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IMPROVED PACKET DELIVERY RATIO IN MOBILE ADHOC NETWORKS USING BTSNA-DS ALGORITHM

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Abstract

Mobile Ad-hoc Networks (MANETs) in which moving nodes act as mobile-terminals as well as routing stations. These movements cause the change in the network topology. In this connection, route establishment is the primary task to initiate the communication between resources is very difficult due to their random movements. MANET flooding method is used for broadcasting route request (RREQ) packet from one node to another node for route discovery. This is the simplest method of broadcasting of RREQ packets but it often results in broadcast storm problem, originating collisions and congestion of packets in the network. The conventional routing protocol designed for MANET fail to handle dynamic movement and self-starting behavior of the node effectively. Most broadcast protocols are however only ever evaluated using simulations, which have repeatedly been shown to be unreliable, and potentially misleading. In this paper, a new routing algorithm named Binary Tree Structured based Network Approach using Depth Search (BTSNA-DS) for energy efficient path from sender to receiver is proposed. Finally, the performance Analysis of the proposed BTSNA-DS algorithm provide better performance compare to the existing Energy Efficient Neighbor Coverage Protocol (EENCP) and also improved the Packet Delivery Ratio (PDR) with mobility, transmission range, and number of node is increased.

Keywords:

Adhoc, Broadcasting, Neighbor Discovery, Flooding Mechanism, MANET

1. INTRODUCTION

Designing associate degree economical routing protocol is one in all the foremost strict tasks in Mobile Adhoc Networks (MANET). In MANET, the route may be a path that consists of multiple hops created with the assistance of intermediate nodes accessible to transmit the mobile information packet from the route initiated supply mobile node to the targeted mobile node. The distinctive characteristics of Edouard MANET like quality, dynamic topology, and resource sharing can create the routing method a difficult one. The quality of the mobile nodes leads to extremely dynamic topological network during which the trail failures are caused often. Due to shared wireless channel, the mobiles nodes are offered with low and variable quantity of information measure. This helps to perform the communication between the mobile nodes; consequently this can have an effect on the info packet transmission and will result in respectable quantity of loss in turnout. Hence, the routing protocol must be designed to adapt the dynamic changes in topology of network along with the potential to scale back the route request packet transmissions over information packet transmission. Thus, it will increase the accessible information measure to perform the info packet transmission in an exceedingly abundant effective method. As a results of varied analysis works, MANET is possessing variable range of fine and effective routing protocols over a decade. By understanding the method of route discovery and routing table update, the routing protocols of Edouard MANET are derived into the subsequent 3 major varieties particularly proactive routing protocols, reactive routing protocols, and hybrid routing protocols that is that the combination of best practices in reactive and proactive algorithms.

1.1 BROADCASTING IN MANETS

Broadcasting is that the straightforward and basic method in Mobile Adhoc Networks within which identical packet has been transmitted from the sender node to all or any the remaining nodes of the network. Thanks to restricted radio vary of mobile nodes; the MANET is multihop in nature. Hence, the packet that is transmitted from the valid mobile supply cannot reach the target during a single hop. So, here another node of the network is needed to forward the supply transmitted packet to the destination. These nodes are usually called intermediate nodes. In MANET, the method of selecting the intermediate node is that the most vital issue as a result of these nodes can use the precious resources of the network like battery power and information measure. Also, the method of intermediate node choice can cut back or avoid the redundancy in packet forwarding process. There are 2 basic models that are employed in broadcasting with relevancy physical layer, namely, one-to-many model within which the supply transmitted packet are going to be sent to the opposite neighbor mobile nodes of the transmission initiated node and matched model within which the supply transmitted packet are going to be given to a particular neighbor solely. The broadcasting method has several benefits with relevancy the network layer. However, the broadcasting mechanism in mobile adhoc network acts as a backbone of many protocols that are offered within the network layer. Several method relating to improve the packet delivery ratio in MANETs are seen in [1], [3] - [16].

2. PROPOSED CONCEPT

In this section, the details of the proposed scheme are given. The signal strength is processed to provide some useful information. In practice, the broadcasting signal to find the path from source to destination, because all mobile nodes execute small battery power. In this connection, to find the energy efficient path between sender and receiver [2]. In order to proposed broadcast based more efficient path to find between sender and receiver using binary tree search based network approach using depth search.

2.1 DEPTH SEARCH (DS)

The exploration of a new node cannot begin until the node currently being explored is fully explored. D-search like state space search is called LIFO (Last In First Out) search which uses stack data structure. To illustrate the D-search let us consider the following tree (Fig.1).

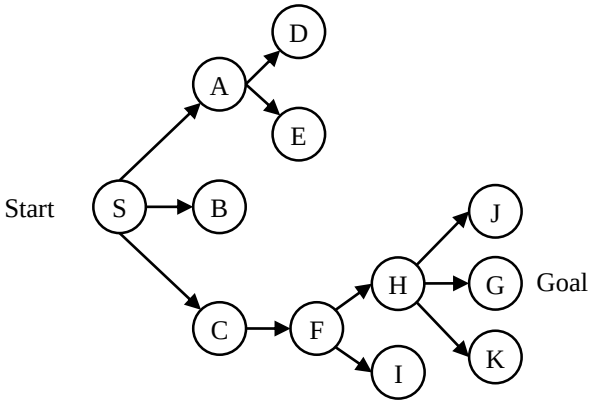

Fig.1. Depth search tree

In Fig.2, the search order for goal node (*G*) is as follows: *S*, *A*, *B*, *C*, *F*, *H*, *I*, *J*, *G*. The resultant tree is shown below

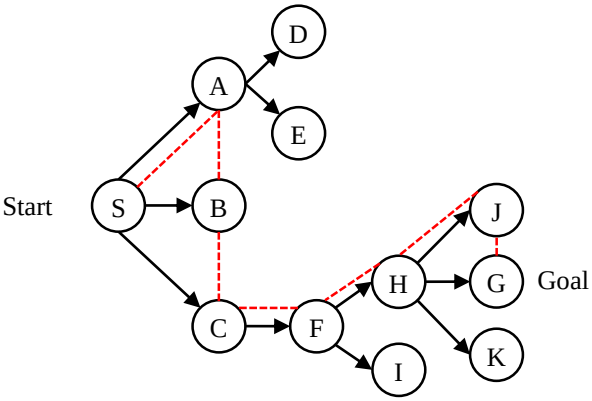

Fig.2. Path searching using DS

The given network, the broadcasting signal is flooded the neighbor nodes in the ad-hoc networks. The communication signal forward to next range of nodes which are presented surrounding the source node, its forward flow of direction from source to destination. Each signal forward towards the destination so it considers the directed graph in Fig.3.

In Fig.3, the node V_3 three times received the broadcasting signal from node V_1, in via V_1, V_2 and V_3, then V_1 to V_3 finally V_1, V_4 and V_3. In this case the node V_3 received the duplicate signal from various node, this situation rise the network complexity, So Instead of this the node V_3 receive the signal only one time it reduce the complexity and also it helps to quick forwarded message to next nodes for that case this research introduce the new algorithm to construct the Binary Tree structured based network approach using Depth Search (BTSNA-DS).

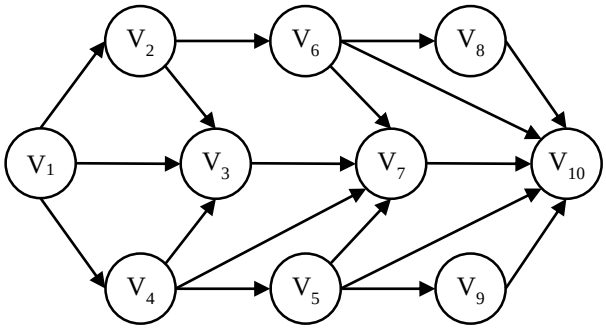

Fig.3. Network Construction

2.2 ALGORITHM FOR (BTSNA-DS)

Calculate the in-degree and out-degree for each node.

Assign source node (in-degree = 0).

Find the destination node (out-degree = 0).

// other node have out-degree = 0 that node 0 is called terminated node.

Construct the tree structure for given node.

Id: In--degree

O_d: Out-degree

E_i: In-degree Edge $\in E$

E_o: Out-degree Edge $\in E$

//construct the tree, the node have no child (R_{child}, L_{child}) first add L_{child} then $R_{child.}$

// whenever added the new node to existing tree to find the minimum distance from root node to that node.

//which edges have to create the minimum path length, that edges will be selected, other edges simply rejected.

Step 1: First select V_1 have the no in-degree so consider as a root node.

Step 2: Select V_2, that node have in-degree = 1, out-degree = 2. Node V_2 have only one in-degree edge (V_1-V_2) E_i, so take it as it is. Then V1node does not have Lchild so add V_2 as left child of V_1.

Step 3: Next select V_3 node, it have in-degree = 3, out-degree = 1, that node have three E_i in-degree edges (V_1-V_3) (V_2-V_3) (V_4-V_3). In these three edges first we consider (V_2-V_3) edge that connect from node V_2, the node V_3 connect V_2 left child the level will be increased by 1, so that node added right child of node V_1 through edge (V_1-V_3), in this case the node V_2, V_3 have the same level. Then (V_4-V_3) edge not yet finalized so simply it discarded.

Step 4: Next select V_4 node, it have in-degree = 2, out-degree = 2, that node have two E_i in-degree edges (V_1-V_4) and (V_3-V_4). In these two edges first we consider (V_1-V_4) edge that connect from V_1 node that node already have two child V_2, V_3 nodes. So, that edge (V_1-V_4) is simply rejected. Another edge is (V_3-V_4), the node V_3 does not have any child. So, the node V_4 added the left child of the node V_3.

Step 5: In this manner the remaining nodes all are added to construct the Binary Tree Based Network Structured created using Depth Search Technique.

In the above Fig.4 we consider the destination node is V_9 and source node is V_1. Suppose the beacon signal pass from node V_1 that signal pass through the all nodes then finally reach the V_9 nodes because the node V_9 is present the final level and also last leaf node in the tree structure. To avoid this unnecessary delay and broadcasting overhead we start the broadcasting from destination node in the above structure the signal only pass V_5, V_4, V_3 and V_1.

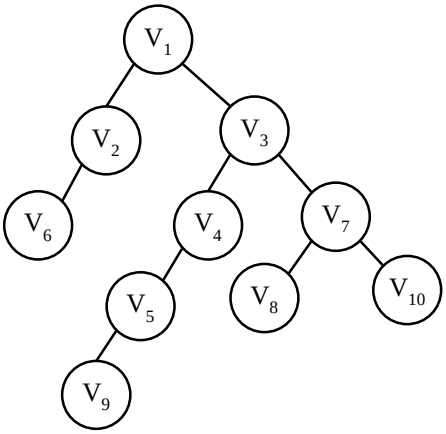

Fig.4. (BTSNA-DS) Tree

3. RESULTS AND DISCUSSION

In order to analyze the performance analysis of the proposed algorithm is measured using Network Simulator version 2 (NS-2). The basic assumptions made for the simulations are the MANET works in following parameters are chosen for the simulation environment. The network area is confined within $1000\times1000m^2$. Each mobile node has a position and a velocity and moves about over a rectangular flat space. Each node in the network has a transmission range of 250m. A two-ray ground reflection model is used as the radio propagation model. The MAC layer scheme follows the IEEE 802.11 MAC specification. The broadcast mode with no RTS/CTS/ACK mechanisms is used for all message transmissions, including HELLO, DATA, and ACK messages. The movement pattern of each node follows the random way-point model. Every node moves to a randomly selected destination with a constant speed between 0 and the maximum speed 25m. Then, some randomly selected nodes start to send broadcast packets. This procedure lasts for 1000 seconds. The number node for testing scenario is 20 to 100, number of packet sender is 40, constant bit rate is 2 packets per seconds, packet size is 512 bytes, Initial node energy of per node is 100 joules and antenna module is omnidirectional. Transmission range of the nodes is varied from 50 to 250 meters. Simulations are done for number of node is 20-100 nodes by varying the transmission ranges between 50 and 250 meter. The following performance metric is evaluated using networks simulation tool (NS2) [17].

3.1 PACKET DELIVERY RATIO (PDR)

The ratio of the number of delivered data packets to the destination. This illustrates the level of delivered data to the destination.

$$PDR = \frac{Total\ no.\ of\ packets\ delivered}{Total\ no.\ of\ packets\ transferred} \times 100 \qquad (1)$$

Table.1. Packet Delivery Ratio (PDR) vs. Mobility (m/s)

Mobility	EENCP	BTSNA-DS
5	60	38
10	55	26
15	50	35
20	45	20
25	40	20

In this part performance analysis of proposed Binary Tree structured based network approach using Depth Search (BTSNA-DS) algorithm with existing Energy Efficient Neighbor Coverage Protocol (EENCP). The Table.1 shows that the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also improved the Packet Delivery Ratio (PDR) with mobility is increased.

Table.2. Packet Delivery Ratio (PDR) vs. Transmission Range(m)

Range	EENCP	BTSNA-DS
50	55	45
100	40	30
150	40	30
200	40	25
250	20	20

In this part performance analysis of proposed Binary Tree structured based network approach using Depth Search (BTSNA-DS) algorithm with existing Energy Efficient Neighbor Coverage Protocol (EENCP). The Table.2 shows that the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also improved the Packet Delivery Ratio (PDR) with transmission range is increased.

Table.3. Packet Delivery Ratio (PDR) vs. Number of Nodes

No. of Nodes	EENCP	BTSNA-DS
20	68	30
40	68	30
60	55	30
80	45	30
100	45	30

In this part performance analysis of proposed Binary Tree structured based network approach using Depth Search (BTSNA-DS) algorithm with existing Energy Efficient Neighbor Coverage Protocol (EENCP). The Table.3 shows that the proposed BTSNA-DS algorithm provides better performance compare to existing algorithm and also improved the Packet Delivery Ratio (PDR) with number of nodes increased.

4. CONCLUSION

One of the major research challenges in a MANET is conserving the network resources from increased network traffic and power consumption by flooding packet transmissions at each mobile. In this paper, a broadcast approach is proposed for minimizing flooding for routing in MANET. In this connection, proposed a new routing algorithm named Binary Tree Structured based Network Approach using Depth Search (BTSNA-DS) for energy efficient path between source and destination. This proposed BTSNA-DS algorithm constructs the network path from source to destination using depth search based tree construction, based on the calculation of in-degree is zero as a source node and out-degree is zero as a destination need given from the algorithm. Finally, proposed BTSNA-DS algorithm provides better performance compare to existing Energy Efficient Neighbor Coverage Protocol (EENCP) and also improved the Packet Delivery Ratio (PDR) with mobility, transmission range, and number of node is increased. In Future to apply in satellite save more energy.

REFERENCES

[1] Naeem Ahmad and S. Zeeshan Hussain, "Broadcast Expenses Controlling Techniques in Mobile Ad-hoc Networks: A Survey", *Journal of King Saud University-Computer and Information Sciences*, Vol. 28, No. 3, pp. 248-261, 2015.

[2] R. Ragul Ravi and V. Jayanthi, "Energy Efficient Neighbor Coverage Protocol for Reducing Rebroadcast in MANET", *Procedia Computer Science*, Vol. 47, pp. 417-423, 2015.

[3] Huaqiang Xu, Lei Ju and Zhiping Jia, "Enhance Internet Access Ability for Ad Hoc Network with On-Demand Gateway Broadcast Strategy", *International Journal of Wireless Information Networks*, Vol. 22, No. 4, pp. 415-427, 2015.

[4] Yosuke Totani, Kei Kobayashi, Keisuke Utsu and Hiroshi Ishii, "An Efficient Broadcast-based Information Transfer Method based on Location Data over MANET", *Journal of Supercomputing*, Vol. 72, No. 4, pp. 1422-1430, 2016.

[5] Ahyoung Lee and Ilkyeun Ra, "Network Resource Efficient Routing in Mobile Ad Hoc Wireless Networks", *Telecommunication Systems*, Vol. 60, No. 2, pp. 215-223, 2015.

[6] Abderezak Touzene and AbdulsalamAlkathiri, "Performance Analysis of an Extended Grid based Broadcast Algorithm in Mobile Ad-Hoc Networks", *Wireless Networks*, Vol. 21, No. 2, pp. 659-672, 2015.

[7] Imran Ali Khan, Sajjad Ahmad Madani, Waqas Anwar and Khizar Hayat, "Location based Dynamic Probabilistic Broadcasting for MANETs", *World Applied Sciences Journal*, Vol. 13, No. 11, pp. 2296-2305, 2011.

[8] N. Aitha and R. Srinadas, "A Strategy to Reduce the Control Packet Load of AODV using Weighted Rough Set Model for MANET", *The International Arab Journal of Information Technology*, Vol. 8, No. 1, pp. 108-117, 2009.

[9] S.Z. Hussain and N. Ahmad, "Cluster based Controlling of Route Exploring Packets in Ad-Hoc Networks", *Advanced Computing, Networking and Informatics*, Vol. 2, pp. 103-112, 2014.

[10] S.Z. Hussain and N. Ahmad, "Minimizing Broadcast Expenses in Clustered Ad-hoc Networks", *Journal of King Saud University-Computer and Information Sciences*, Vol. 30, No. 1, pp. 67-79, 2016.

[11] I.M. Pu and Y. Shen, "Enhanced Blocking Expanding Ring Search in Mobile Ad Hoc Networks", *Proceedings of 3rd IEEE International Conference on New Technologies, Mobility and Security*, pp. 1-5, 2009.

[12] I.M. Pu and Y. Shen, "Analytical Studies of Energy-Time Efficiency of Blocking Expanding Ring Search", *Mathematics in Computer Science*, Vol. 3, No. 4, pp. 443-456, 2010.

[13] O.K. Tonguz et al., "On the Broadcast Storm Problem in Ad Hoc Wireless Networks", *Proceedings of 3rd IEEE International Conference on Broadband Communications, Networks and Systems*, pp. 1-11, 2006.

[14] H. Zhang, "On Reducing Broadcast Expenses in Ad Hoc Route Discovery", *Proceedings of 25th IEEE International Conference on Distributed Computing Systems Workshops*, pp. 946-952, 2005.

[15] M. Bakhouya, J. Gaber and P. Lorenz. "Energy Evaluation of AID Protocol in Mobile Ad Hoc Networks", *Journal of Network and Computer Applications*, Vol. 58, pp. 287-293, 2015.

[16] K. Prabu et al., "Energy Efficient Routing in MANET through Edge Node Selection using ESPR Algorithm", *International Journal of Mobile Network Design and Innovation*, Vol. 5, No. 3, pp. 166-175, 2014.

[17] Network Simulator NS 2.34, Available at: http://www.isi.edu/nsnam