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Optimization of Routing Protocol for MANET using BAT Optimization Algorithm

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Abstract: A Mobile Ad Hoc Network (MANET) consists of a set of self arranging remote portable hubs conveyed without brought together foundation. In MANET, all hubs are portable in nature and having restricted battery charge. Persistent change in position and association debases the battery charge of the hubs; consequently it is important to spare battery of those hubs which are having low battery so that the network lifetime can be long lasting. In order to enhance the lifetime of network by using energy efficient AODV routing protocol with energy parameter. This work aims at increasing the network life time while reducing the energy consumption, minimizing the end to end delay. The NS2 simulator is used for simulation and the results are compared with existing Ad Hoc on Demand Distance vector (AODV) protocol. In this paper, a new Bat Optimized Link State Routing (BOLSR) protocol is proposed to improve the energy usage of the Optimized Link State Routing (OLSR) protocol in the MANET. This BOLSR protocol that determines the optimized path from a source node to a destination node according to the energy dynamics of the nodes. The results of the tests reveal that the BOLSR protocol reduces the energy consumption and increases the lifespan of the network, compared with the AODV routing protocol.

Keywords: *Mobile Ad hoc network (MANET), Optimized link state routing (OLSR), Ad-hoc on demand distance vector (AODV), Bat Optimization Algorithm (BOA), NS-2 Software.*

I. INTRODUCTION

Ad hoc Networks are unplanned or spontaneous networks which do not have a pre-existing infrastructure or base station. Directing route to be more effective with the goal that information and hub won't be influenced by assailants. The hubs in the MANETs are self designing systems. Because of the absence of foundation, the hubs in the MANETs demonstration both as a switch and also a host. As MANETs are self creating and very powerful, some unique specially appointed steering conventions have been produced. A Mobile Ad-Hoc Network (MANET) is a collection of mobile nodes which communicate with each other via wireless link either directly or relying on other nodes as routers. Since the nodes are movable from one network to another they are known as mobile ad hoc networks or MANETs. Network nodes in MANETs are free to move randomly.

A. Mobile Ad-hoc network

Mobil Ad-hoc Network (MANET) is a new kind of wireless connection between nodes. In MANET there is no need for fixed infrastructure can be developed by using a wireless link which connecting diverse mobile nodes. When there is no alternatives are obtainable to create a network the Ad-hoc network is the proper choice, this characteristic makes it hard to make a network with no need to any existing infrastructure.

Vehicle Ad-hoc Network (VANET) is a sub category of the MANET. In this technology the vehicles represent the nodes to create a mobile network. Every vehicle acts as a wireless router or node so this allows the vehicles to connect and create a wide range of the network.

B. Ad-hoc On Demand Distance Vector

Ad Hoc on-Demand Distance Vector (AODV) is a packet routing protocol designed for use in mobile ad hoc networks (MANET). AODV supports both unicast and multicast routing. This protocol establishes the route from source to destination when there is a need for this link by using its control packets Route Request (RREQ) and Route Reply (RREP). Route Error (RERR) control packet used on route maintenance operation. Dynamic Source Routing (DSR) is one of the reactive protocols which are on demand routing protocols. Like in AODV the work of the Protocol summarizes in two parts: route discovery which is used for setting up routes and route maintenance which are used for monitoring of those routes respectively. DSR does not depend on the information in the intermediate nodes and instead of that use source routing.

C. Meta-Heuristics

Meta-heuristics are the most recent evolution in search methods for solving complex optimization problems that increase in business, commerce, industry and many other areas. Also, it uses concepts Inspired from artificial intelligence, biological, mathematical, natural and physical sciences improve their performance.

BAT Algorithm is one of the algorithms that rely on optimization and arithmetic intelligence. This algorithm operates on the principle inspired by echolocation behavior of microbats. The algorithm uses frequency, speed and location for each bat in the swarm in all iterations in the specific dimension in the search space. The position represents the vector of solutions to the problem. The best solutions are stored during the frequent search process.

D. BAT Algorithm

In 2010 Yang proposes Bat Algorithm [9]. Bat algorithm used to solve optimization problems by simulating the behavior of bats, which depend on the echolocation of the microbats to update its position and velocity to get appropriate to live. This algorithm works iteratively and in each iteration the position of each bat updated depends on the velocity and hertz number of sound wave. In network optimization, the position vector of bats represents the parameters of the problem to be solved. In all iteration, position and velocity for every bat in the swarm will be measured depending on previous velocity, frequency and global information. BAT algorithm uses following equations

To update velocity and position:

$F[i] = F[min] + (F[max] - F[min])\ \beta$ …… (1)

$Vt[i] = Vt - 1[i] + (Xt[i] - X[g])\ f[i]$ …….(2)

$Xt + 1[i] = Xt[i] + Vt + 1[i]$ ……..(3)

Where, F (i), F (min), and F (max) represent the hertz of the sound wave of microbat at time t. β is a random vector and its value range from 0 to 1. X (g) is the current global best solution for each bat. The global best solution X (g) of the swarm is calculated after finishing all the iterations.

Algorithm of BAT

1. Objective function: f(x), x= $(x_1 x_2 x_{3---} x_{d)}$t
2. Initialize Bat population x_i and velocity vi where i=(1,2---n)
3. Describe pulse frequency f_i at x_i
4. Initializes pulse rate R_i and loudnessA_i
5. Whereas (t<maximum number of iteration)
6. Create new solution by modifying frequency, updating velocities and location
7. If(random<i)
8. Select a solution among the best solution
9. Generate a local solution around the selected best solution
10. End if
11. If((random<Ai)and f(xi)<f(x*))
12. Admit new solution
13. Increase R_i decrease A_i
14. End if
15. Rank the bats and find current best x*
16. End while
17. Display result.

Flowchart of BAT Algorithm

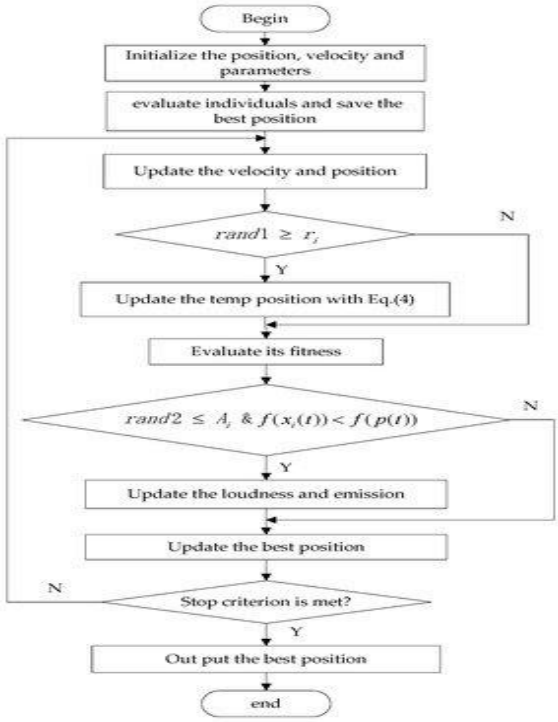


Figure 1: BAT Algorithm flowchart

E. Optimized Link State Routing (OLSR)

The OLSR is proposed by Clausen et al. as a proactive routing protocol for ad hoc networks and is built based on the link-state (LS) protocol with reduced signaling packets and control traffic flooding. Accordingly, the OLSR protocol broadcasts messages transmitted in the network by using MPRs, nodes that are specifically designed to broadcast only such messages.

The OLSR protocol functions in a fully distributed manner and does not rely on any kind of central entity. When transmitting control messages, this protocol does not require reliable transmission because the messages are occasionally transmitted and are exemplified by the sequence number which rearranges them. The OLSR is also known to support nodes mobility.

F. NS-2 Software

NS2 stands for Network Simulator Version 2. It is an open-source event-driven simulator designed specifically for research in computer communication networks.

NS2 uses OTcl to create and configure a network, and uses C++ to run simulation. All C++ codes need to be compiled and linked to create an executable file.

Use OTcl

i. For configuration, setup, or one time simulation, or

ii. To run simulation with existing NS2 modules.

This option is preferable for most beginners, since it does not involve complicated internal mechanism of NS2. Unfortunately, existing NS2 modules are fairly limited. This option is perhaps not sufficient for most researchers.

Use C++

i. When you are dealing with a packet, or - when you need to modify existing NS2 modules.

This option perhaps discourages most of the beginners from using NS2. This book particularly aims at helping the readers understand the structure of NS2 and feel more comfortable in modifying NS2 modules.

II. Energy Efficient Routing Protocol

Efficient routing objectives to reduce the power required to transmit or obtain packets i.e., Energetic communication electricity. It also tries to lower the energy fed on cell node stays idle but listens to the wireless medium for any visible conversation requests from other nodes i.e., inactive electricity. Transmission power manage approach and load distribution method minimizes lively communication power and sleep mode approach minimizes inactive electricity. Every protocol has specific risks and is well perfect for sure situations and it is not clean any specific set of rules or a class of algorithms is the best for all scenarios. In contrast to AODV which optimizes routing for lowest delay, the energy efficient protocols ensure the survivability of the network which is to ensure that all nodes equally deplete their battery power. There are several ways of implementing routing such as Minimum Total Transmission Power Routing, Minimum Battery Cost Routing etc. In case of wireless networks it is more reducing the energy consumption and increasing the lifetime of the nodes.

III. IMPLEMENTATION

The flowchart of the algorithm of the modified AODV is shown in Figure 1.

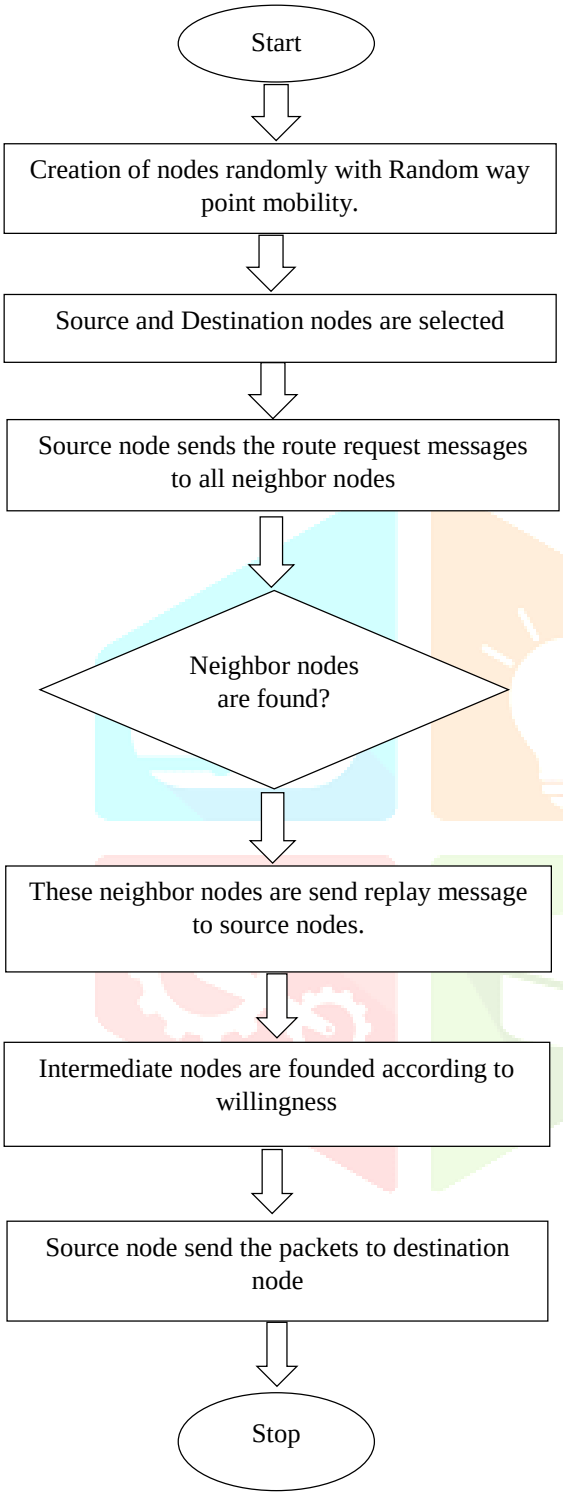


Figure 1: Packet Transmission

Proposed Algorithm:

The following steps describe the proposed algorithm:

Step 1: When a source node finds no route to destination node, it starts the route discovery phase to the destination node.

Step 2: The source node then, checks the neighbor nodes list to find the route to the destination node.

Step 3: If the source node is found in the neighbor nodes list. Then, this intermediate node sends RREP control packet to the source node from which it received the RREQ packet. This RREP packet follows the same reverse path traversed by the RREQ packet until it reaches the source. This ends the route discovery phase and the route is established.

Step 4: According to willingness, the intermediate nodes are found.

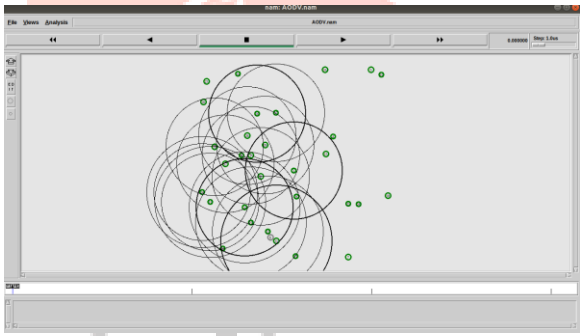
$$willingness = \frac{\text{Residual energy}}{\text{Initial energy}}$$

Where, initial energy = 50J and remaining energy are calculated and save in fie.

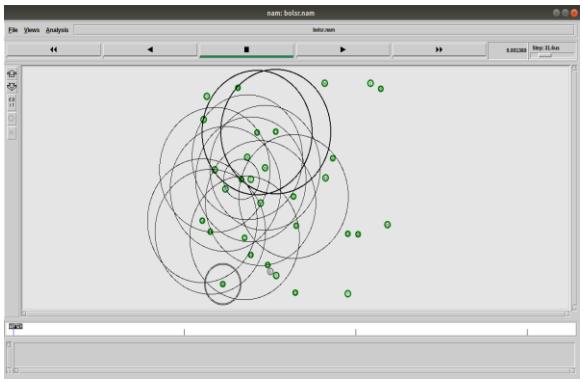
Step 5: Finally, the packets are transmitted between source and destination nodes via intermediate nodes.

IV. OUTCOME

(A) Implementation of AODV



(B) Implementation of BOLSR



(C) Throughput

Throughput measure how fast the network can continuously send/receive data to the sink. Throughput is the number of packet received from the sink per millisecond. It is defined as total packets received divided by duration of last packet received by destination node. It is calculated in bps "bits per second".

In this Figure as shows the how many packets are received at destination. Better throughput in AODV with energy compared with BOLSR protocol.

We have calculated the throughput using the following formula.

Throughput = 8*pkt_byte_sum[i-1]/(end_time[i- 1]-start_time)

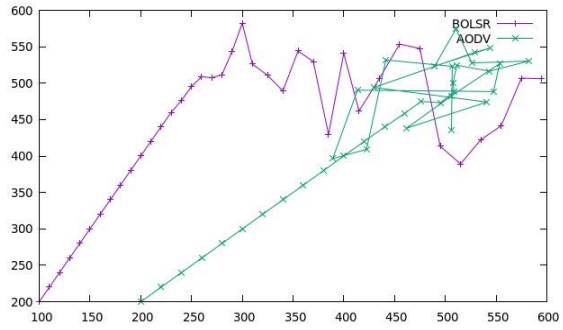


Figure: Rate at which the packets are sent and received VS Throughput

V. CONCLUSION

The computational results show that using micro bats based algorithms is possible to choose the best solution for the performance of the AODV. The metaheuristic algorithms have the ability to find the best network metrics so it have been used it to improve the performance of choosing the best solution. The BAT algorithms are simulated using NS2 software and the results are compared with AODV and dropped packet as parameters. The algorithm is made energy efficient by consolidating energy efficient protocols with this algorithm.

VI. REFRENCES

1. S. Habib, S. Saleem, and K. M. Saqib, "Review on MANET Routing Protocols and Challenges," IEEE Student Conf. Res. Dev., no. December, pp. 16–17, 2013.

2. C. Mafirabadza and P. Khatri. "Energy Analysis of AODV Routing Protocol in MANET". International Conference on Communication and Signal Processing, April 6-8, 2016 IEEE.

3. Herberg, U.; Clausen, T. Security Issues in The Optimized Link State Routing Protocol Version 2 (Olsrv2). IJNSA 2010, 2, 162–181.

4. I. F. Jr., I. Fister, Xin-She Yang, S. Fong, and Y. Zhuang, "Bat algorithm : Recent advances," Comput. Intell. Informatics, pp. 163– 167, 2014.

5. K. Sumathi and A. Priyadharshini, "ENERGY OPTIMIZATION IN MANETS USING ON- DEMAND ROUTING PROTOCOL," Procedia Comput. Sci., vol. 47, pp. 460–470, 2015.

6. W. Kuo and S. Chu, "Energy Efficiency Optimization for Mobile Ad Hoc Networks," IEEE Access, vol. 4, 2016.

7. K. A. Adoni and R. D. Joshi, "Optimization of Energy Consumption for OLSR Routing Protocol in MANET," Int. J. Wirel. Mob. Networks, vol. 4, no. 1, pp. 251–262, 2012.

8. The ns Manual available at http: //www. isi.edu/nsnam/ ns/doc.

9. Kaveh A, Farhoudi N. A unified approach to parameter selection in metaheuristic algorithms for layout optimization. J Constr Steel Res 2011;67:15453–62.