Multi-Parameter dependent Routing using Moth Flame Optimization for MANET

Surankur Rajee Singh[1], Surinder Singh[2]
[1]*Chandigarh Engineering College, Landran*
[2] *Chandigarh Engineering College, Landran*
(E-mail: surankursingh07@gmail.com)

***Abstract*—** The rate of suspicions is one of the major issues in the Ad hoc network. So there is a need to propose a new algorithm which will consider sufficient and reliable list of parameters to overcome the issues of traditional work. A novel method is proposed that will increase the number of parameters along with the implementation of MFO based decision model. The objective behind using MFO (moth flame optimization) is that it is capable to handle the uncertainties which traditional fuzzy inference system fails to handle. The proposed model conquers the problems of the existing work. With the implementation of MFO based decision model the number of parameters is increased in this work. Also the uncertainties are handled by the proposed work in this paper. In this model the packet delivery ratio is increased when the nodes are stable and the packet delivery ratio is decreased when the nodes are mobile. The packet delivery delay is increased when the nodes are mobile. But in all the cases the results of the proposed model are better than the traditional mechanism. Therefore the projected method is much better than the conventional methods in all the cases.

Keywords—*Ad hoc Networks, MANETs, Routing, Throughput, Energy.*

I. INTRODUCTION

Wireless networking is getting so advance day by day. It gets so advanced due to the advancements of technologies. Wireless communication is the most emerging technology of nowadays [1]. Thus data transmission from source to destination with security is important part in communication. Data is transmitted through the routers or nodes from one to another. Data i.e. transmitted is known as packets. These packets send from source to the destination [2].

Ad Hoc Networks are the wireless networks which poses the property of self-organizing or did not follow any physical infra to settle down in the environment. Nodes or hubs in specially appointed systems (Ad Hoc Networks) act as both client and router [3]. A few uses of specially appointed systems could incorporate mechanical and business applications including helpful versatile information exchange [4], such as military and protect operations. As of late, developing advances, for example, remote sensor systems (WSNs), wearable computing, pervasive processing, Internet of Things, have a great extent added to a further push toward application [5] possibilities of specially appointed systems [6]. Ad hoc Networks present the characterized attributes of open connect, dynamic topology, and dispersed operation.

MANETs are a type of ad hoc networks that comprises of large number of mobile nodes which are interconnected through wireless medium and do not have any centralized device or server. MANETs are the advantageous network as compare to other networks as it comprises of low infrastructure maintenance cost, less complex to implement [7], fault tolerance etc. The MANETs are widely used wireless network but there are some issues that have adverse effects on reliability of the network. These issues are lacking of centralized structure due to which each and every hub in the network act as a router [8]. In MANETs each node is responsible for delivery of data packets to destination node [9]. Thus, the node selection process in route creation is a tedious task.

This work develops a novel route creation process by selecting the nodes on the basis of various QoS factors such as energy of the nodes, throughout of the nodes, delay and drop rate of the nodes.

II. PROBLEM FORMULATION

Wireless sensor networks are spatially distributed networks by nature. The WSN is basically developed to monitor the various physical activities such as environment of surroundings like temperature, sound, pressure etc. Then this monitored data from respective surroundings is passed to the server or base station via created route by using the deployed nodes. Because of various features such as open network, bi-directional communication mode, dynamic structure, ad hoc network bears various uncertain problems.

In the tradition approach fuzzy logic was used to calculate fuzzy cost of each node in network so it can be selected for the communication, but fuzzy logic controllers are facing issue of defined work means as fuzzy works on the rules defined in it layer, as if input will be out of lower and upper limits set in system of fuzzy it will give random result so this approach is not much effective where real data is to transmit, can cause issue related to data drop etc. so there is need to update the system with the algorithm which can handle the multiple parameters for the selection of effective transmission node.

III. PROPOSED WORK

Ad hoc network is a system of wireless nodes that dynamically self-organize in arbitrary and temporary network

topologies. It consists of large number of nodes. As the occurrence of uncertainties is one of the major issues in the Ad hoc network. Many researches had done work to resolve this issue but as discussed in above section the traditional fuzzy system was not capable to handle them. So there is a need to propose a new algorithm that is that will consider sufficient and reliable list of parameters to overcome the issues of traditional work. So a new approach is to be proposed that will increase the number of parameters along with the implementation of MFO based decision model. The objective behind using MFO (moth flame optimization) is that it is capable to handle the uncertainties which traditional fuzzy inference system fails to handle. The parameters that will be used in proposed works are as follows:

a. Delay
b. Energy
c. Drop rate
d. throughput

The step wise flow of the proposed work is as follows:

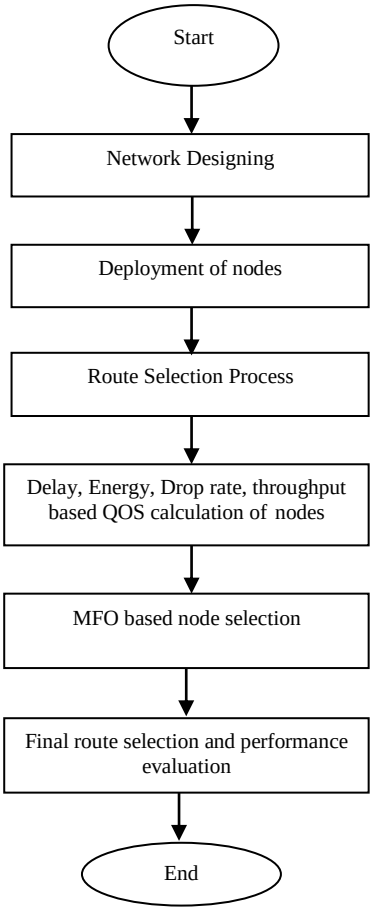

Figure 1 Framework of proposed work

Step 1. Start

Step 2. First step is to design the network. The network design refers to deployment of the nodes in a defined area for network formation. For this purpose, the user has to define the dimensions for the area in which the defined number of nodes are going to place. Along with this, the users have to define the amount of initial energy of the nodes.

Step 3. Next step is to deploy the network as per the defined dimensions for the area of the network, number of nodes in the network, initial energy of the nodes, source and destination node etc.

Step 4. In this step, the route selection process of proposed work is initiated.

Step 5. Evaluation QoS parameter is done on the basis of various factors of a node such as delay, energy, and packet drop ratio and throughput.

Step 6. Than the MFO optimization is applied to select the nodes for route creation purpose.

Step 7. After creating the route, the data transmission is done among source and destination node. After this, the performance evaluation is done to evaluate the efficiency and reliability of the proposed work.

Step 8. End.

IV. RESULTS

In this work a novel approach for route creation in Ad hoc network is developed and simulated in MATLAB. The basic for electing the route in this work is various factors of the node such as energy, delay, throughput, drop rate etc. This section presents the graphical evaluation of proposed work over traditional routing techniques. The graph of Figure 2 depicts the Packet Delivery Ratio of the proposed model.

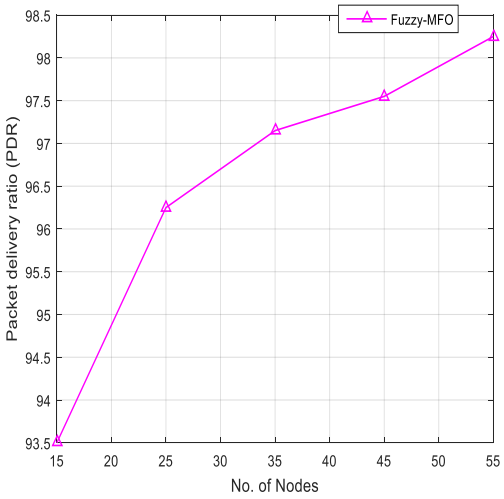

Figure 2 Packet Delivery Ratio of the proposed model with stable nodes.

The packet delivery ratio is the ratio in which it is described that how many packets are successfully delivered out of the total delivered packets. In this graph the Packet delivery ratio is shown on the y-axis ranges from 93.5 to 98.5 and the number of nodes is shown on the x- axis ranges from 15 nodes to 55 nodes. Here the nodes are stable and the packet delivery ratio of the proposed model that is Fuzzy-MFO is increased.

The graph of Figure 3 depicts the Packet Delivery Ratio of the proposed model comparative to the conventional models. In this graph the Packet delivery ratio is shown on the y-axis ranges from 70 to 100 and the number of nodes that are stable is shown on the x- axis ranges from 15 nodes to 55 nodes. The packet delivery ratio of the proposed model that is Fuzzy-MFO, shown as a pink line, is better than the conventional models that are MAODV, ODMRP, EFMMRP that are shown in the graph as green red and blue lines.

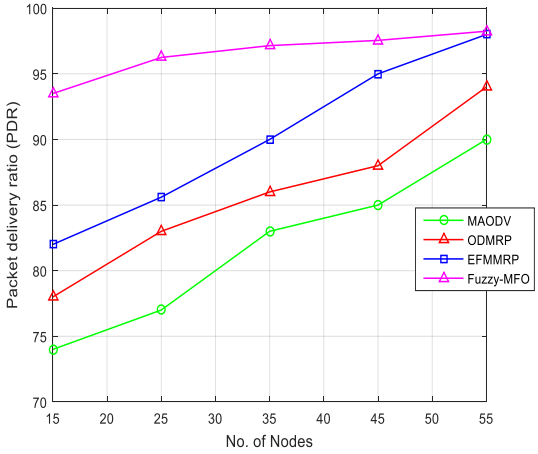

Figure 3 Comparison Analysis of Packet Delivery Ratio.

The graph of Figure 4 depicts the Packet Delivery Ratio of the proposed model with mobile nodes. In this graph the Packet delivery ratio is shown on the y-axis ranges from 93 to 94.2 and the number of nodes is shown on the x- axis ranges from 5 nodes to 30 nodes.

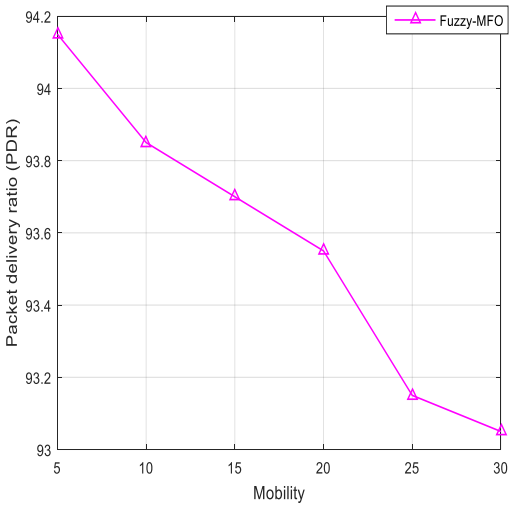

Figure 4 Comparison Analysis of Packet Delivery Ratio with respect to the mobile nodes.

Here the nodes are mobile and the packet delivery ratio of the proposed model that is Fuzzy-MFO is decreased due to the quick movement or mobility of the nodes the packets are lost or we can say that does not delivered properly.

The graph of Figure 5 depicts the Comparison of Packet Delivery Ratio with mobile nodes of the proposed model to the conventional models. In this graph the Packet delivery ratio is shown on the y-axis ranges from 45 to 95 and the number of nodes that are mobile is shown on the x- axis ranges from 5 nodes to 30 nodes. The packet delivery ratio of the proposed model that is Fuzzy-MFO is decreased but not as much the packet delivery ratio of the conventional models that are MAODV, ODMRP and EFMMRP is reduced. So the packet delivery ratio with mobile nodes of the proposed model is still better comparative to the traditional methods.

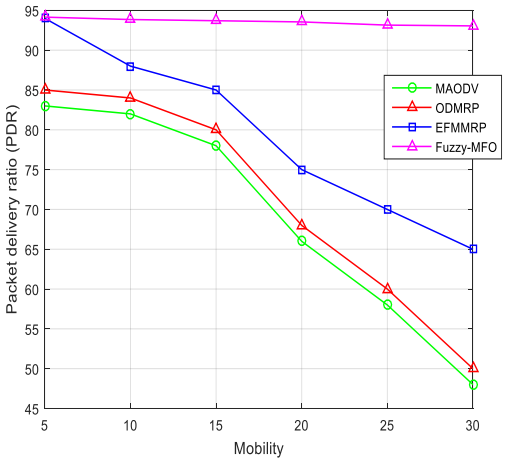

Figure 5 Comparison of Packet Delivery Ratio on the basis mobile nodes in network.

The graph of Figure 6 depicts the Packet Delivery delay of the proposed model with mobile nodes. The packet delivery delay is the delay of packets that are not delivered successfully due to the mobility of the nodes as the nodes move very quickly and the packets are lost.

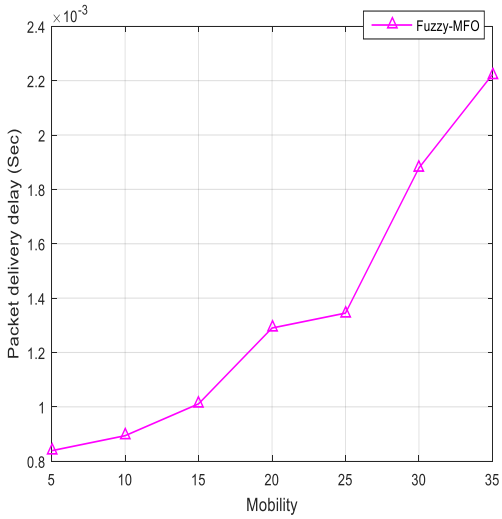

Figure 6 Packet Delivery delay of the proposed model with respect to the mobile nodes.

In this graph the Packet delivery delay is shown in seconds on the y-axis ranges from $0.8*10^{-3}$ to $2.4*10^{-3}$ and the number of nodes is shown on the x- axis ranges from 5 nodes to 35

nodes. Here the nodes are mobile and the packet delivery delay of the proposed model that is Fuzzy-MFO is increased.

The graph of Figure 7 depicts the Comparison of Packet Delivery Delay with mobile nodes of the proposed model to the conventional models. In this graph the Packet delivery delay is shown on the y-axis ranges from 0 to 0.2 and the number of nodes that are mobile is shown on the x- axis ranges from 5 nodes to 25 nodes.

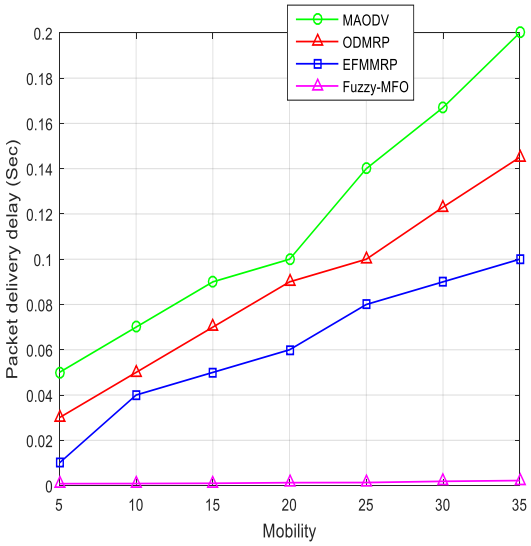

Figure 7 Comparison of Packet Delivery Delay with mobile nodes.

The packet delivery delay of the proposed model that is Fuzzy-MFO is increased but still it is better than the packet delivery delay of the conventional models that are MAODV, ODMRP and EFMMRP. As the packet delivery delay of the conventional models increases more. Therefore, the packet delivery delay with mobile nodes of the proposed model is still better comparative to the traditional methods.

V. CONCLUSION

With no central administration an Ad hoc network is a network is generated that contained mobile nodes which utilize a wireless interface to transmit packet data. In a network as the nodes of this sort can serve as routers and hosts, the packets can be forwarded by them on the basis of other nodes and perform consumer applications. The novel Fuzzy-MFO mechanism is proposed to handle the several parameters in order to choose the efficient transmission node to which the traditional mechanism is not capable of. The proposed model conquers the problems of the existing work. With the implementation of MFO based decision model the number of parameters is increased in this work. Also the uncertainties are handled by the proposed work in this paper. In the proposed model the packet delivery ratio is increased when the nodes are stable and the packet delivery ratio is decreased when the nodes are mobile. The packet delivery delay is increased when the nodes are mobile. But in all the cases the results of the proposed model are better than the traditional mechanism. Hence, it is proved from the results that the proposed model offers better results.

As the proposed work offers the better results but in future more amendments can be done and much better results can be achieved by working on the complexity reduction of the system and on the processing of the system.

REFERENCES

[1] A. K. Yadav, S. K. Das, S. Tripathi, “EFMMRP: Design of efficient fuzzy based multi-constraint multicast routing protocol for wireless ad-hoc network”, ELSEVIER, pp. 15-23, 2017

[2] S. Tan et al, “A Trust Management System for Securing Data Plane of Ad-Hoc Networks”, IEEE Transaction on Vehicular Technology, vol 65, pp. 7579-7591, 2016

[3] D. Zhang et al, “Software-defined Vehicular Ad Hoc Networks with Trust Management”, DIVANet, pp. 13-17, 2016

[4] F. S. Proto, “A Framework for Packet-Droppers Mitigation in OLSR Wireless Community Networks”, IEEE, pp. 1-6, 2011

[5] J. M. Robert et al, “RBC-OLSR: Reputation Nased Clustering OLSR protocol for Wireless ad hoc Networks”, ELSEVIER, vol 35, pp. 487-499, February 2012

[6] Z. Wei et al, “Security Enhancements for Mobile Ad Hoc Networks With Trust Management Using Uncertain Reasoning”, IEEE, vol 63, pp 1-12, 2014

[7] Heena, “Battery Power and Trust Based Routing Strategy for MANET”, IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT), pp. 1559-1562, 2014.

[8] H. Xia, “Trust-Enhanced Multicast Routing Protocol Based on Node's Behavior Assessment for MANETS”, IEEE , pp. 473-480, 2014.

[9] Z. Yan et al, “A Survey on trust management for Internet of Things”, ELSEVIER, vol 42, pp. 120-134, 2014

[10] D. Chasaki et al, “Attacks and Defenses in the Data Plane of Network”, IEEE, vol 9, pp. 798-810, 2012

[11] Y. Yang et al, “Broadcast encryption based non-interactive key distribution in MANETs”, ELSEVIER, Vol 802, No 3, Pp 533-545, May 2014

[12] A. Khandakar, “Step by Step Procedural Comparison of DSR, AODV and DSDV Routing protocol”, ICCET, vol 40, pp 36-41, 2012

[13] Rajesh Sharma, “ Dynamic Source Routing Protocol (DSR)”, ijarcsse, vol 3, pp 239- 241, 2013

[14] A. N. Thakare, “Performance Analysis of AODV & DSR Routing Protocol in Mobile Ad hoc Networks”, ijca, vol 4, 2010