International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-6, March 2020

Energy Bio-Inspired For Manet

Rohan Sharma, Pankaj Bhambri, Amandeep Kaur Sohal

Abstract*: Mobile Ad-Hoc Network (MANET) is a collection of wireless mobile hosts forming a temporary network without the aid of any stand-alone infrastructure or centralized administration. Due to the mobility of the nodes in the network, these nodes are self-organizing and self-configuring. Not only they act as hosts, but also, they function as routers. In MANETs, routing protocols are necessary to find specific paths between the source and the destination. The primary goal of any ad-hoc network routing protocol is to meet the challenges of the dynamically changing topology. Therefore, an efficient route between any two nodes with minimum routing overhead and bandwidth consumption should be established. The design of these routing protocols is challenging due to the mobility and the dynamic nature of the mobile ad-hoc networks. MANET routing protocols are categorized into two types: proactive and reactive. In this paper, the MANET characteristics and challenges are highlighted. Moreover, a comparison is conducted between three protocols: namely, DSDV, DSR and AODV in terms of both properties and performance.

***Keywords:* MANET, IDA, RREQ, Local binary patterns.**

I. INTRODUCTION

The MANET is an ad hoc mobile network that can change positions and fly [1]. Because of the mobile nature of MANETS, they are wirelessly linked to different networks. As MANET is an auto-organizing and easily deployable wireless network for applications including special outdoor events, wireless-free communications areas, developing and natural disasters, military, mining, emergency trade meetings and robot data acquisition, and more, they are strongly suited [2,3]. Many MANETs can only be connected to the Internet in a local wireless area (such as a laptop-only community). For example, a VANET is a type of MANET that permits vehicles to attach to equipment on the roadside. Although vehicles cannot be directly connected to the Internet, the Internet can be connected to the wireless route equipment's so that vehicle information can be transmitted via the Internet.

Manuscript received on February 10, 2020.
Revised Manuscript received on February 20, 2020.
Manuscript published on March 30, 2020.
Correspondence Author
Rohan Sharma*, Department of Computer Science and Engineering, Guru Nanak Dev Enginerring College (G.N.E), Ludhiana, Punjab.Email: rohansharma134d@gmail.com
Pankaj Bhambri, Department of Information technology, Guru Nanak Dev Engineering College(G.N.E), Ludhiana, Punjab.Email: pkbhambri@gndec.ac.in
Amandeep Kaur Sohal, Department of Computer Science and Engineering, Guru Nanak Dev Enginerring College (G.N.E), Ludhiana, Punjab.Email:amandeeepkaursohal@gndec.ac.in

Considering the dynamic nature, it is important to take care how data is transmitted over the MANET, because MANETs are typically not extremely safe.
The key task of building the MANET system is to ensure that each system keeps the data it needs to transport its roads properly [4] on an on-going basis. Usually multiple hops may be included in ad hoc network routes between nodes and, thus, this form of wireless multi-hop ad hoc networks should be referred to.

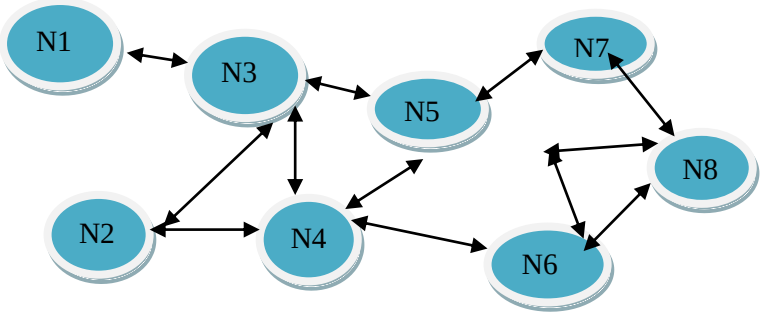

Fig.1. Mobile Ad Hoc Network (MANET)

II. ROUTING PROTOCOLS IN MANET

Routing protocols are rules that govern message packet in a network route from source to destination.
A. *Proactive Routing*: Proactive protocols for routing are also referred to as protocols for table routing. That node has a routing table which contains network topology information in this protocol. Although this function is useful for traffic with datagrams, it acquires major signaling and electricity consumption. These protocols contain a number of routing tables protocol-to-protocol. DSDV, OLSR, CG SR, WRP, TBRPF, and QDRP are separate routing protocols.
B. *Reactive Routing*: A reactive routing protocol is also called as for the request routing protocol. This route can be found in this protocol wherever possible. The nodes are focused on road discovery requests. The source node will check for the correct path from source to destination if the path is not available, it will start the route sensing process. For e.g., DSR, AODV, LMR, TORA, LQSR etc. are reactive routings.
C. *Hybrid Routing*: The features of reactive and proactive are inherited by hybrid protocols which usually attempt to exploit a reduced overhead traffic of proactive systems while minimizing reactive route discovery time by retaining a type of route table.

III. ROUTING OPTIMIZATION ALGORITHMS

A. Cuckoo Search Algorithm:

To give effective way foundation from source to goal, improvement has been proposed here inside the AODV convention which incorporates the usage of cuckoo search Algorithm. Cuckoo Search man-made consciousness advancement calculation finds the briefest steering way for sending information in MANETs.

Yang and Deb [8], created metaheuristic CS calculation, motivating cuckoo feathered creature multiplication framework. In other host winged creature's home, cuckoo female prepared her eggs. Accidentally the host flying creature raises her brood along those lines. Host birds will The host plum trees will throw out them or leave their homes. The CS calculation takes into account that each egg is arranged in the host and that the cuckoo egg can talk to a new arrangement. When new arrangement is perfect, the most remarkably awful arrangement at this stage is replaced by new arrangement. Yang and Deb [8] find that the erratic flight of demand is the better way to walk arbitrarily than the simple one. The CS strategy for arithmetic's creates an ideal new arrangement using demand walking [9] in every single home, for instance, with one egg (arrangement). Cuckoo birds produce progressive eggs that flash like the host's birds in the field. Consequently, a guide for optimization is three important points, as shown below.

- *Original Solution*: The solution package consists of cuckoo eggs and is randomly placed in a separate nest.
- *Next generation*: Next generation is allowed only a portion of the eggs (major eggs) with acceptable solution.
- *Acceptance rules*: when one of the eggs is marked as odd and replaces the alien in a new nest, the planned remedy is withdrawn. CS algorithms initially begin with n host nest populations and meet monotonously. The jth part of Equation 1 is contained n the original document.

$$Xij(0) = R.(Uij - Lij) + Lij \quad (1)$$

Where in Uij there is the upper jth of Lji, the lower jth of Lji, R is an interval between 0 and 1 of a random uniform number. This approach ensures that initial values remain in the search area for every search iteration.Every house contains one egg in the basic CS algorithm. If, for instance, multiple eggs are available, the algorithm may be expanded to a slowly intertwined scenario. The control parameters of the CS algorithm are especially simple for the number of cycles for this one limit condition. The space limits permitted are therefore followed when estimates of the characteristics flood. The levy flight algorithm [10] is used to randomly select cuckoo egg I to create another Xi(h + 1) arrangement for every h focus. This is a somewhat unusual walking algorithm, with steps labelled to steps that have certain chance of spreading randomly or isotopically upon request for the means. Levy flight searching with traditional techniques levy is summoned to other irregular flights due to improved CS

$$xi(h + 1) = xi(h) + \alpha \ \ levy(\lambda) \quad (2)$$

Equation 2 includes the non-exclusive levy flight condition, Levy (ć)h, where h shows the current age quantity and μ shows step-size that is a scale factor issue, refers to a simple increase in the passage for levy flight. Equation (5) the probability distribution chain refers to Markova. Local position h + 1 depends separately upon current location h, likelihood of first and second development. Equation 3 shows the probability of advancement of levy flight; find the cuckoo eggs in their nests.

$$-\lambda,(1 < \lambda\ 3) \quad (3)$$

With an infinite mean, I am named for infinite variance. Random number generation and random distribution with included levy are chosen. Positive and negative approach Equation 4,5 takes symmetric approach into account.

(1.4)

$$\varphi = ((\hat{}\ 1 + \beta\hat{})\sin((\pi.\beta)/2\hat{}) \quad (4)$$

$$(((1 + \beta)/2)\hat{}.\beta.2\hat{}(\beta - 1)/2\hat{}))1/\beta, \quad (5)$$

Where in the original Yang and Deb implementation [8], Gamma and β = 3/2″ are referenced. The levy flight test feature is given by Eq. (8),

$$f(x, y) = \sin2(3\pi x) + (x - 1)2(1 + \sin2(3\pi y)) \quad (6)$$

The following sections describe solution encoding, fitness assessment and multicast routing algorithms in greater detail.

Solution Encoding: The simplest way to describe the algorithmic process is through solution coding. The objective is to transfer data centers, using a Multicast Routing Algorithm, from the source node to the number of destinations requested. Let D1 and D2 identify two S source information destinations. The paths to the objectives of the goals are shown in the following numbers: D1=P1,P2,..... Pm and D2=P1, P2,..... Pn, so that the direction range Pm depends on the number of nodes in the route, i.e. The routing protocol suggests optimal options for routes with better fitness values.

Fitness: The consistency of the solution is determined by the value of fitness. The algorithm's fitness takes four energy goals, LLT, distance, delay into account. As with the following equation, the exercise efficiency of the algorithm must be higher, maximal LLT and the minimum delay between the nodes must be lower;

$$F = \left(\frac{f1}{2T}\right) + \left\{\frac{1}{3 * f1 * 2}\left[\sum_{i=1}^{D}\sum_{j=1}^{Pi}\sum_{n=1}^{Nj}\left(E_n + \frac{LLT(n\prod+1)}{NLLT} + \left[1 - \frac{D}{NDr}\right]\right)\right]\right\} \quad (7)$$

Where T is the network's total number of nodes, D is the number of destinations, Pi is the number of paths that are available to get to the target, En is the node capacity, LLT is the lifetime of the connection between nodes n and n+1; DT is the distance from n to n+1. The f1 is the total number of path nodes, as shown,

$$f_1 = \sum_{i=1}^{D}\sum_{j=1}^{P_i}\sum_{t=1}^{N_j}|N_j| \quad (8)$$

Where Nj is the total number of jth path nodes.
Maximum node energy is required for an effective algorithm for the transmission of the node. The energy of the node is often reduced due to mobility and complex network topology. The maximum energy required in a node must therefore be maintained during transmission. The energy node En contains a continuum rating, where 1 is best and 0 is worst. The second limit is the length of the connection that is optimal for an algorithm (depending on the mobility of the node). LLT affects how the network works better. There is also a similar energy in the connection of the nodes, which needs a maximum value to boost the L.CSO-AODV algorithm is the CSO-AODV algorithm for optimizing the track collection and the trustworthy data supply. The transmission of data to the destination is hampered if the routers identified by AODV are energy-efficient and extremely traffic overloaded. Consequently, AODV is proposed as a CS Routing Optimization solution based on algorithms. It chooses the best way to provide the information effectively. If the response to the route from the target is given, several routes are transferred to the source. That router is fastened with the remaining power, hop count and routing load. Source processes the response packs from different paths and determines the fitness function for each route. The path with the highest fitness value is selected.

Algorithm 1: Basic cuckoo search algorithm.
1: Procedure Objective function (f(v), v = (v1, . . ., vd)P)
2: Generate initial population of n host nests vi i = 1, 2. . . n
3: While p < Max Generation or stop criterion
4: By Levy flights get a cuckoo randomly
5: Evaluate its fitness / quality Qi
6: Choose a nest among n (say, j) randomly
7: If (Qi > Qj)
8: Replace j by the new solution;
9: End
10: A fraction Qa of worse nests is abandoned and new ones are built
11: The best solution is chosen or kept (Quality solutions nests);
12: The current best is rank to find the solutions
13: End while
14: Post process results and visualization
15: End

B. Fire Fly Optimization Routing Algorithm:

The Firefly algorithm is broader than the direct algorithm in terms of scalability and processing time. In this work, a new meta heuristic used for complex optimization issues is proposed to evaluate the shortest path for a Firefly algorithm [6]. Firefly is a modern meta-heuristic Yang algorithm which has been used to solve optimization problems [37]. It is an advanced, smart swarm algorithm which uses' bioluminescence' natural fireflies. A firefly in the search area interacts in the light which affects the range and attraction of the mattresses with the surrounding firefly retardant. This research explored how this algorithm can be used to determine the shortest route in a network.

IV. LITERATURE SURVEY

Kout et al [4] Proposed a new routing convention based on the cuckoo search technique. Mobile ad hoc networks (MANETs) have become a new innovation, giving customers multiple focal points in terms of cost and convenience. A MANET is a set of multi-hub links, which frame a topology of transfer systems without a base station. Steering is a way to send data from a transmitter to a growing receiver. Routing is a technique that certifies the relation between two hubs in a system every time. The Network Test System 2 is revised for this steering convention.

Olagbegi et al [6] Presents a comprehensive review of recent work on energy-efficient Multicast Routing Protocols and Secure Multicast Routing Protocols for mobile ad hoc networks (MANETs). Many problems and solutions illustrate the need for energy and security management in ad hoc wireless networks. The purpose of a Multicast Routing Protocol for MANETs is to enable the transmission of data to all recipients of a MCN and, in the event of regular topology changes, make efficient use of the available bandwidth. The use of the inherent wireless communication broadcast property when transmitting multiple copies of messages enables multicasting to optimize the efficiency of a Wireless Link. In MANETs, efficient multicast routing plays a major role. Nonetheless, it is a difficult and demanding job to provide energy-efficient and reliable multi-cast routing. In recent years, MANETs have been equipped with different multicast routing protocols. These protocols feature characteristics and use various mechanisms. Rohit et al. [8] The theoretical and NS-2 simulation analyzes for MANET were proposed based on the different performance metrics of DSR routing protocol New Reno, SACK, TCP and Hybrid TCP variants.

Delivery ratio of goods, end of production, waste and average volume. Packet delivery. Such efficiency calculations are calculated by adjusting the node density for the same number of nodes in the three four variants. Variant simulation provides the opportunity to pick a good routing setting and the information to use variant algorithm schemes in the static network. Simulation results demonstrate that the variants decrease efficiency as the network node density increases. As the node density increases, simulation results show a decrease of the packets and overheads of the routing protocol, while the distribution ratio of the packets is decreasing. Systems modeling is commonly used for applications ranging from engineering research, business analysis, production planning and biological science, to name only a few. In contrast to analysis modeling, simulation normally requires less model abstraction (i.e. less simplification assumptions), because the actual system can be represented in the simulation model in nearly every detail possible.

If the structure is rather large and complex, it may not be possible to formulate a simple mathematical formula. In this case, the method of simulation is generally preferred rather than analysis. MANET has received attention from many researchers through its importance in the wireless network community. Although a lot of research has been done on the various routing problems within MANET, some areas still need further study.As a result of a time limit, we have focused only on ad hoc routing variants for specific node density with DSR protocols, but there are still some areas that need more attention in the routing protocols.

Varshaney et al. [9] Presented ad hoc networking descriptive research by presenting its associated research history, including MANET definition, characteristics and applications. There are also some technically challenging MANETs, whereby the paper points out some advancement of ad-hoc networking technology research, which is intended to promote the creation and accelerate MANET technology's commercial message coating. Mobile computing is emerging and is another way to communicate on mobile devices, known as a mobile ad hoc network, which forms an autonomous, self-organized, self-managed wireless network. MANETs tend to be more vulnerable to physical safety risks than rigid or. This

paper offers insight into different concepts for MANETS including features and uses, inherent versatility, lack of infrastructure, ease of implementation. In so many ways, the ad hoc network nodes will be smaller, more reliable, capable and in all types, especially if dense deployments such as battlefield and sensor networks are required. In general, the analysis will continue to be remarkably complex and creative given the widespread duplication of Ad-hoc networks.

Sivakumar et al[10] Different criteria for the four ad-hoc network tests include a message supply ratio, packet loss, average end-to-end delay and performance of different node numbers. Several packets are lossed, and many packets are lost if this network are expected to have a DSDV routing protocol. Email loss packets and loss of packets in your area when a connection happens based on various nodes. FAODV works on less loss of packets than other types of routing. Our simulation based on ns-2 has confirmed that the advantages of FAODV are comparable to DSR, DSDV for improving package delivery, reducing delays in end-to-end, and output. FAODV is a single diagram that shows the way to the destination node from the source. If a source node begins a path to the destination that no source route is already given. Send the Path Request Packet (PRP) source node to the neighbor's node. The regionalization of PRP messages from the source node to the target node. The packet Route Request is used to set up a path to find the easiest route between source and destination. This packet receives the that node, and checks that its source node updates the destination address data in the route information tables.A PRP node will send a response to the corresponding node. Whether it is the destination node or whether it is a path that can reach the target node. If the PRP packet does not suit the current destination node address, then orward it to its neighbors once again in the network,

AODV is a protocol for reactive routing that does not hold a route unless additional nodes are requested or required. AODV compared to other distance vector protocols uses the route update sequence number. AODV can quickly respond to the topology network changes and only update the host with the Road Request (RREQ) code. Two messages are mainly involved in the discovery of routes. RREQ is used to start the path to determine the easiest way from source to destination. Ask for roads. Message Router Response (RREP) from the target node is used to respond.Such performance measures must be used to analyze energy calculations for the creation of a protocol that can best provide data over a high random mobility network. Evaluate energy metrics for QoS applications to help move and deliver the message.

V. RESULTS AND DISCUSSION

The network efficiency has been analyzed based on residual energy of the network capacity, end-to-end delay and packet delivery ratio. The network's initial energy was 50 Joules. The energy remaining in the network was at the end of the simulation was approx. 40 Joules for the scheme proposed and 35 Joules for the scheme currently in place. It means that the system suggested reduces the network's energy consumption. The value for average end-to-end delay estimated for the network transmission packets. The difference between the time the packet was received and the time the packet was sent is determined as end to end delay. For the new system, the E2E average delay was 0.013 seconds and for the current scheme was 0.049 seconds

The packet delivery ratio has been compared for both systems. The PDR is defined as the ratio of the packets received in the network to the total packets sent. The value of the PDR for the schemes initially decreases because the congestion occurs in the network while the route request packets are transmitted. The program eventually achieves stronger PDR with a value of 90% during data transmission for the proposed scheme, whereas the current scheme has a value of 79%.

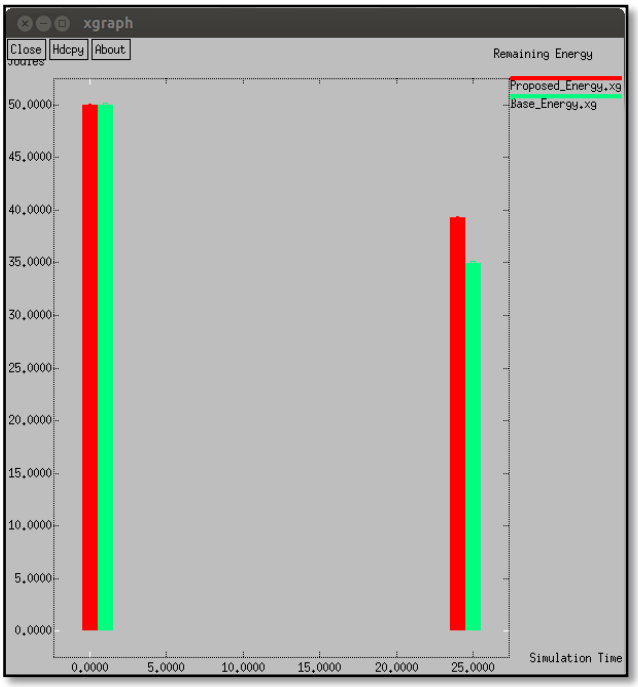

Fig.2. Remaining Energy Comparison

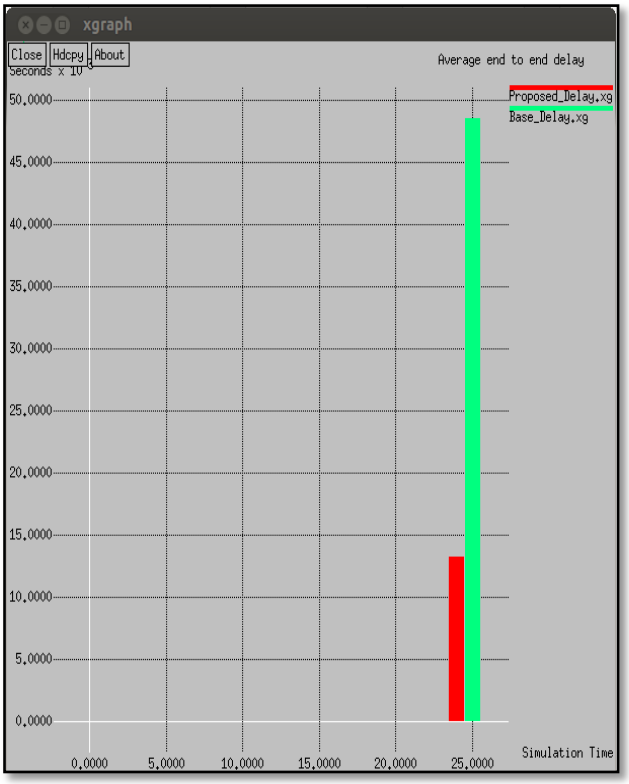

Fig.3. Average End to End Delay Comparison

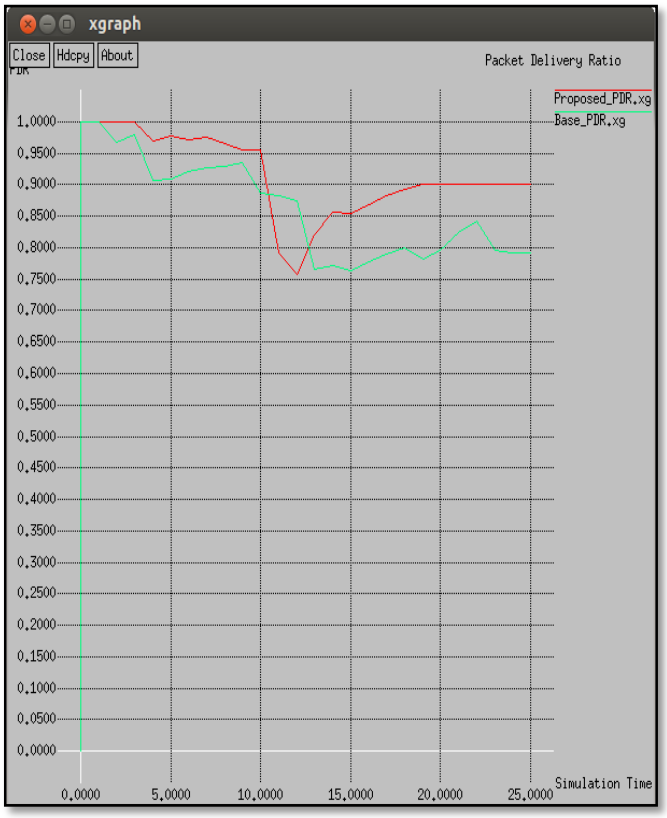

Fig.4. Comparison of Packet Delivery Ratio

The simulation parameters used in our study are listed in the table below:

Parameter	Value
Channel	Wireless
Mac	802.11
Antenna	Omni Directional
Propagation Type	Two Ray Ground
Queue	Drop Tail
Queue Length	500
Number of nodes	50
Routing protocol	AODV
Network Area	1000*1000 sq meters
Initial Energy	50 Joules

VI. CONCLUSION AND FUTURE WORK

The mobile ad hoc networks consist of constantly moving nodes running on limited batteries.

In such scenarios, the focus of research is upon increasing their network lifetime and reducing the dropped packets from the network (occurring due to link breakages among moving nodes). In this work, the proposed technique is presented which is a modification to existing AODV-CS technique. In network simulator 2,35, both the proposed and current strategies were introduced, and their output was analyzed based on the remaining energy of the network, average time limit for end to end and packet returns. The proposed schemes have remaining energy of 40 Joules and existing scheme has remaining energy of 35 Joules. Therefore, the proposed scheme does not require the nodes to forward packets with energy left below a certain amount for the route request. Furthermore, the route reply phase is also executed over the paths having fitness higher than average fitness of the paths. This reduces number of transmissions in the network and leads to energy saving. The fitness function in the proposed scheme considers average end to end delay of the paths as well as attractiveness value of the nodes. Therefore, the paths are optimized in terms of these parameters.

REFERENCES

1. Ajay Kumar Yadav, SantoshKumar Das, SachinTripathi, "EFMMRP: Design of efficient fuzzy based multi-constraint multicast routing protocol for wireless ad-hoc network", Science Direct, Computer Networks 118, pp. 15–23, 2017.
2. Alex Hinds, Michael Ngulube, Shaoying Zhu, Hussain Al-Aqrabi, "A Review of Routing Protocols for Mobile Ad-Hoc Networks (MANET)", International Journal of Information and Education Technology, Vol. 3, No. 1,pp. 1-5, February 2013.
3. B.Thenral, K. ThirunadanaSikamani, "Enhancing Link Stability of Multicast Routing Protocol (Elsmrp) in Wireless Mesh Networks", International Journal of Advances in Engineering & Technology, Vol. 8, Issue 3, pp. 432-441, June, 2015.
4. AkramKout, Said Labed, Salim Chikhi, El Bay Bourennane, "AODVCS, a new bio-inspired routing protocol based on cuckoo search algorithm for mobile ad hoc networks", Springer, Wireless Netw, 2017.
5. GovindP.Gupta, "Improved Cuckoo Search-based Clustering Protocol for Wireless Sensor Networks", Science Direct, 2017.
6. Busola S. Olagbegi, Natarajan Meghanathan, "A Review of The Energy Efficient And Secure Multicast Routing Protocols for Mobile Ad Hoc Networks", International journal on applications of graph theory in wireless ad hoc networks and sensor networks (GRAPH-HOC) Vol.2, No.2, pp. 1-15, June 2010.
7. D. Gopinath , Dr. K. K. c "Artificial Bee Colony Algorithm with Flower Pollination (ABCAFP) for Cluster Formation in MANET" International conference on applied science,technology and management,feb 2018.
8. Rohit Purniya & Dipti Rai "A Comparatively Analysis Of Various Manet Based Throughput Enhacement Techniques" International Journal Of Engineering Sciences & Research Technology ,2018.
9. Ishu Varshney ,Shahjahan Ali "Study On Manet: Concepts, Features And Applications" Elk Asia Pacific Journal Of Computer Science And Information System" Volume 3 Issue 2 ,2017.
10. Sivakumar Venu, A.M.J.Md.Zubair Rahman "Faodv, Dsr, Dsdv Performance Analysis For Broadcasting In Manet"2018.

AUTHORS PROFILE

Rohan Sharma, MTech Student, Department of Computer Science and Engineering, Guru Nanak Dev Engineering College (G.N.E), Ludhiana, Punjab, Research Interest: Networking and Artificial intelligence.

Pankaj Bhambri, MTech, No of Publications:9, Professional Memberships: Indian society for Technical Education Department of Information technology, Guru Nanak Dev Engineering College (G.N.E), Ludhiana, Punjab**,** Research Interest: Bioinformatics, Machine Learning.

Amandeep Kaur Sohal, MTech, Department of Computer Science and Engineering, Guru Nanak Dev Engineering College (G.N.E), Ludhiana, Punjab, Research Interest: Genetic algorithms, Optimization Techniques, Data structures