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# THE HYBRID AODV ROUTING PROTOCOL FOR PATH ESTABLISHMENT IN MANET

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**Abstract-The mobile adhoc networks is the type of network which is self configuring and de-centralized in nature. The mobile nodes can join or leave the network when they want due to which routing issues may raised in the network. The routing protocols are used to establish efficient and secure path from source to destination. It is been analyzed that AODV protocol is efficient protocol among all other protocols for the path establishment. In this work, the performance of AODV protocol is improved using bio-inspired techniques for the path establishment in the network. The performance of proposed algorithm is test in network simulator version 2 and it gave good performance as compared to other protocols in terms of various parameters.**

*Keywords:* **MANET, Reactive, AODV, Bio-Inspired Techniques**

## I. INTRODUCTION

The network in which the nodes communicate with each other using the radio waves is known as Mobile Ad hoc network (MANET). The range of radio waves is a very important factor as the nodes which come under this range are able to communicate amongst each other. Intermediate nodes are required for the purpose of routing packets in the case of nodes which are out of range. For the purpose of communication, a wireless interface is required with respect to each node [1]. There is no fixed infrastructure as access points or base stations needed in these types of networks. MANETs are distributed and do not require any fixed infrastructure. For the purpose of transmission of relay messages, independent communication is held in case of nodes within the transmission range and the nodes outside this range are dependent on other nodes. This results in creating a multi-hop scenario which helps in transmitting the packets from source to destination with the help of certain intermediate hosts. Amongst the various challenges observed in MANETs, the symmetric and asymmetric links are a major concern. There are various mobility patterns followed by nodes. There are nodes which are highly mobile whereas other nodes which are stationary. The prediction of the movement of these nodes is difficult. The attacks and unreliability are the arising issues which are caused due to the dynamic nature of MANETs [2]. The most important part of MANETs is routing which makes a node not only complete the tasks related to it but also help in accomplishing tasks which are related to other nodes. As the MANETs are prone to attacks there is a major requirement for establishing a secure as well as trustworthy end-to-end path for them. The routing protocols used in the network are classified into tree broader categories. The Proactive also known as the table-driven routing protocols are one of the categories. Here, the maintenance of routing tables which are used to store routing information is needed [3]. Updates are to be propagated according to the changes made in the network topology. This helps in maintaining a consistent network view. Another category is the reactive routing which is also known as the on-demand routing protocol which does not need to maintain the routing information or activity when there is no communication in the network. In an on-demand manner, the routes are searched within the network when there is need to provide communication from one node to another. A connection is established which helps in transmitting as well as receiving the packets amongst each other. The route request packets are flooded in the network in order to discover a route. The combination of reactive and proactive routing protocols, are known as the hybrid protocols. The routing protocol which divides the network into various zones is known as the Zone Routing Protocol (ZRP). This protocol provides a hierarchical architecture through which every node needs to maintain additional topological information which also needs extra memory [4].

**AODV routing protocol:**

The Ad Hoc On-Demand Routing Protocol (AODV) is a reactive routing protocol which is used in the ad



hoc mobile networks. Using this type of protocol, the routes are created within a network only when there is a need to provide communication. Traditional routing tables are used for providing one entry per destination and sequence numbers which help in determining whether the routing information is up to-date and also for avoiding the routing loops within the network [5]. The maintenance of time-based states for each node is an important property of this protocol which involves declaring the routing entry which was not frequently used as expired. Notifications are sent to the neighboring nodes which are present when the route is broken. Query and reply cycles are the basis for providing route discovery. The intermediate nodes present along the route help in storing the routing information. THIs is stored in the form of route table entries. There are various control packets which are utilized. When a node needs to establish a route to another node, the routing request message (RREQ) is sent. As a reply the routing reply message (RREP) is unicasted back to the source from where RREQ comes. When there is loss of link, the route error message (RERR) is sent which notifies all the other nodes regarding it. For the purpose of detecting and monitoring the links to the neighbors, the HELLO message is used [6].

## II. LITERATURE REVIEW

**Seon Yeong Han, et.al (2013)** proposed in this paper [7], that the purpose of route establishment and maintenance there is a need of local link connectivity information in the MANETs. For providing this local link connectivity information, the periodic Hello messaging is used in a popular manner. When the mobile devices are not being used, the sending of nor required Hello messages can result in draining the batteries of nodes within the network. To avoid this, an adaptive Hello messaging method is proposed in this paper. There is no reduction in the detection of broken links within the network when this scheme is used. According to the simulation results, there is a reduction in energy consumption as well as network overhead within the network with the use of this newly proposed scheme. There is no explicit difference in the throughput of the network. **Cong Liu, et.al (2009)** proposed in this paper [8], an important issue in MANETs is the routing. The geometric routing is made to be just as a theoretically feasible method by providing planar graph to the underlying network in the case of face routing. To avoid this, the local minimum problem is handled in this paper by proposing two methods. For the purpose of reducing the number of local minima, first, a virtual small-world network is created which involves long virtual links. Secondly, without depending on the face routing, the virtual face method is used to recover local minima. By combining these, a purely greedy routing protocol is proposed which is also known as the small-world iterative navigation greedy (SWING+) routing protocol. According to the simulation results this proposed scheme improves the performance of network as compared to other protocols. **Ming Yu, et.al (2009)** proposed in this paper [9], a novel algorithm which uses both message as well as route redundancy to detect the internal attacks caused during the route discovery. Also, an optimal routing algorithm is proposed here along with the routing metric, which combines the trustworthiness as well as performance properties of the node. On the basis of its observations of the behaviors of neighboring nodes, the trustworthiness of a node is built. The proposed algorithms are integrated into any of the already existing routing protocols such as AODV or DSR. According to the simulation results, advantages are seen in the proposed attack detection and routing algorithm over already known protocols. **Haiying Shen, et.al (2013)** proposed in this paper [10], that in order to have high anonymity protection at less cost an Anonymous Location-based Efficient Routing (ALERT) protocol is used. Here, the network filed is partitioned into zones with the help of ALERT. The nodes are selected randomly as the intermediate relay nodes by the network. This helps in forming a non-traceable anonymous route within the network. For the purpose of strengthening the anonymity protection of source and destination the information regarding the sender or receiver are hidden. For providing intersection as well as timing attacks, various strategies are proposed within this scheme. It is seen through the experimental results that the ALERT provides better route anonymity, protection and also has less cost than other protocols. **Thomas Watteyne, et.al (2011)** proposed in this paper [11], that there are various routing protocols which are to be surveyed here. A chronological taxonomy is to be followed within the provided protocol taxonomy for surveying the protocols here which is different from other surveys. For every different protocol category, a didactic presentation which describes there concept is provided along with the discussions which include the enhancements and variants according to their concept. Also the latest state-of-the-art protocols are provided along with their descriptions. Various solutions are provided as per the problems identified in the networks with respect to their designing



parameters which are also helpful in designing IETF ROLL protocols which are evolving recently. **Hui Xu, et.al (2010)** proposed in this paper [12], that for the purpose of evaluating the performance of proactive and reactive routing protocols in MANETs, a new mathematical framework is provided. A parametric view of protocol performance is provided here which provides a closer view of the protocol operations. The effects of protocol logic as well as the network parameters are also provided here. For the routing protocols of both of the categories, the important behavior and scalability limits are gathered as per the network size. Under different network configurations and mobility conditions, the guidance on the performance for both of the categories is also defined here.

## III. OPTIMIZATION TECHNIQUES

Optimization techniques are those which give the best fit solution. It is used to solve complex computational solutions [5]. It finds out the best result from the given feasible solutions. There are several techniques which are based upon the natural phenomena. These techniques are as following:

**A. Bee Colony Optimization:** Bee Colony Optimization is nature inspired technique. It is based upon the swarm intelligence technique. It is meta-heuristic technique which is concern with memory based searching. Bee colony optimization technique is used to find the best path from the number of the solutions. It is bottom-up approach used to solve complex combinatorial problems. It is decentralized and self organizing technique. There are two types of bee which are present in the bee hive. These are in hundred and thousand in numbers which work together. It is a global optimizer which ahs effective searching process [12].

**B. Ant Colony Optimization:** Ant Colony Optimization is a probalistic and meta-heuristic technique. It is also natural insipid technique which is meta-heuristic in nature and used to solve complex combinatorial problems. It uses the previous results to find out the present best paths. It is dynamic in nature. It gives the idea for team coordination, their behaviour and functionality. It is also based upon swarm intelligence. Ant starts from nest to reach to destination and follow different paths. Each ant secretes pheromone trails to attract other ants following that path. The path which has the highest pheromone trails are the best paths compared to others. So the path is depending upon the trails. It is also upgradeable technique according to the secrete pheromone trails. When they ant's returns back to the home they follow the same as the path of starting not the shortest path [12].

**C. Cuckoo Search Algorithm*:*** Cuckoo search is one of the optimization algorithms which is used in various fields of image processing, networking, artificial intelligence This search carries concept from various cuckoo spices. Earlier this algorithm is used for complex computational problems. Later on this research is applied with PSO and Genetic algorithm and finds out that it achieves better results than PSO and Genetic algorithms. Basically cuckoo search is deal with multimodal problems naturally and efficiently. CS algorithm revolves around the behaviour of obligatory brood parasitism of some species of cuckoo as well as the Levy Flights of some birds and fruit flies which follow the random walk of heavy tailed probability distribution step size.

## IV. PROPOSED METHODOLOGY

In this work, First of all I start with first step of research work methodology in which three routing protocols (AODV, DSR and DSDV) are analyzed and compared on basis of three parameters like throughput, delay and packet loss. The performance is evaluated by using "NS2"simulator. When results are cooperate, then results shows that ad-hoc on demand distance vector (AODV) is the best routing protocol .After this performance of AODV protocol is improved using bio-inspired techniques (ant colony& bee colony techniques) for the path establishment in the network. To establish shortest path destination both ant colony and bee colony techniques are used with AODV routing protocol.These bio-inspired techniques (Ant Colony & Bee Colony technique) apply on AODV routing protocol and compare results with simple AODV.The shortest path is selected between source and destination node before selecting the path common nodes are checked. The node which has minimum distance will be selected as the hop node from source to destination.

Similarly cuckoo search technique is used on AODV for better results, then compare these obtain results. Lastly, I would like to analyze and compare the results of proposed cuckoo search technique with hybrid (ant colony &bee colony techniques) and simple AODV. The main objective of my work is to improve the performance of ad-hoc on

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demand distance vector (AODV) in the mobile Adhoc network.

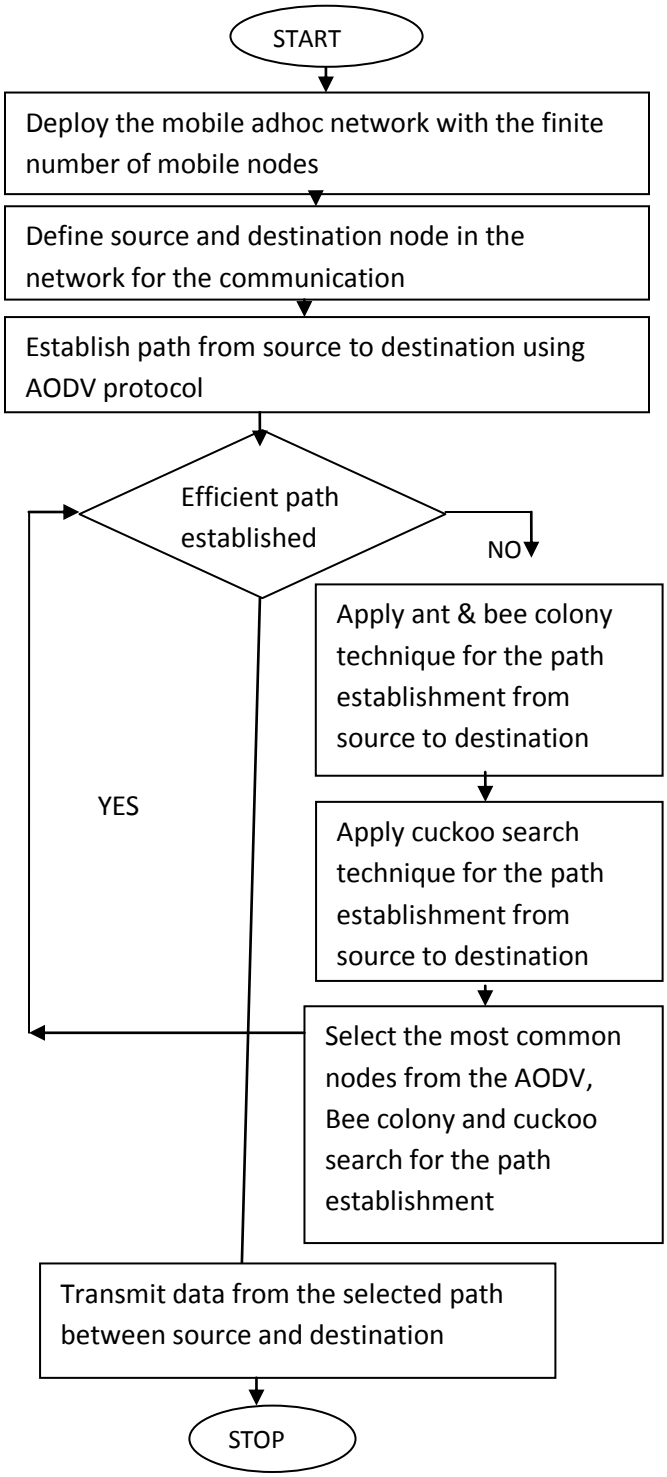



Fig 1: Research Methodology

## V. RESULTS AND DISCUSSION

The proposed technique is implemented in network simulator by considering parameters which are described in table 1

| Parameters | Values |
|---|---|
| No of nodes | 24 |
| Antenna type | Omi-directional |
| Routing protocol | AODV |
| Link layer | LL |
| Propagation Model | Two-ray model |
| Queue | Priority queue |

**Table 1: Parameter values**

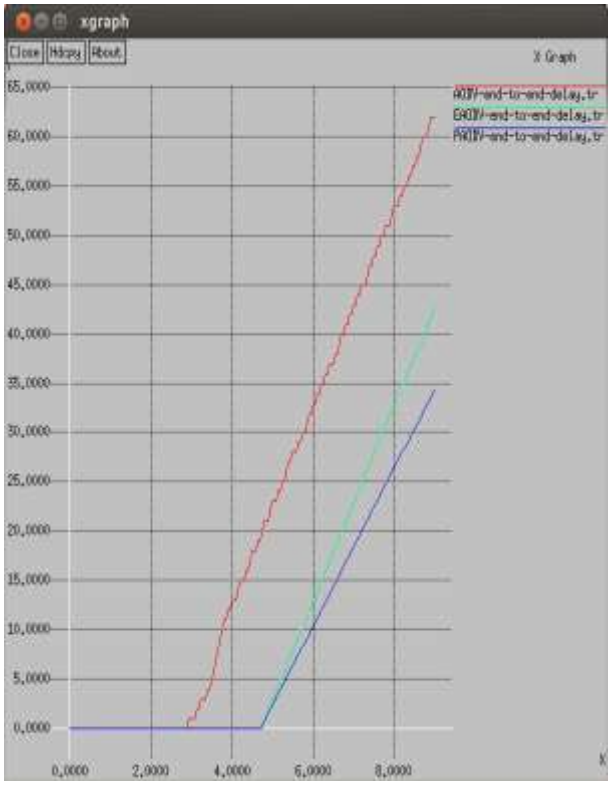



**Fig 2: Delay comparison**

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As shown in the figure 2, the delay of the proposed, basic AODV and Improved AODV is done. It is been analyzed that delay of the proposed technique is least as compared to other techniques.

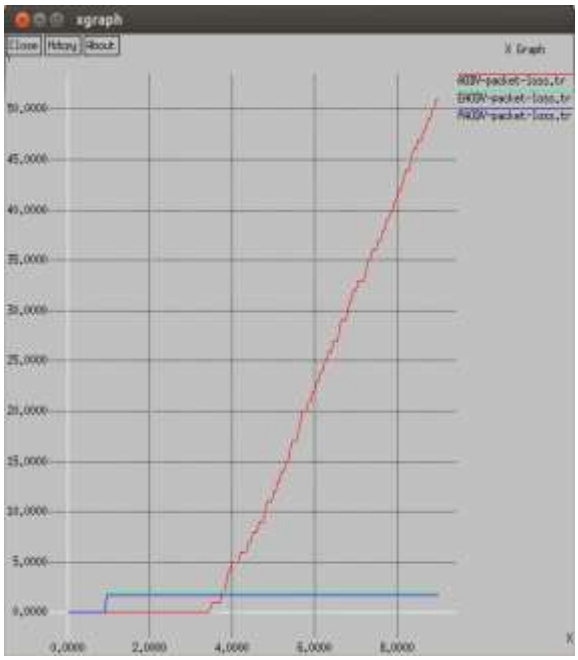


**Fig 3: Packet loss Comparison**

As shown in figure 3, the packet loss comparison of the proposed, existing and improved AODV is done and it is been analyzed that packet loss is least in the proposed technique as compared to other techniques .

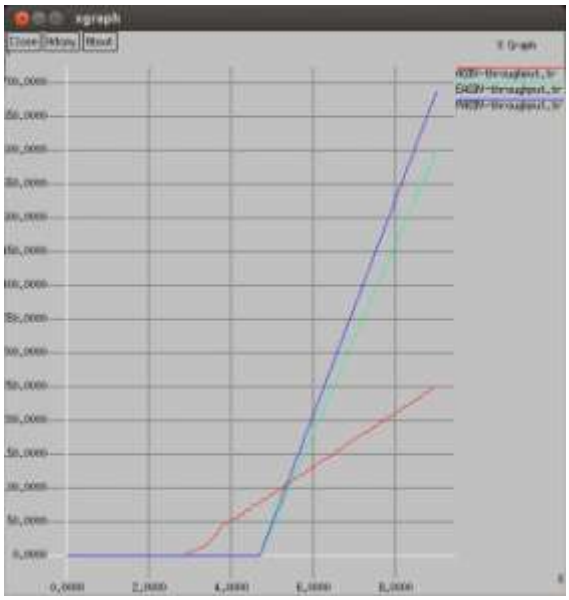


**Fig 4: Throughput Comparison**

As illustrated in figure 4, the comparison is done of the proposed, existing and basic AODV protocol in terms of throughput. Due to efficient path establishment in proposed AODV its throughput is maximum as compared to other techniques

## VI. CONCLUSION

In this work, it been concluded that AODV protocol is the reactive type of protocol which gave maximum performance in terms of various parameters. In this work, the bio-inspired technique is been applied to increase performance of AODV routing protocol. The simulation results show that the network delay is decrease & throughput is increase to 10 percent and packet loss is reduced to 15 percent in the network.

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