Improved Artificial Colony and Balanced-AODV Routing Method for Performance Enhancement in MANET

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Abstract: With the advent in the field of internet and technology, there has been huge development in wireless communication system. Mobile ad hoc network is most challenging field in wireless ad hoc network. Due to increase in the acceptance of the mobile sensor and wireless system network, wireless ad hoc network system has become lively and vigorous field of data communication and system networks. Mobile ad hoc network (MANET) is an automated association of the movable sensors (Laptop, mobile phone and sensor device) that connect with each other above wireless connections and collaborate dispersed order for presenting an essential network function without fixed arrangement. In exiting approach, proposed a well-organized and steady route algorithm based on learning automation (LA) for mobile ad hoc network. First, they construct novel stable op measurement method and describe real power ratio function. In proposed method, designed a Balanced Ad-hoc on demand distance vector routing protocol to communicate the packets one node to another node and generate the balance index. Implement a novel approach (IABC) improved Artificial Bee Colony Optimization algorithm to enhance the route performance. Design a Balanced Ad-hoc on demand distance vector routing protocol to communicate the packets one node to another node and generate the balance index. Improved ABC algorithm implemented to enhance the route energy and delay with balance index. Employee Bees, Onlooker and Scouts with Cost Function to improve the performance. Evaluate the performance metrics like as a packet delivery rate, energy and throughput and compared with existing parameters (End to end delay, Energy consumption and packet Delivery Rate).

Keywords: MANET (Mobile Ad-Hoc Network), Balance on demand distance vector routing protocol, Improved Artificial Bee Colony Optimization Algorithm and Balanced Index.

I.   INTRODUCTION

MANET is mobile ad network that is self-regulating scheme of the movable nodes linked with connectionless contacts, single node operate as destination and route to other movable hop in system network. MANET is set of the connectionless movable node associated through forwarding of data frames for another hop to allow communication externally of straight wireless communication [1]. Mobile ad hoc network is the association of the movable nodes that have automated self-regulating system network. There is linking of various nodes in mobile ad hoc network. Various routing protocol are present in mobile ad hoc network. Movable nodes determine route among the nodes and distribute data that selects the route among nodes in the network [2].Mobile ad-hoc network features are; (i) Self Regulating (ii) Simple Communication and (iii) maintain Multiple Routing in the mobile ad hoc network.

1. Self-Regulating:- Each movable node in mobile ad network works as host and router. One node route the data to other node and other node forward the data packet to nearest node in mobile ad hoc network[3].

2. Simple communication:- The data transfers among the mobile ad network may change. Node may be connected during the communication and disconnected. Permission for communication is not required for the communication among the nodes. The data communication in mobile ad hoc network is simple and cheap.

3. Maintain Multiple Routing in network:-Various type of routing takes place in mobile ad hoc network. The type of routing is unicast routing and multicast routing. The sender controller was forwarding of the data to another node in wireless links. Sender will start communication on the basis of the PREQ message to mobile ad hoc network system.

The major challenges are Routing, scalable, QoS and Security threats [4].

1. Routing: In mobile ad hoc network, there is presence of multiple routing that alter because of portable nature. Routing protocols has been developed for better communication. When data packets are forwarded to other nodes, new routing table is set in mobile ad hoc network. Routing may be proactive where direct routing used as direct communication. In routing protocols, route table may not set as new every time[7].

2. Scalable nature: In unique noticeable scheme, computation is worked for the remote sensed system. In some versatile multipurpose required system contains number of hub. The considerable scheme contain hub along with controlled values are not direct that have some issues Which are Managing the space ,mange the data, high remote technology.

3. Quality of Service (QOS): The number of the applications area may be due to the presence of the administrated data. The nature of the data hold by system may lead to problem during the time of the execution. Node and hub allowed to move anywhere in the system.

4. Security Concern: Security is an essential part of the network system. The main problem in the security is the chance of the attacks by the intruders. Hub update the route information and accessible for main communication of data. There may be chance of sending wrong information to the system [5,6].

Proposed algorithm is Balanced Ad hoc on demand distance vector routing protocol (B-AODV) is the advanced version of the

AODV protocol [8,9]. B-AODV is re-active protocol that rate of broadcasting message by creation of path that depends on demand. When source node forward the data packet to destination node, a route request packet (PREQ) is broadcasted. Neighbor node forward the data packets to nearest nodes and the procedure will repeat unless the data packet reaches to destination node [10]. When route request is forwarded to neighbor node, middle hop place the address location of the neighbor node .The data stored in routing table supports for development of reverse route. If duplicate of similar request PREQ are received then packets are rejected. The reply message is passed to node through reverse route. Route discovery method will proceed again, during movement of sender for the maintenance of route. If middle node pass through specific node that can recognize the failure in the connected links and forward an alert message to neighbor node. The method will repeat unless an alert message reaches sender node [11,12].

An improved artificial bee colony algorithm is advanced form of artificial bee colony algorithm. It is technique in which Optimisation works as the actual bee search for the food Or destination. This approach resolves a sequence of the composites optimization issue. The complex structural data can be enhanced through normal approach. An artificial bee colony approach is surrounded through local maxima in artificial bee colony algorithm. It is based on swarm intelligence process that depends on foraging behavior of honey bee. It contains three phases which are employed bee, onlooker bee and scout. Employed bee achieves data before exploration and presents data to onlooker bee. Scout may search the data randomly based on external probable approach [13].In proposed work, design a Balanced Ad-hoc on demand distance vector routing protocol to communicate the packets one node to another node and generate the balance index. Implement a novel approach (IABC) improved Artificial Bee Colony Optimization algorithm to enhance the route performance with delay, energy and delivery rate and compared with existing parameters.

Section I, described that the introduction about the mobile ad hoc network, feature and challenging in the network. Section II and III defined that the existing research and research methodology. In proposed work develop a new method to resolve the main issues such as network overloading and High time consumption. IV section defined that the result explanation with balanced on demand distance vector and Artificial Bee Colony Optimization. Section V defined that the conclusion and future scope in improved artificial bee colony optimization algorithm.

II.   RELATED WORK

Alnumay W., et al., 2019[14] proposed a research on new measurable method by linking directly and indirectly the choices for computation of the exact value. Additionally, this research describes about the measurable method for mobile ad hoc networks. Proposed research method have the possible segmentation for the linking various proofs and direct computation. In this research, was combining of the proof and prediction of actual output for each hop in multiple approaches. Along with that, routing protocol was established to guarantee the safety and end to end delivery of the data frames in the route. Experimental results determined that the planned measurable method have better result than the existing output.**Jabbar W. A., et al., 2014 [15]**proposed a research on the quality of service and efficiency of power based on the routing protocols. The name of the protocol is OLSR, DSR and AODV, MP-OLSR with the multiple extension output. This research focused on the part of the various protocols. Performance metrics evaluate the result on the basis of the traffic internet based utilized through various benefits. In this research, proposed algorithm on the basis of the network density of various applications.**Neeraj, K., Yedupati, K., et al., 2018, [16]** proposed a research on the assumptions of the related routing for the altered number of the nodes for the selected scheme in mobile ad hoc network. In this research, deep replications were done using ns2 simulation. Experimental describe about the transmission of the data on the basis of the throughput, end to end delay related to amount of the nodes in specific model.**Ali, A. K. S. et al., (2017)[17]** studied about the concept of the various routing protocol which are AODV, TORA and DSR routing protocol. In this research, presented simple connection criteria and ad hoc demand vector algorithm for the mobile ad hoc networks. This algorithm helps to decrease the network delay by building route table among sender and receiver. Other algorithm is temporarily order route approach (TORA) that related on the connections for the production of reliable multiple system networks. Both the approaches lead to detection of the data packets from sender to receiver. The procedure includes, creating route and maintain of the route.**Bai, Y., Mai, Y and Wang, N et al., 2017[18]** evaluated and compared the presentation of the four described protocol of mobile ad hoc network utilizing NS2 simulation result. In this research, proactive protocol is DSDV and FSR approach whereas re-active protocol is AODV and DSR approach. In this research, description was done on the basis direct justification of the amount of node and data packet in re-active and pro-active routing protocol. Experimental analysis was done on the basis of the evaluation results which are overhead, throughput and end to end delay by comparison analysis with existing results.**Bhuvaneswari, M and Naik, D 2014[19]**established a new technique on the cryptography that presents the authenticated data, safety, confidential data and unique data utilizing certified approach and public key method. Firstly, detection of the attack and protection of the routing protocols. Secondly, number of techniques and approach increase the safety of the routing protocol. An approach was for the selection of the authenticated data and key administration. Thirdly, assume the routing and safety method used to acquire necessities. In this research, routing scheme was applied to increase the security mechanism on the basis of the computation method.

III.   RESEARCH METHODOLOGY

In this section described the steps in research work in MANET.

- Initialize a network (MANET).
- MANET deployment based on network area (l*w).
- To find the source and destination.
- Set the coverage range to transfer the information one hop to another hop.
- Initialize B_AODV Protocol.
- Request Sent, Request Reply and Route Error.

- Calculate the route with balanced index.
- Improved ABC algorithm implements to enhance the route energy and delay with balance index.
- Employee Bees, Onlooker and Scouts with Cost Function to improve the performance.
- Evaluate the performance metrics like as a packet delivery rate, energy and throughput.
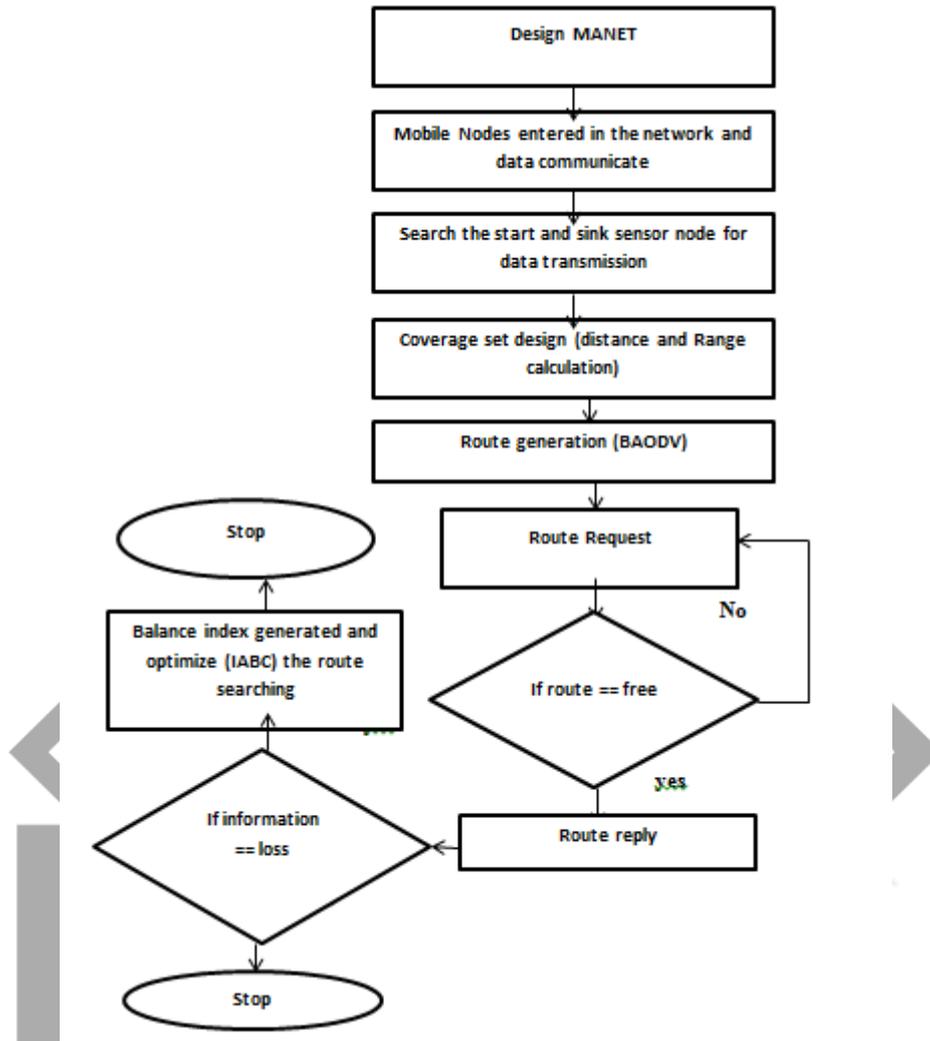- Comparison.

Figure 1. Proposed Methodology Flow Chart

In this propose work; implement novel approach to improve the performance in MANET. Proposed algorithm works with Route Requests:-

BAODV and IABC algorithm:-

1. Signal Communication
2. Ack Signal
3. Route Request
4. Route Reply
5. Route Error
6. Balance Index (Energy and Time).
7. Fitness Function.

IV. RESULT ANALYSIS

In this section, mathematical equation described in below:

4.1.1 Energy Consumption
The consumption of the energy during the routing and the trasmission of data may loss of power in the network. In wireless body area network, the lifetime of the network can be enhanced in the prrsence of the nodes.The equation of the energy consumption can be mathematically can used as,

$$Energy = E_S + E_C + E_D + E_M \qquad\qquad \text{……………………………………… (i)}$$

The energy consumption is the sum of the energy in signal transmission, energy consumption during aggregation , energy during depletion of energy and energy consumed during mobile process.

4.1.2 Delay
The average delay is the difference of the time of the arrival of the packets and the sending time of the packets to the ratio of the total number of the connections.

$$\text{Average Delay}= \sum \frac{Arrival\ time\ of\ packet - sending\ time\ of\ packet}{Total\ number\ of\ connections} \qquad \text{………….. (ii)}$$

4.1.3 Packet Loss
Packet loss is the reduction of the power density of an electromagnetic density ehich propagte through the space.Packet loss can be expressed in decibels,

$$P_{pac} = 10 log_{10} \frac{P_T}{P_R} \qquad\qquad \text{………………… (iii)}$$

In the wirelss body area network, the P_T is the transmitted power and P_R is the received signal power during the communication of the network.

4.1. 4 Packet Delivery Rate
The packet delivery ration is the method for the recignisation of the efficiency of the network.Packet delivery ratio is the number of the received packet to the number of the packets tranmitted.

$$\text{Packet Delivery Ratio}= \frac{no\ of\ the\ packets\ recieved}{Total\ number\ of\ the\ packets\ transmiitted} \qquad \text{……………….. (iv)}$$

4.1.5 Throughput
It defines the average data rate or nodes of successful information delivery over a specific communication link.
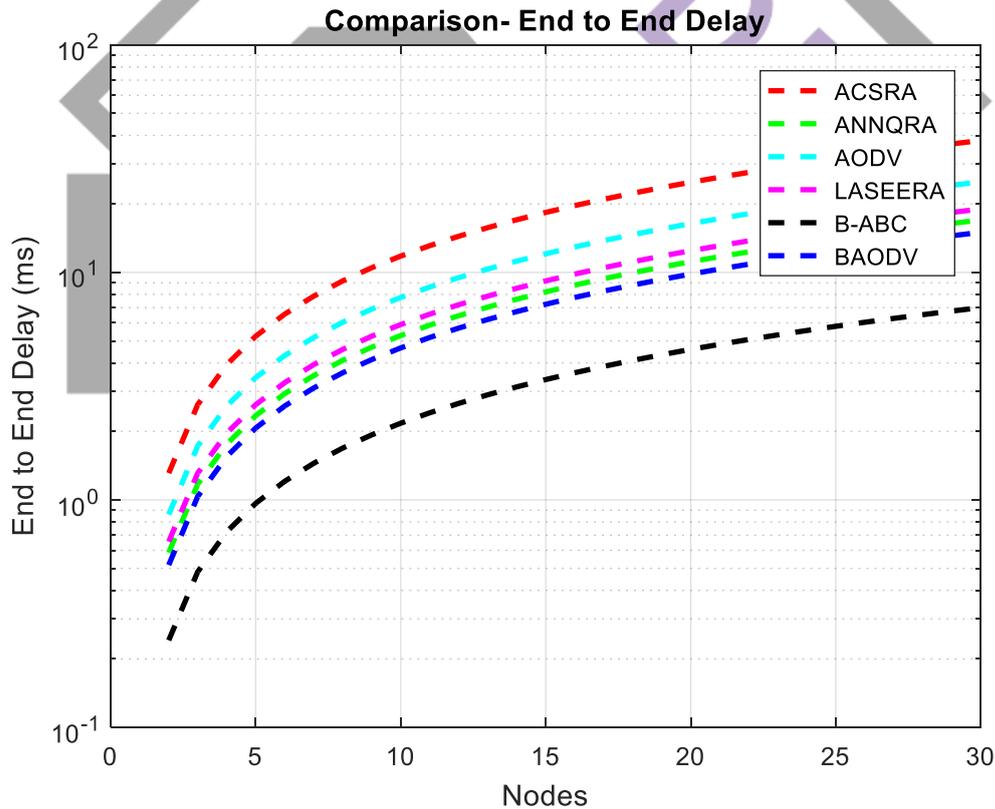

Figure 2. Comparative Analysis with End to end Delay (ms)

The end delay factor also indicates the performance of the network transmission. The high rate of calculated end delay of network communication shows slow speed and degraded network transmission. In figure 1, transmission with BAODV, ABC, LASEERA, ANNQRA, ACSRA in an ad-hoc network shown. According to figure 1, the proposed optimized transmission technique shows a low rate of end to end delay.
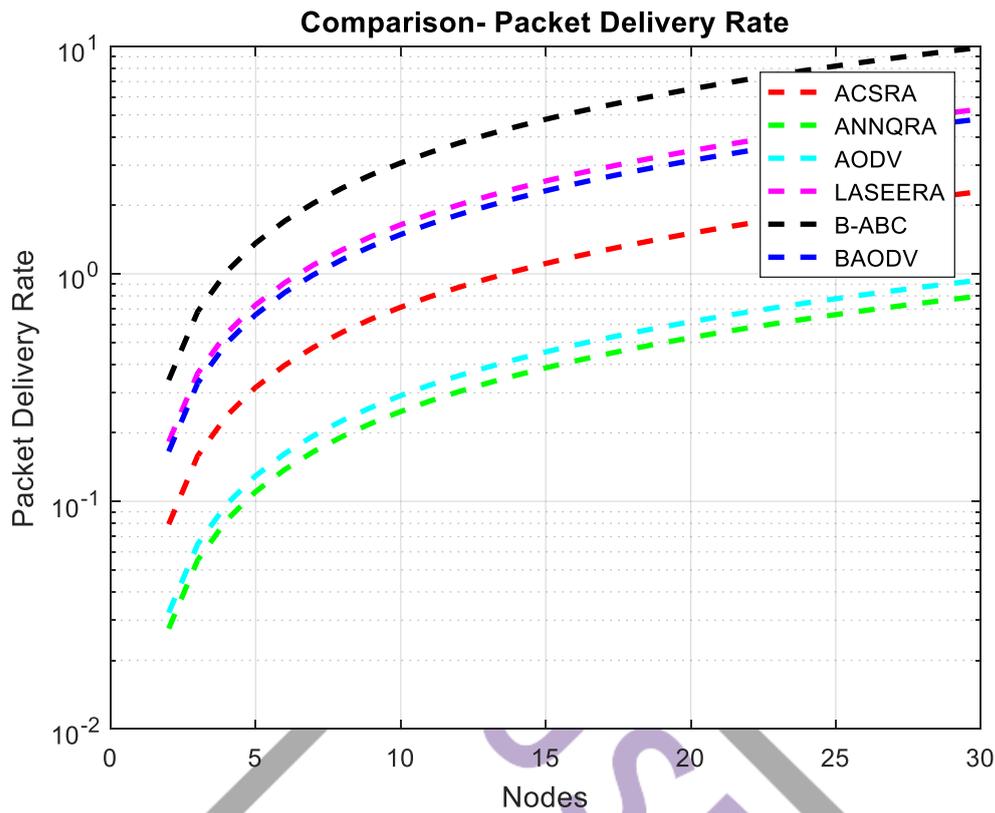
Figure 3. Comparative Analysis with Packet Delivery Rate (%)

Packet delivery rate of various routing protocol shown in figure 10. Packet delivery rate shows the speed of network transmission and accuracy. High packet delivery ratio shows better performance of the ad-hoc network. PDR in the above figure calculated and compared with the various existing techniques in the ad-hoc network. Proposed packet delivery rate shows high transmission speed as compared with others. PDR is high in all the cases in the comparison shown in figure 3.
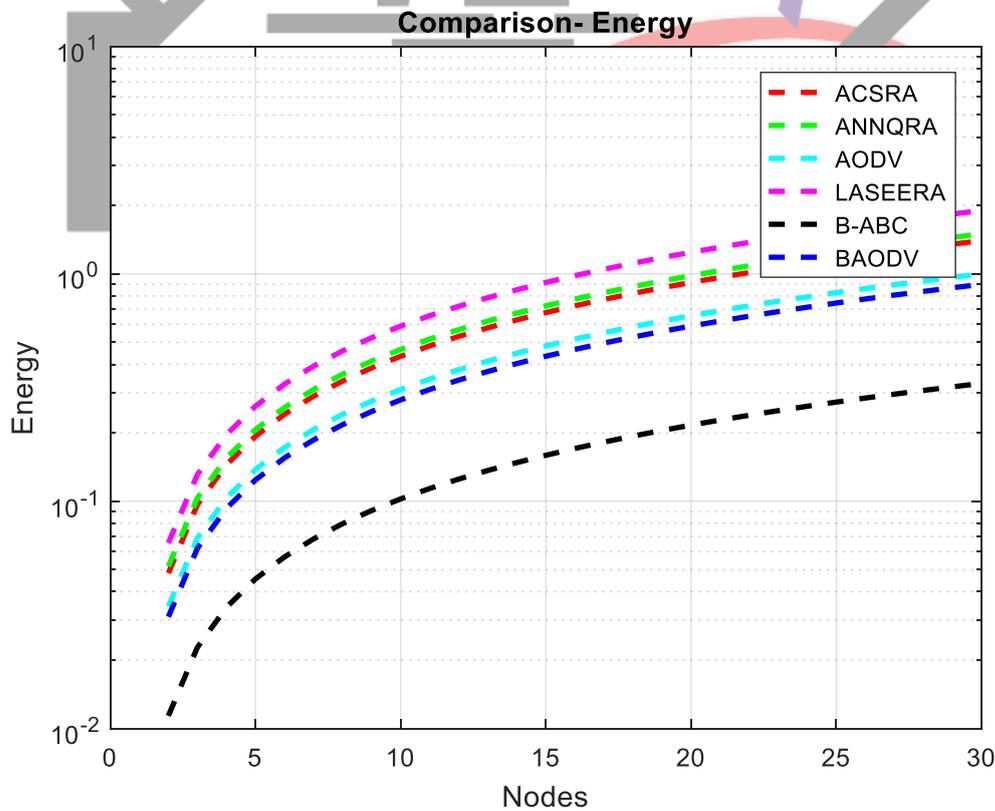

Figure 4. Comparative Analysis with Energy (Joules)

One of the most critical parameters that show the cost of the network in terms of energy consumption. High energy consumption shows degrade performance of the network. In the simulation environment, the performance of various protocols calculated and

compared. The proposed optimized algorithm shows the high performance of the transmission and less energy consumption. With this comparison, it shows the cost effectiveness of the proposed architecture.

Table 1: Proposed Parameters

Parameters	(BAODV) Routing Protocol	Improved ABC algorithm
Delay	15	7
Energy	0.9	0.33
Packet Delivery Rate	4.8	9.9
Throughput	48	79
Path loss	300	99

Table 2. Comparison between proposed and existing parameters

Parameters	BAODV	B-ABC	ACSRA	ANNQRA	AODV	LASSERA
Delay	15	7	38	17	25	19
Energy	0.9	0.33	1.4	1.5	1	1.9
Packet Delivery Rate	4.8	9.9	2.3	0.8	0.94	5.30

Table 1 and 2 defined that the parameters with proposed work is energy, packet delivery rate, throughput, path losses and delay. Energy consumption and delay metric in proposed work minimum values achieved and packet delivery maximum rate. Other one is comparison shows about the parameter based delay; energy optimized the values as compared to other routing methods and increases the packet delivery rate as compared with the various routing methods.

V. CONCLUSION AND FUTURE SCOPE

In conclusion, MANETs are WNs (Wireless Networks) that used various hop routing instead of dynamic or static network infrastructure to give network connectivity. Manets have various applications in speedily changes according to time. Therefore, there are main challenges for routing protocol to detect the attack in the network and sometime less packet delivery. In research work are developing a novel methods with routing in MANET network, comparing and enhancing existing parameters. Implemented a balanced ad-hoc routing protocol to balance the route and data transmission based on shortest path creation. In BAODV algorithm implemented two phases: (i) Path discovery and (ii) Path Maintenance.

In path discovery means to broadcast the signal in the network for data transmission. Source sent the packet one node to other nodes. Source sent the requests closest to the node if node is free then reply back otherwise waiting case occur. All data transfer according to the nearest node reply is back. After that, protocol validates the request factors and time, energy. If a route consumes high energy and time then route size is maximum then no index generate. After that small route search then create the balance index and find the attack node in the mobile network. Sometime most of route consumed high time and network load occur in the network. Then path losses and packet drop. This is the major issue in the MANET. In research work, has implemented a novel algorithm which is improved artificial bee colony optimization. When IABC implemented in the network and re-filter the routes in the network with the help of fitness cost function. IABC perform the iterations to re-verify the route information and waiting state. It has working on heavy weighted routes then re-filter the packet information and optimize the performance of the network. Experimental analysis using MATLAB 2016a tool box with script language and designed a code in programming language based. Evaluate the performance metrics based on energy, throughput, delay , packet delivery and packet losses.

In future work, will implement authentication algorithm to improve the network security and performance enhancement in mobile adhoc network. In Mobile ad-hoc network all information has moved one location to another location. Sometime data or packet losses in the network phase then it will implement authentication (KDS) design to create the secret key to packet sharing time. It is a unique key and before information open combined with secret key and id search in unique after that user access the original message and packet rate.

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