

ENHANCED TECHNIQUE FOR CONTROLLING CONGESTION IN AODV IN MANETS

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Abstract: The mobile ad-hoc network is the self-configuring type of network in which hops can join or exit the network when they desire. In this type of network, routing is the major issue because many hops can join or exit the network anytime. The several types of routing protocols are employed which are mostly categorized into a reactive, proactive and hybrid type of routing protocol. It has been examined that AODV protocol performs well as compared to other protocols. The betterment in the AODV protocol will be proposed for path establishment from source to destination to bring down opportunities of congestion in the network. The proposed betterment will be built on bio-inspired techniques. These bio-inspired techniques are cuckoo search and bee colony algorithm. The cuckoo search and bee colony algorithm will explore an optimal path from source to destination. The explored path will be compared with the path explored by AODV protocol. The hops, which are mutual in both paths are chosen as the best nodes and hops, which are not common are chosen on the basis of buffer size. The proposed technique is implemented in NS2 and it has been examined that it performs well in terms of delay, packet loss, throughput and energy than AODV protocol.

Index Terms – MANET, AODV.

I. INTRODUCTION

In day-to-day communication, wireless networks play a striking function. There are many applications where it is widely employed like industrial applications, military applications, and in personal area networks [1]. Due to its simplicity of installation, flexibility and scalability, it is really popular in other applications as well. The wireless network has two further categories: Infrastructure and Infrastructure-less. In Infrastructure wireless networks, the base stations are fixed, the mobile hops can travel while communicating. MANET is a self-configuring network, in which topology is dynamic. These hops are scrambling to manage with the normal effect of radio communication channels, multipath fading, multi-user interference, etc. [2]. The blueprint of an optimum routing protocol for MANET is extremely hard. To find out the connectivity of web organizations, there is a demand for an effective algorithm link scheduling, and routing in such dynamic scenarios, becomes very significant. The efficiency of a routing algorithm depends on the expert and winning route computation. Ordinarily, the shortest path algorithm is a successful method to compute the optimal path in static networks. But this thought is not possible in a MANET platform [3]. There are many components which can be conceived for routing. Networks should adaptively alter their routing routes depending on scenarios at any instance to amend any of these effects. 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 hop configure with random topology. In the random topology, each hop is mindful of the hops which are their neighbouring hops or in their direct scope. Laptops, mobile devices are configured to constitute a network. In this type of network, single and multi-hop communication is possible [4]. In single hop communication when two hops are a direct scope of each and in the multi-hop communication hop can communicate each other indirectly through intermediate hops. The hops in MANETs are interlinked employing the multi-hop communication routes. Simply, it mentions that all the hops in the harp must be organized to contribute to the operation of handing over a packet by forwarding it from source to destination. Packets are moving through multiple routes. A single file is divided into various data packets, and then these packets are forwarded through dissimilar routes. At the destination hop, all these packets are aggregated in sequence to generate the original file. The principle aim of these protocols is to create an optimal pathway with a minimum number of intermediary hops between the source and destination, the path should have less overhead and fair bandwidth consumption in order to send the message on time [5]. The protocol should be capable to execute in an effective & an efficient fashion throughout the networking environment consisting of heterogeneous ad-hoc networks i.e. from small to large multi-hop networks. There are three categories of these routing protocols, which include reactive routing protocols, proactive routing protocols, and hybrid routing protocols with respect to the routing topology employed in MANET. Proactive routing protocols constantly hold the updated state of the network topology and are typically a table-driven [6]. The proactive routing

protocols include OLSR, DSDV routing protocols. The second category includes reactive routing protocols, also known as source-initiated on-demand routing protocols. Therefore, they do not comply the procedure for making & updating routing tables with routing information at regular intervals. As they are on-demand routing protocols, so they initiate route discovery only when they are asked to. AODV & DSR are examples of these types of routing protocols [7]. Hybrid protocols are the one which employs the advantages of both reactive and proactive approaches. It includes Zone Routing Protocol.

II. LITERATURE SURVEY

Surendran. S, et.al [8] has inaugurated that routing decision should be made before any hop exits the network. Most of the routing protocols have cooperative and friendly, which vulnerable to the several attacks Reputation and Trust would function as major resolutions to these problems. In this paper, a survey has been performed on fault tolerance algorithms and ant colony optimization has been enforced to routing protocols. They proposed a QoS constrained fault tolerant ant look ahead routing algorithm which attempts to identify the valid routes and look-ahead route pairs which might help in choosing the alternate path in case of valid route failure. The results prove that the proposed algorithm takes better routing decisions with 20-30 percent improvement compared with existing ant colony algorithms.

Amith Khandakar et.al [9] examined that MANET is a network where nodes are free to move. They can use multiple hop paths to exchange data. Routing protocols are required for timely and efficient delivery of data. In this paper, three routing protocols have been compared, those are AODV, DSDV, DSR with the parameters end-to-end delay and normalized routing load while varying the number of nodes, speed and pause time. It also provides a step by step approach based on an assumption on how to carry out such a comparative study, can be useful for future research.

CH. V. Raghavendran et.al [10] introduced swarm intelligence algorithms for routing purposes. SI adopts natural behaviors of fish, ants, bees and many insects. Although each individual has little knowledge and simply follow basic rules using local information obtained from the environments. Ants routing follows the basic mechanism of swarm intelligence and gives an interesting solution to the problems. Ants routing is dynamic and adaptive in nature which is more popular algorithms based on researchers. In the end, various bio-inspired algorithms have been discussed.

Jagdeep Kaur et.al [11] described that MANET is a network in which nodes can freely join and leave the network. MANET has some properties like infrastructure-less, dynamic in nature and decentralized control. Due to frequently topology change network performance decreases. Cuckoo search optimization (CSO) algorithm is a good technique for developing efficient routing protocols for MANETs. CSO is beneficial to find out the best optimal path with the shortest routing to send data in MANET. In this paper, AODV and DYMO routing protocol with CSO algorithm. Further implemented CSO algorithm on AODV & DYMO protocols using the NS2 simulator and compared its simulator results with simple AODV & DYMO protocols.

Dr. Umadevi Chezhiyan et.al [12] they explained the importance of the ad-hoc networks, which communicate and establish a path between two end nodes. Routing is the path for the establishment between source and destination to transfer data. Reactive routing is a performed well in MANET than proactive routing. In this paper, various routing protocols with their advantages and disadvantages have been discussed. At the end measurement performance analysis is also done in MANET.

Charu Sharma et.al [13] explained that MANET is a network which can be easily deployed. MANET has no central controller so topology changes dynamically. Topology change is a challenging issue in MANET. In this paper, the whole network strategy with performance metrics which are to be used in the OPNET simulation for the analysis has been described. The performance metrics used are throughput, packet queue size, transmitted packet rate and received a packet rate and the simulator tool used in OPNET Modeler 14.0.

III. RESEARCH METHODOLOGY

In this work, betterment will be proposed in the AODV routing protocol employing bio-inspired techniques. The bio-inspired techniques are Cuckoo Search and Bee Colony. In the proposed technique, let suppose path will be established from source to destination using AODV protocol. In the established path, hops are 1, 3, 5, 9. Then Bee Colony algorithm is applied for path establishment and path which is established having hops 1, 3, 8, 9. The source node selects hops, which are common in the paths and select nodes which are not common on the basis of buffer size. The resultant path is 1, 3, 5, 9. Then Cuckoo Search algorithm is applied for path establishment and path which is established having hops 1, 2, 5, 9. The source selects hops, which are common in the paths and selects hops, which are not common on the basis of buffer size. The resultant path is 1, 3, 5, 9.

IV. PROPOSED ALGORITHM

1. Input: Number of Mobile Nodes
2. Output: Path establishment from source to destination
3. AODV Protocol ()
 - 3.1 While (route request packets send on the network)

- 3.2 Receive route reply from each node
- 3.3 Check hop_count () & sequence number ()
- 3.4 If (hop_count () is small & sequence number () is high)
 - 3.4.1 Select path
- 3.5 Return best path 1
4. Apply Bee Colony ()
 - 4.1 Check buffer size of each node from source to destination in the network
 - 4.2 Select best path 2 on the basis of a distance
 - 4.3 Check common nodes ()
 - 4.3.1 Repeat for each node in the selected paths (path 1 & path 2)
 - 4.3.1.1 If (nodes are common)
 - 4.3.1.2 Select common nodes
 - 4.3.1.3 Else { select a node which has a maximum buffer size }
 - 4.4 Return best path 3
5. Apply Cuckoo search ()
 - 5.1 Check buffer size of each node from source to destination in the network
 - 5.2 Select best path 4 on the basis of a distance
 - 5.3 Check common nodes ()
 - 5.3.1 Repeat for each node in the selected paths (path 3 & path 4)
 - 5.3.1.1 If (nodes are common)
 - 5.3.1.2 Select common nodes
 - 5.3.1.3 Else { select a node which has a maximum buffer size }
 - 5.4 Return best path 5

v. RESULTS AND DISCUSSION

1. End-to-End Delay: It is the time interval to transfer data packets from source to destination. The protocol, which has a less end-to-end delay is best.



Fig. 1 Delay Graph

As shown in fig 1, the AODV and Enhanced-AODV routing protocols are compared in terms of delay. It has been examined that Enhanced-AODV protocol has the least delay as compared to AODV routing protocol.

2. Packet Loss: It is simply the number of packets which are dropped. The protocol, which has less packet loss is best.



Fig. 2 Packet Loss Graph

As shown in fig 2, the AODV and Enhanced-AODV routing protocols are compared in terms of packet loss. It has been examined that Enhanced-AODV protocol has least packet loss as compared to AODV routing protocol.

3. Throughput: It is the amount of packets transfer from source to destination successfully in a given amount time. The protocol, which has high throughput is best.

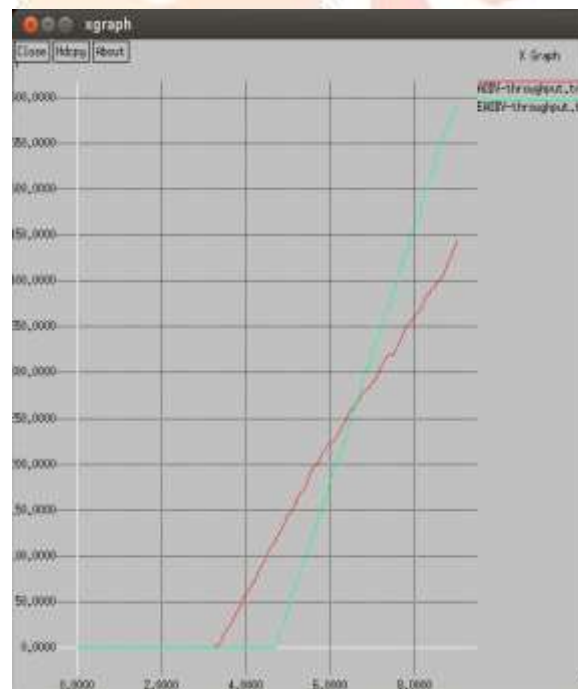


Fig. 3 Throughput Graph

As shown in fig 3, the AODV and Enhanced-AODV routing protocols are compared in terms of throughput. It has been examined that Enhanced-AODV protocol has a maximum throughput as compared to AODV routing protocol.

4. Energy: It is the energy which is consumed by each node in the network during the simulation process. The protocol, which consumes less energy is best.

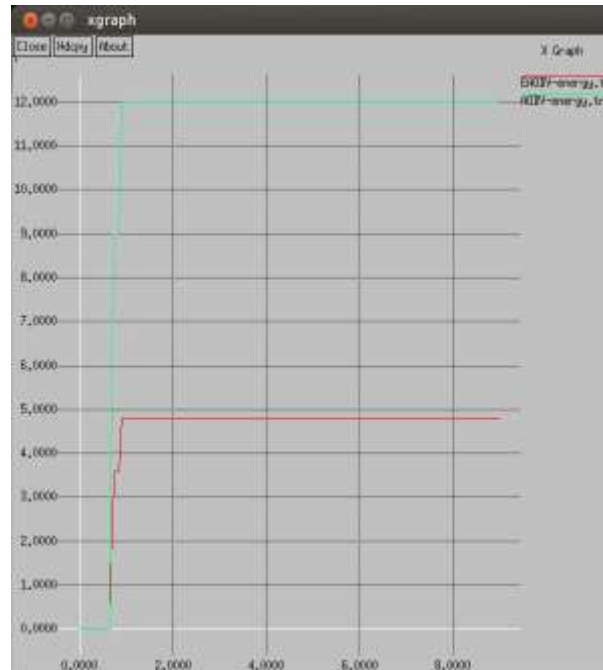


Fig. 4 Energy Graph

As shown in fig 2, the energy comparison is made between the AODV (existing technique) and Enhanced-AODV (proposed technique). It has been examined that the proposed technique consumes less energy as compared to the existing technique due to congestion avoidance.

VI. CONCLUSION

From literature, it can be summarized that due to self-configuring nature of the mobile ad-hoc network, routing is the major matter of MANETs. Due to decentralized nature, three types of routing protocols are employed which are reactive, proactive and hybrid type of protocols. These protocols are compared in terms of throughput, end-to-end delay, packet loss and energy. It has been examined from the literature that AODV routing protocols perform well as compared to other protocols. In this work, betterment will be proposed in AODV routing protocol for congestion control in MANET. The proposed betterment will be built on bio-inspired techniques. These bio-inspired techniques are cuckoo search and bee colony. The proposed technique is implemented in NS2 and it has been examined that the proposed technique performs good as compared to AODV protocol in terms of throughput, end-to-end delay, packet loss and energy.

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