routing protocols in MANE which are used in the traditional wired networks. Ad hoc routing protocols are classified a follows shown in Figure 1.

### 1.1.1 Proactive Routing Protocol (ProRout)

As we all know ProRout is the more power full routing technique that was used in conventional Network (Ethernet). After some time this technique was successfully implemented for wireless ad hoc networks (MANET). In this technique each device maintains the information about their neighbor's node in the table. Due to this, it is also called the table driven routing protocol. The information inside the table is updated on the periodic basis. In this technique each node exchanges the topology information with its neighbors. These periodic information exchanges consume lot of network resources like network band width, battery life of communicating devices. The proactive routing gives better performance in the case of stable (zero mobility) network as compared to mobile network. Most widely used table driven routing protocols are: DSDV, WRP, OLSR and STAR

### 1.1.2 Reactive Routing Protocol(ReRout)

Another approach that is used for route the packet form the source to destination is a *ReRout* also called on demand routing protocol. As its name on demand, it preserves and establishments the path when node actually sends the data instead of regularly maintain and update the information table about the all neighbor nodes. The major advantage of reactive routing over proactive routing is that it saves the network bandwidth and battery life of nodes. The disadvantage of this technique is that it is slower than table than proactive routing technique. Most widely used table driven routing protocols are: DSR, AODV, TORA, CBRP, RDMAR and ABR.

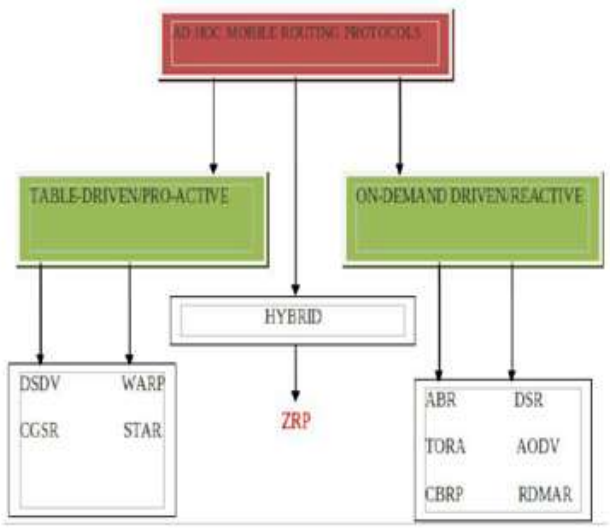



**Fig.1:** Protocols

### 1.1.3 Hybrid Routing Protocol (HyRout):

HyRout accede the advantage of both table driven and on demand driven routing protocols. The most powerful advantage of table driven routing is high speed and on demand driven is less overhead. HyRout inbuilt these features. HybRout protocols may exhibit table driven or on demand driven routing depending on the circumstance, hence allow flexibility based on the wireless network. Most widely used table driven routing protocols are: ZRP and ZHLS.

### 1.1.4 ACO (Ant Colony Optimization)

In the natural world, ants of some species (initially) wander randomly, and upon finding food return to their colony while laying down pheromone trails. If other ants find such a path, they are likely not to keep travelling at random, but instead to follow the trail, returning and reinforcing it if they eventually find. Over time, however, the pheromone trail starts to evaporate, thus reducing its attractive strength. The more time it takes for an ant to travel down the path and back again, the more time the pheromones have to evaporate. A short path, by comparison, gets marched over more frequently, and thus the pheromone density becomes higher on shorter paths than longer ones. Pheromone evaporation also has the advantage of avoiding the convergence to a locally optimal solution. If there were no evaporation at all, the paths chosen by the first ants would tend to be excessively attractive to the following ones. In that case, the exploration of the solution space would be constrained. The influence of pheromone evaporation
in real ant systems is unclear, but it is very important in artificial systems. The overall result is that when one ant finds a good (i.e., short) path from the colony to a food source, other ants are more likely to follow that path, and positive feedback eventually leads to all the ants following a single path. The idea of the ant colony algorithm is to mimic this behavior with "simulated ants" walking around the graph representing the problem to solve.

### Network Configuration

| | |
|---|---|
| Network Size | 800*500 |
| Number of Nodes | 50 |
| Protocol | TCP |
| Application | CBR |
| Packet Size | 512kb |
| Queue Length | 50 |
| Intermediate delay | 1 sec. |

**Table 1**

Above are the basic network configuration used while setting up the network. So that the network having successful communication amongst different nodes. These network configurations are used for setting up the network in NS2.

### Performance Parameter

While setting the network for two protocols two performance parameters are being evaluated. These parameters are like.

a. Throughput.
b. Energy Dissipation

I. Throughput: it is the amount of packets sent successfully per unit interval of time.
Throughput= (Sent packets-Received packets)/(Total communication time)

II. Energy Dissipation: it is the amount of energy that has been used while success full communication. And what the amount of energy left as residual energy at each node.

### Research Algorithm

**Step1** setup the network with given number of node. Build the network under two different set of protocols like MAODV and ODMRP.

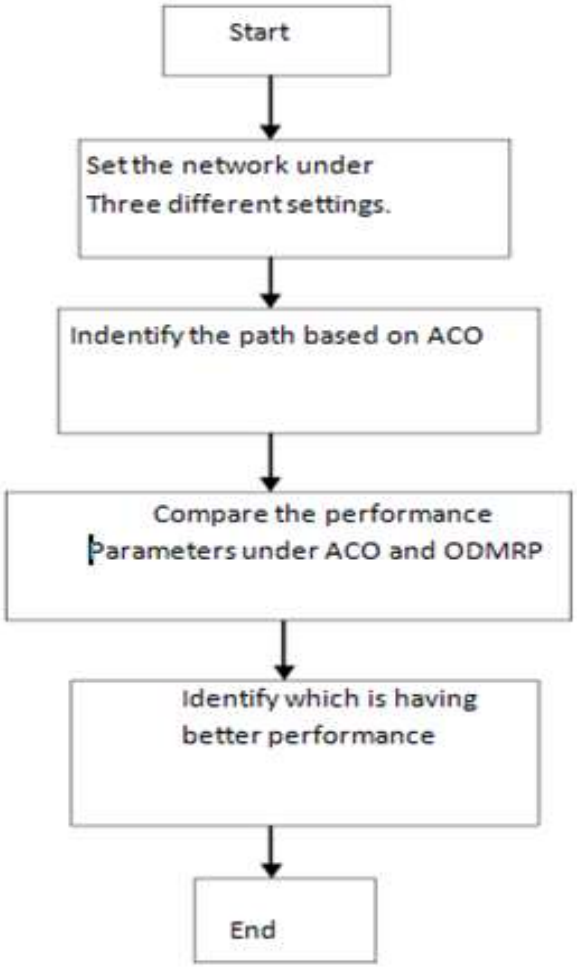
**Step2** set the communication under fixed setting under both MAODV and ODMRP.

**Step3** Identify the network simulation performance parameters under both the network settings.

**Step4** compare the performance parameters for network under both the protocols.

**Step5** Identify which protocol is better in terms of throughput and remaining energy.

**Flowchart**




**Results and Discussions**

**7.1 Nam File for MAODV**

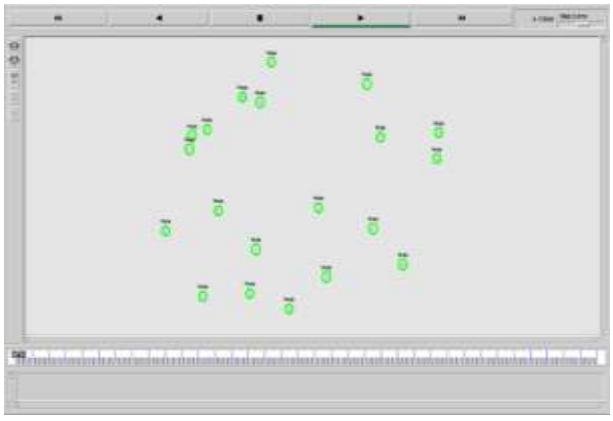


**Fig.2**

This Figure 2 shows various nodes distributed randomly**.** Source node identifies the intermediate node to arrive at the destination. While identifying the path from source to the destination various route requests are being sent. And multiple route replies will be received. Such that better path will be identified. This path will be minimum hop path.

**7.2 Nam files for ODMRP-MPR**

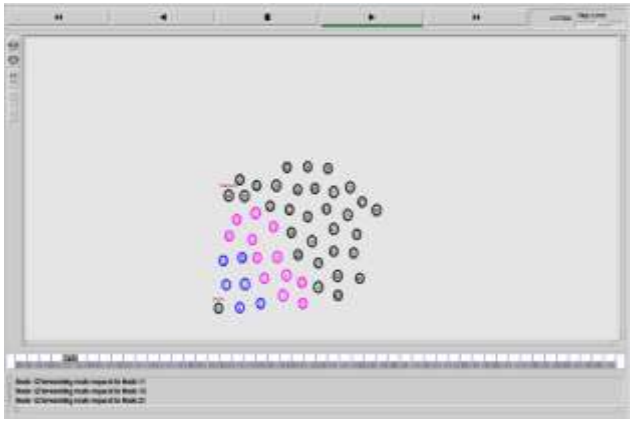
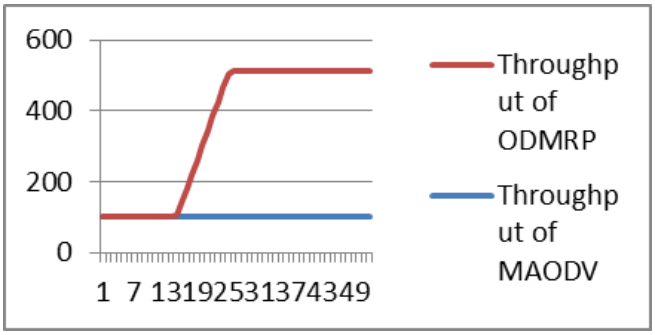


**Fig.3**

This figure 3 shows various nodes distributed randomly and identify the path from source to the destination. It is again based on identifying the path from source to the destination.

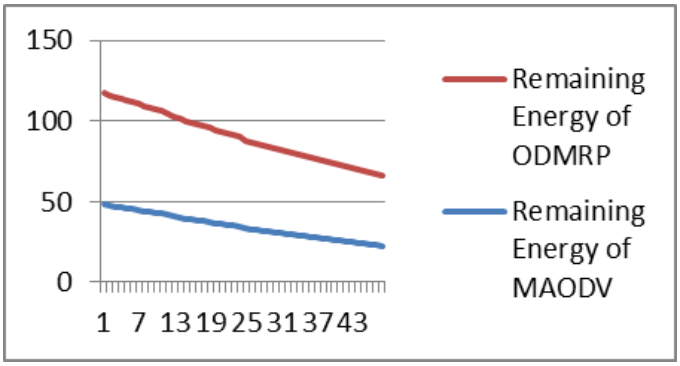
**7.3 Throughput Comparison of MAODV and ODMRP**




**Graph 1**

This graph 1 shows the throughput comparison of both MAODV and ODMRP. Clearly it is shown that the throughput of ODMRP shows better performance compared to MAODV.

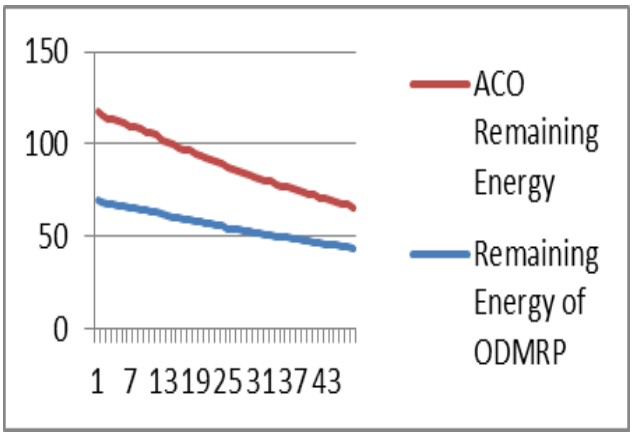
**7.4 Energy Comparison of MAODV and ODMRP**




**Graph 2**

This graph of energy shows that the energy for ODMRP shows better performance compare to the MAODV. In case of ODMRP the energy diminish less compare to the MAODV.

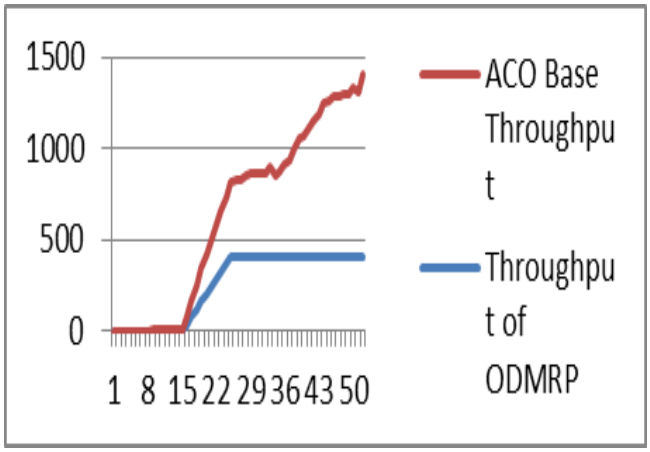
### 7.5 Energy Comparison of ACO and ODMRP




**Graph 3**

This graph of energy shows that the energy for ACO shows better performance compare to the ODMRP. In case of ACO the energy diminish less compare to the ODMRP.

### 7.6 Throughput Comparison of ACO and ODMRP




**Graph 4**

This graph shows the throughput comparison of both ACO and ODMRP. Clearly it is shown that the throughput of ACO shows better performance compared to MAODV.

### 7.7 Percentage improvement of Throughput

| | |
|---|---|
| Throughput of MAODV | 5200 |
| Throughput of ODMRP | 13366 |

Percentage improvement is 61%. That means throughput of ODMRP has shown the improvement of about 61% compare to MAODV.

7.8 Percentage Improvement of Energy Remaining

**Table 3**

| | |
|---|---|
| Remaining Energy of MAODV | 1664.1197 |
| Remaining Energy of ODMRP | 2672.1197 |

Percentage improvement is 37.72%. That means remaining Energy of ODMRP has shown the improvement of about 37% compare to MAODV.

### 7.9 Percentage improvement of Throughput

**Table 4**

| | |
|---|---|
| Throughput of ACO | 19988.36 |
| Throughput of ODMRP | 13366 |

Percentage improvement is 49.35 %. That means throughput of ACO has shown the improvement of about 49.35 % compare to ODMRP.

### 7.10 Percentage Improvement of Energy Remaining

| | |
|---|---|
| Remaining Energy of ACO | 1638.983 |
| Remaining Energy of ODMRP | 2672.1197 |

**Table 5**

Percentage improvement is 63.035%. That means remaining Energy of ACO has shown the improvement of about 63.035% compare to ODMRP.

### Conclusion and Future Work

MANET is mobile ad-hoc network. Where various mobile nodes communicate to each other. They transfer the data amongst each other. For sending the data there requires to identify the path from source to destination. Different protocols behaves in different way for identifying the path. MAODV and ODMRP are two another improved techniques for identifying the path from source to the destination. For route each source node sends the route request and against route request multiple route replies will be received. Out of multiple route reply best or optimized route will be identified. In comparison of MAODV and ODMRP, ODMRP has shown marked improvement in two contexts like throughput and remaining energy. Throughput of ODMRP has shown the improvement of 61%. And remaining energy has shown the improvement of 37%. That means ODMRP behaves better compared to the MAODV. Based on ODMRP the improvement by using genetic based technique ACO (Ant Colony Optimization) is done. The results of throughput and remaining energy has shown the improvement of 49.53% and 63.035% resp.

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