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End to End Delay using Aodv-Artificial Neural Networks (Ann) To Improve Performance of Manets

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Abstract: ***MANETs consist of the nodes that move continuously in the random directions. The frequent topology changes leads to broken links which increases the delay in sending the data to the end node. In the traditional direction-finding protocols such as AODV, DSR or DSDV, do not focus on reducing the back-to-back stoppage of the transmitted packets and remaining energy of the network. In healthcare applications where the urgency of the data is on the highest priority, the routing protocol that can reduce the back-to-back delay is required. To get better quality of service (Qos). We have implemented the AODV-ANN predicts the delay dependencies based on distance between two nodes, relative mobility and congestion index and it helps in choosing the energy efficient and delay aware optimized path to send data from starting place to end node. The presentation of the system has been computed based in back-to-back stoppage, remaining energy of the system. The proposed AODV-ANN predicts the enhancement of the (quality of service) networks. The AODV-ANN simulation is better results and increase the network lifetime.***

Keyword: MANETs, ANN, Congestion Index, Network Lifetime

I. INTRODUCTION

MANETs is also referred to as wireless unplanned system. It is an uninterrupted self-configuring, infrastructure-less network of convenient devices connected without making use of wires. In MANET architecture, devices can move in any direction [1]. They have only limited energy, computing power & memory. The nodes of the network are mobile & the topology changes rapidly. They possess a plane network infrastructure. In MANET architecture every processor or node means any device is a router as well as end host. MANET has a vibrant topology architecture which highly promotes mobility. In the MANET architecture, every node also works as a router since they route packets for other nodes. As a result of mobility of the nodes in MANET, direction-finding a packet from supply to end becomes more complex.

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Thus, many routing protocols have been proposed with suggestion to MANET but in a scenario of bulky nodes with high mobility no procedure is prove to be that profficient because of some exacting constraint of that procedure. Consequently, mobility and scalability are upsetting issue in mostly all procedures which hold direction-finding.

1.1 Paper Organization

In term paper, we explain direction-finding procedure in these systems in Section II. Then we describe the concept of artificial neural network for classification of the data. Section III presents the motivation and the proposed ANN based AODV has been presented in Section IV. This proposed protocol aims to improve the back-to-back stoppage of the packets and energy consumption of the nodes in the network. Finally the result has been shown in Section V with the conclusion presented in the last section of this paper.

II. ROUTING IN MANETS

There are different routing protocols accessible in MANET. direction-finding protocol can be confidential into three types: Proactive, Reactive routing protocol and Hybrid protocol. The direction-finding protocol in MANET are proficient to hold a large number of nodes among controlled assets. The main worry in direction-finding set of rules is fading/ appear of the nodes in various spaces. Routing protocol is categorize on the plan of how and at what time path are revealed, however both select the shortest path to the destination [2].

2.1 Proactive Routing Protocols

This kind of direction-finding protocol uses link-state direction-finding algorithms which flood connection data regarding its neighbors frequently. Proactive routing protocol provisions the routing data and maintain the data advanced by exchange the control packet from their neighbors. The example of proactive direction-finding protocols are DSDV, OLSR, and WRP etc.

2.2 Reactive Routing Protocols

Reactive direction-finding protocol lessen overheads that are here in proactive procedures. It utilizes distance-vector routing algorithm and establish the path to given intention simply while a node request it by initiate path finding procedure.

There are number of reactive direction-finding protocol offered in MANET [4] like DSR, AODV, TORA and LMR etc.

2.3 Hybrid Routing Protocols

It is the combination of reactive and proactive direction-finding protocols. The illustration of Hybrid routing protocols are ZRP, BGP, EIGRP.

2.4 AODV

AODV (ad hoc on demand distance vector) is a distance vector routing procedure that operate reactively to lessen transparency verdict paths only on demand. When a path does not be present to specified intention, a path request (RREQ) message is flooded by the resource and intermediary nodes if they have no earlier paths in their table. Ahead getting a RREQ message, the getting nodes will verification the path information in its direction-finding table. One time RREQ message reach the intention or intermediary node, the node respond by uni-casting a route reply (RREP) message reverse to neighbor from which it acknowledged the RREQ message. As the RREP message is forwarded reverse beside the invalidate path, nodes beside this path arrangement forwarding entry in their routing tables. The major advantage of AODV routing protocol each and every node should be maintain routing table, next hop and intention information[4]. The stored information is use to resolve the route from resource to intention. In addition, both node in a network to verify the routing table to know whether the route is exist or not. During this protocol communication, the packets are forwarded to next hop node and then destination.

2.5 DSDV

Destination Sequenced Distance Vector (DSDV) is a hop-by-hop vector direction-finding procedure require all node to occasionally screen routing update. This is a table drive algorithm based on modification prepared to the Bellman-Ford routing mechanism. All node in the association maintain a routing table that have entries for all of the intentions in the system and the number of hops necessary to arrive at all of them. Each entry has a sequence number related with it that assists in identify stale entries. This mechanism allow the protocol to avoid the development of routing loops. All node occasionally sends updates tag throughout the system with a monotonically rising even sequence number to broadcast its location. New route broadcast include the address of the intention, the number of hops to arrive at the intention, the sequence number of the information acknowledged about the intention, in addition to a new sequence number unique to the broadcast. The route label with the mainly current sequence number is always used. When the neighbors of the transmit node collect this update, they identify that they are one hop ahead of the resource node and comprise this information in their distance vectors. Each node stores the “next routing hop” for all reachable intention in their routing table. The path use is the one with the highest sequence number i.e. the most current one. When a neighbor B of A finds out that A is no longer reachable, it advertises the path to A with an infinite metric and a sequence number one greater than the latest sequence number for the path forcing any nodes with B on the path to A, to rearrange their routing tables[6].

2.6 DSR

DSR is a easy and proficient direction-finding procedure planned expressly for use in multi-hop wireless unplanned networks of mobile nodes. DSR allows the network to be completely self-organize and self-configuring, with no need for some vacant network infrastructure or organization. The procedure is collected of the two major mechanism of "Path Discovery" and "Path Maintenance", which work collectively to permit nodes to find out and maintain paths to illogical intentions in the unplanned network. All characteristics of the procedure work totally on demand, allow the routing packet overhead of DSR to scale automatically to only what is desirable to react to changes in the routes presently in use. The procedure permits several paths to any intention and permits each sender to choose and organize the paths used in routing its packets, for example, for use in load balancing or for augmented toughness. Additional advantages of the DSR protocol comprise simply guaranteed loop- free routing, process in networks contain unidirectional links, use of only "soft state" in routing, and very fast upgrading when paths in the network vary. The DSR protocol is consider mostly for mobile ad hoc networks of up to regarding two hundred nodes and is consider to work well even though very high rates of mobility [3].

2.7Artificial Neural Network

Artificial Neural Network (ANN) can be considered as a numerical model of a human brain. This fundamental inspired method marks the next generation advancement in the computing field. The composition of Artificial Neural Network (ANN) consists of a huge number of easy processing aspects or basic units called neurons. All neuron apply an establishment purpose to its net enter to verify its output signal. Every neuron is associated to other neurons by means of directed communiqué links, each with an linked weight. Each neuron has an inner state called its activation level, which is a service of the input it has acknowledged. This can be compared with a bottle with a liquid. If we have a bottle and if we fill in the bottle with a liquid, and if we have an alarm to caution us when the level of the liquid is up to the neck of the bottle, then establishment level also does the same thing as that of the disturbing signal we receive. As and when the neuron receive the signal, it gets additional and when the combined signal reaches the establishment level the neuron sends an output. Neural networks are the easy clustering of the ancient artificial neurons. This clustering occur by create layers which are then coupled to one other. Mostly, all artificial neural networks have a alike structure or topology. Several structure of the neurons interface to the actual world to accept its inputs. Other neurons offer the actual world with the network's outputs.

This output might be the particular character that the network assumes that it has scan or the particular image it thinks is being view. All the rest of the neurons are hidden from view [5].

III. MOTIVATION

The nodes in the movable unplanned networks travel continuously in the random directions. The frequent topology changes leads to broken links which increases the delay in sending the data to the intention node. In the traditional routing protocols such as AODV, DSR or DSDV, do not focus on reducing the back-to-back stoppage of the transmitted packets and remaining energy of the network. In healthcare applications where the urgency of the data is on the highest priority, the routing protocol that can reduce the back-to-back stoppage is required. Although there exists routing protocol such as enhanced-ant-aodv [7] in which the authors have considered energy of the paths as well in addition to the reliability in improving the back-to-back stoppage of the packets, they do not consider the mobility of the nodes which may lead to higher link breakage and more delay in the network. The proposed AODV-ANN takes care of such issues in predicting the delay dependencies and choosing the energy efficient and delay aware optimized path to send data from source to destination node.

IV. PROPOSED AODV-ANN

Here part, we explain the planned direction-finding protocol AODV-ANN. It follows the path finding stage, similar to AODV. In the path finding stage, the resource node screens a RREQ packet, when it has got to send some data for destination node and the route to destination is not available in its routing table. The nodes that receive the RREQ packet rebroadcast it upon not finding the route in their routing tables. The process continues until the request reaches the destination node. In the proposed protocol, the nodes send information about their remaining energy along with RREQ packet.When the intention receive the RREQ packet, it formulates various routes to the resource node and sums up their remaining energy. In order to use the artificial neural network, we classify the paths in training and testing set. For all the paths having remaining energy more than the average remaining energy, the paths constitute the testing set while the other paths constitute the training set. ANN trains the network and tests the highest energy paths to compute their delay dependencies. Distance between two nodes, their relative mobility and congestion index has been used to predict the delay dependency. All three factors are directly proportional to delay of the transmitted packets.

After application of ANN, the intention send the RREP to the resource node over the paths in the testing set. The source node upon receiving the RREP chooses the path having minimum computed delay dependency. Then the data is transmitted over such a path.

4.1 Algorithm

0. While (destination is not found)
1. for i=1:N // N is number of nodes
2. $Node_i$ finds neighbors in its range.
3. if (neighbor == destination)
4. ANN();
5. RREP();
6. Else
7. Broadcast RREQ packet to the neighbor.
8. End if
9. End for
10. End while

ANN(P) // P is set of paths

11. Compute remaining energies of the paths

RE. = $\sum_{i=1}^{P} Initial\ Energy - Consumed\ Energy$

12. If RE > Average Energy
13. Testing set = P;
14. Else
15. Training set = P;
16. End if
17. Apply ANN on training set.
18. Predict delay dependencies for testing set.

RREP(P, Delay dependencies)

19. Send route reply to source node over paths.
20. if delay dependency == minimum
21. Send data over the path.
22. Else
23. Put the path in the cache memory.
24. End if

V. RESULTS

The simulation has been done in MATLAB 2016. First, the comparison of the three direction-finding protocol namely AODV, DSDV and DSR has been done. Their performance has been analyzed based on the back-to-back stoppage of the packets and remaining energy of the network. The various simulation parameters used are:

Table 1: Simulation Parameters

Parameter	Value
Channel	Wireless
Number of nodes	100
Routing Protocols	AODV, DSR, DSDV
Initial Energy	100 Joules
Mobility	0-5 m/s
Network area	1000 * 1000 sq. units

1. Back-to-back stoppage: It is the time-span by a packet to arrive at from resource to intention node.

2. Remaining energy: This depicts the network lifetime. It is difference between initial energy and consumed energy.

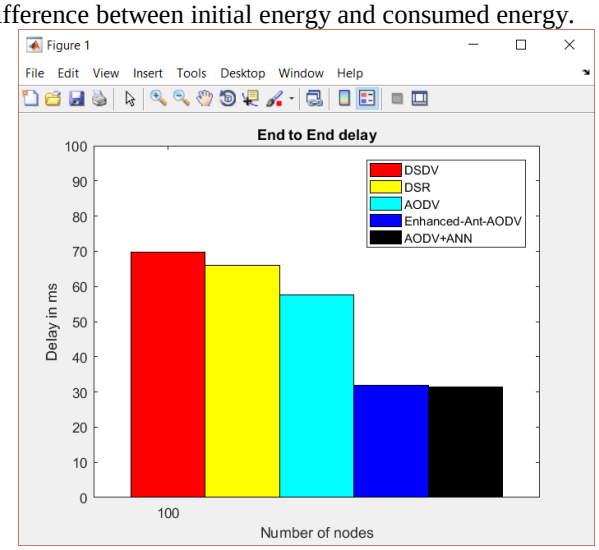

Figure 1: End to end delay comparison

The back-to-back stoppage is maximum for dsdv and minimum for the proposed aodv-ann. DSDV proactively maintains the routes, therefore if the routes go stale the routing updating process requires broadcasting of the packets among the nodes. Whereas in other two routing protocols, AODV and DSR the routes are reactively made. The routes made are fresh which gives less delay values as compared to proactive DSDV routing protocol. For Enhanced Ant based AODV, the delay value was found to be 32 ms and for the proposed AODV-ANN the value was found to be 31.5 ms.

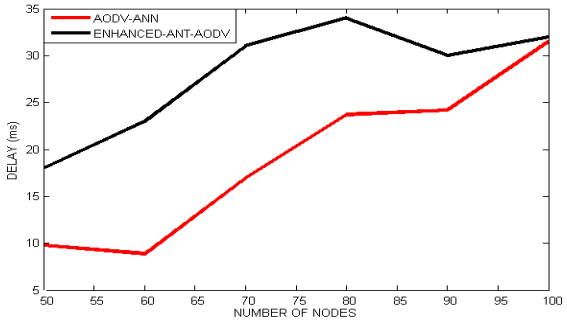

Figure 2: Effect of Node number on Average end to end delay

The ANN considers congestion and mobility as well in predicting the delay dependencies therefore the path is better optimized as compared to enhanced ant based AODV.

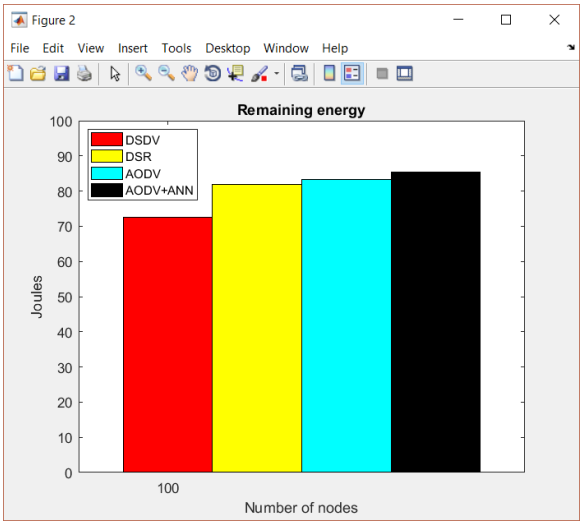

Figure 3: Remaining energy comparison

The DSDV requires broadcasting of the control packets between the nodes such that they can share the information of the routing table with each other, therefore it consumes maximum energy. ANN based AODV considers energy efficient paths in the testing set for which delays are predicted. This allows the network to choose energy efficient path from the testing set. The remaining energy was found to be 85.3 Joules for the proposed protocol and 72.5 for the DSDV.

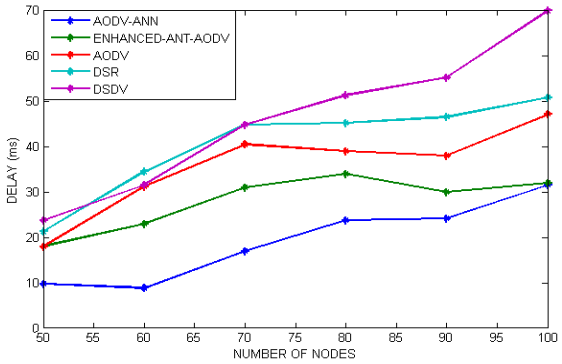

Figure 4: End to End Delay Comparison between Various Routing Protocols

In the above we compute the results of various routing protocols such as AODV, DSR, DSDV and Enhanced Ant AODV with implemented AODV-ANN approach. In this figure we compute the results by changing their number of nodes and get the enhanced performance as compare to existing implementation. As mentioned we get better quality of service which simplifies the enhancement of the networks.

VI. CONCLUSION

This work was aimed at improving the energy effectiveness of the network and delay in the transmitted packets by optimizing the path. Firstly we choose the simple MANET protocol such as AODV, DSR and DSDV. This simulation is basically meant for the medium scale networks. We found that AODV got better average end to end performance. And then we inherited the properties of AODV. To implement ANN we proposed the AODV-ANN.

The artificial neural network was used to predict the delay dependencies based on distance between two nodes, relative mobility and congestion index. The energy efficient path with minimum delay dependency was chosen to send data to intention. The prospect procedure had shown improvement in terms of back-to-back stoppage and energy consumed. In future, the security aspect of mobile unplanned network can be considered so that network can defend itself against attacks. Also, the network can be tested for various IoT applications such as traffic applications, military applications as well in which delay plays an important role.

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