

# Improvement in AODV for Congestion Avoidance using Bio-Inspired Techniques

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**Abstract-**The mobile ad-hoc network is the network in which no central controller is present and nodes can change its location any time. As the nature of network routing is dynamic, security and quality of service are become a three dominant issues of the network. The most efficient routing protocol is AODV. It is most efficient to transmit data from source to destination by using AODV routing protocol. The congestion is the problem which gets raised in the established which reduce network performance in terms of various parameters. In this paper, the bio-inspired technique has been proposed which selected optimal path for data transmission in which least chances of congestion in the network. To implement the proposed algorithm NS2 software has been used and analyzed that proposed technique performs well as compared to existing technique in terms of various parameters.

**Keyword:** AODV, Bio-inspired, OLSR, Reactive Routing, MANET.

## 1. INTRODUCTION

The mobile ad-hoc networks are the network in which no central controller is present and it is the decentralized type of network. In such type of network mobile node configure with random topology. In the random topology each node are aware of the nodes which are their adjacent nodes or in their direct range. In this type of network, single and multi-hop communication is possible. In single hop communication when two nodes are direct range of each and in multi-hop communication node can communicate each other indirectly through intermediate nodes. The nodes in MANETs are interrelated using the multi-hop communication paths. Simply, it mentions that all the nodes in the hop must be prepared to contribute in the procedure of delivering a packet by forwarding it from source to destination. Packets are travel through multiple paths. Data packets which are made by dividing a single file are forwarded to different paths. Than to generate the original file all these packets are combined in sequence at the destination node. In order to transmit the message on time the main objective of these protocols is to create an optimal pathway with minimal number of intermediary nodes between source and destination. The route which is selected should have less overhead and reasonable bandwidth consumption [1]. The protocol should be able to perform in an effective & efficient manner throughout the networking environment consisting of heterogeneous ad hoc networks i.e., from small to large Multi-hop networks.

The routing protocols can be broadly classified into three broader sections. They are reactive, proactive and hybrid type of routing protocols. The classification of these protocols can be done on the basis of their topology involved. The continuous updating of topology of network in the tables is done by proactive routing tables which are also named as table-driven routing protocols [2]. The examples of this category are DSDV and OLSR. The reactive routing protocols are those which update the network tables only on the basis of demand of the user. Thus, they are also known as on-demand routing protocols. Thus, there is no need to generate or update the routing tables after certain time duration. As per the demand of the user only the route discovery is initiated. The protocols that belong to this category are DSR and AODV [3]. The merits of both reactive and proactive routing protocols are combined together to build hybrid routing protocols. The Zone

Routing Protocol is an example of these types of routing protocols.

### 1.1 On demand distance vector routing protocol (AODV)

The utilization of single source and destination routing in order to provide efficient routing is known as an ad hoc on demand vector routing protocol (AODV). In AODV path establishment protocol source node will flood route request packets in the network and the respond will come back from the nodes which are adjacent to destination. The response will come with route reply packets. There are numerous paths present within the source nodes. The best path has to be selected depending on the two factors which are the hop count and the sequence number of the nodes. The hop count defined the number of hopes and sequence number defines the path freshness.

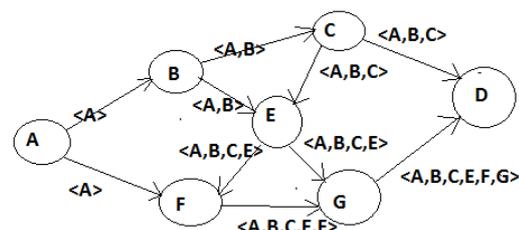


Figure 1: AODV protocol

As depicted in figure 1, from source to destination a route or path is generated. The path is chosen on the basis of two factors which are hop count and the sequence number of the nodes in the path. The packet is transmitted through this path after the selection of one final path [1].

## 2. LITERATURE REVIEW

**Changling Liu et al. [4]** proposed in this paper the major issue which is the generation of an efficient routing protocol within the MANETs. The generation of an appropriate routing protocol has become difficult due to the growth in complexity of the network. In order to provide better communication, the protocols are utilized which can only transfer the data through the routing process. There are certain guidelines and objectives presented by the applications in which the protocols are used in order to design the protocols as per their requirements.

**Helge Wiemann et.al [5]** presented in this paper the important properties of Geo-based routing protocols. Within these protocols the geographical addresses of the protocols are utilized and the IP addresses are avoided. This results in improving the scalability of the network. The location of destination is important to be defined initially only then the packet be transmitted.

**ShimaMohseni et al. [6]** a study has been made related to the various reactive and proactive routing protocols utilized within mobile ad hoc networks. There are numerous routing methods proposed within these networks which are to be studied here in order to select an appropriate protocol as per the requirement of the user or application. The best routing protocol can never be defined because each of the protocol works different as per the area in which it is applied.

**While, S.S Tyagi et al. [7]** studied in this paper the working of various routing protocols in terms of certain performance parameters. These performance parameters include the end-to-end-delay, routing overhead and packet loss occurring within the network. The analysis in this paper is made amongst the three most utilized routing protocols which are AODV, DSR and DSDV. The simulations are performed here in NS2 simulator. It is seen that as per the different environments each protocol shows its benefits. It is seen that the performance of AODV routing protocol is better however, there is some packet loss occurring within these networks.

**Dr. R.K Singhet al. [8]** proposed that there is a need to categorize the various routing protocols involved within the wireless ad hoc networks. There are numerous routing protocols which already exist and in order to study them, a quantitative and qualitative analysis are performed. In order to perform qualitative analysis the various properties

of the protocols are compared among each other. The simulations are performed with the help of NS2 simulator and the performance of various protocols are studied and analyzed. The results achieved are helpful in distinguishing the properties of numerous protocols which can be helpful in applying them to the application areas accordingly.

**Xiaoyan Hong et al. [2]** presented in this paper a review of the numerous routing protocols in order to study their scalability while being applied in certain applications. There are three main classifications of review of routing protocols. They are hierarchical routing, flat routing as well as the GPS augmented geographical routing methods. The properties of various protocols and their challenges are studied here in detail. There are innumerable applications in which the ad hoc networks have been deployed. There are numerous changes made within the routing protocols when they are applied to certain applications. The study proposed in this paper will help one analyze the working of certain protocols which can be helpful when they have to be used. The future work will focus on studying the routing protocols in order to define their scalability and security in terms of their utilization.

## 3. PROPOSED METHODOLOGY

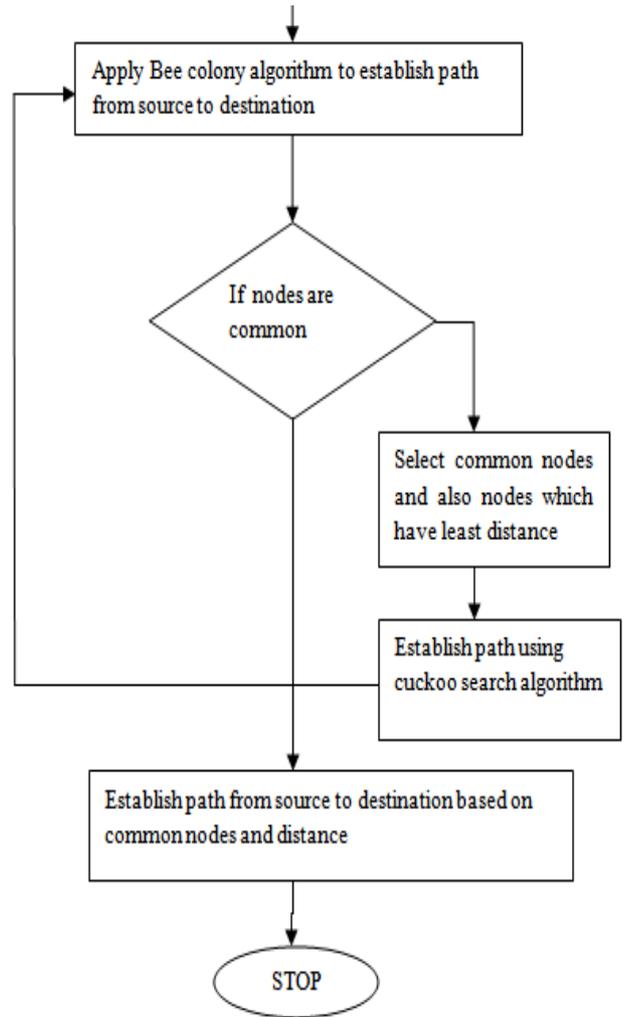
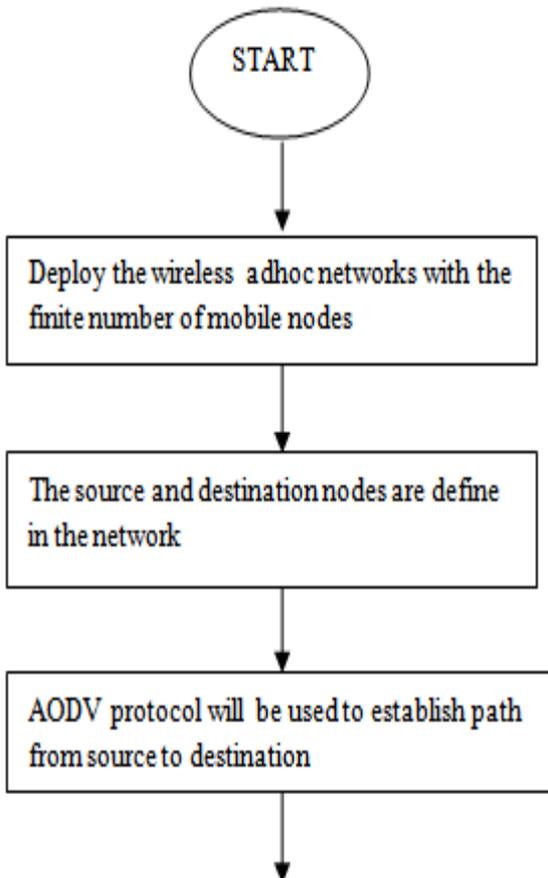
In order to establish a path from source to the destination, the proposed reactive routing protocol is utilized. The most prominently used and highly efficient routing protocol for establishing a path is the AODV routing protocol. The performance of the network is minimized when congestion occurs within it. On the basis of bio-inspired techniques, the AODV protocol is enhanced in this paper. In order to choose an appropriate path the bio-inspired methods such as bee colony and cuckoo search are applied with AODV protocol. The proposed process includes three major steps in it. With the help of AODV routing protocol the path is chosen at the initial phase. The selected path is input to the second phase in which the second path is selected using the bee colony algorithm. The nodes which are common in the both paths are selected and nodes which are left behind are selected on the basis of their buffer size. In the third phase, the path is selected using cuckoo search algorithm and path of cuckoo search algorithm is compared with the path selected in the second phase and nodes which are not common are selected on the basis of buffer size. The node which has maximum buffer size is selected as the best node for path establishment from source to destination.

### 3.1. Proposed Algorithm

1. The input in the proposed algorithm will be number of Mobile nodes
2. The path will be established from Source to destination on the basis of output achieved from the proposed algorithm.
3. AODV Protocol ()
  - 3.1 The route request packets are sent from source to all the other nodes present in the network.

- 3.2 The route reply packets are sent back by the adjacent nodes to the destination.
- 3.3 The best path is selected on the basis of hop count and sequence number of the source.
- 3.4 Return Best path
4. Bee Colony ()
  - 4.1 Source check buffer size of its adjacent nodes to establish path to destination
  - 4.2 Select path which has maximum buffer size from source to destination
  - 4.3 Return Best path 1
5. Select Common Nodes ()
  - 5.1 Select nodes in the Best path 1 and Best 2
  - 5.2 Return Best path 3
6. Cuckoo Search ()
  - 6.1 Check buffer size from source to destination of each node in the network
  - 6.2 Store best path in Best path 4
  - 6.3 Select common nodes from Best path and Best path 4
  - 6.4 Return Best path 5

**3.2. Proposed Flowchart**



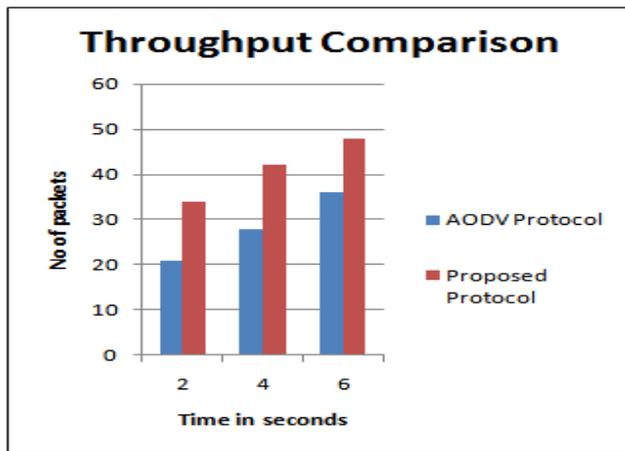
**Figure 2:** Proposed Flowchart

**3. RESULTS AND DISCUSSIONS**

The Network simulator version 2 is the simulator which is used to perform simulation of proposed and existing techniques. The simulation parameters are described in table 1.

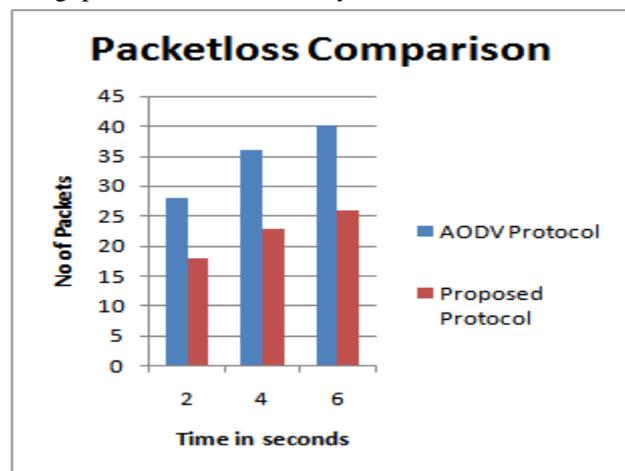
**Table 1:** Simulation Parameters

Parameters	Values
Antenna type	Omi-directional
Queue type	Priority Queue
Queue size	50
Number of nodes	28
Area	800*800 meters
Range	18 meter
Frequency	2.4 Ghz



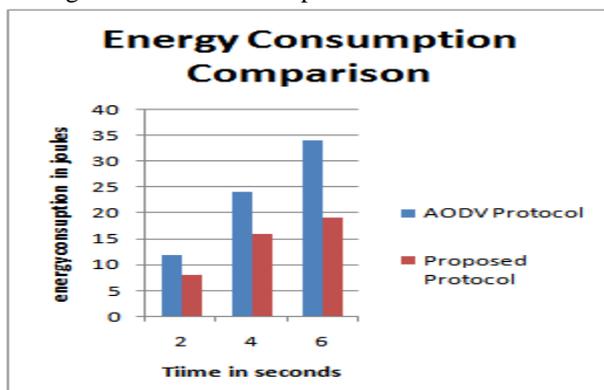
**Figure 3:** Throughput Comparison

As shown in figure 1, the network throughput of AODV protocol and proposed technique is compared on different time intervals. It has been analyzed that due to least chances of congestion in the proposed protocol network throughput is increased at steady rate



**Figure 4:** Packet loss Comparison

As shown in figure 2, the network performance of proposed protocol and AODV protocol is compared in terms of packet loss. In the AODV protocol congestion chances is maximum which increase packet loss in the network. In the proposed technique there are least chances of congestion which reduce packet loss in the network



**Figure 5:** Energy Comparison

As shown in figure 3, the energy consumption of proposed and existing algorithm is compared and due to least chances of congestion in the network energy consumption of proposed algorithm is least as compared to existing algorithm

### 3. CONCLUSION

In this paper, it has been concluded that reactive routing protocol AODV is the most efficient protocol for path establishment from source to destination. Due to dynamic nature of the network chances of congestion in the network is high which reduce its performance. In this paper, bio-inspired technique of congestion avoidance is proposed which select efficient path from source to destination in which has least chances of congestion. The performance of proposed algorithm is tested in NS2 and compared with AODV protocol in terms of throughput, packetloss and energy consumption. In each aspect proposed algorithm performs well as compared to AODV protocol.

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