Performance Analysis of Angle Direction Routing in AODV Protocols for MANETs.

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ABSTRACT

The study and developments of communications in wireless networks has commanded on increasing interest of researchers in the last few years. Mobile ad hoc networks (MANETS) belong to the class of networks that do not need the support of wired access points for intercommunication. Mobile ad-hoc networks consist of nodes that may frequently move. We have proposed a new purely on-demand protocol which uses the heading direction angle of a mobile node to transmit a message in the network in order to find the best route to the destination .The protocol is designed to calculate the angel direction and to find the best route from the source to the destination. The performance of the new adaptive and dynamic routing algorithm for MANETs is based on the evaluation of the number of broken links between source and destination. Broken links are one of the most important performance evaluation metrics in Ad Hoc networks. We evaluate our proposed algorithm by comparison with the well known On-Demand (reactive) routing protocol called the Ad hoc On-Demand Distance Vector (AODV) protocol. The evaluation shows that, our algorithm provides a better performance by reducing the number of broken links than the AODV algorithm. We investigated various simulation scenarios with different node densities and our new algorithm outperforms AODV in all cases.

I. Introduction

Many ad hoc network protocols (e.g., routing, service discovery, etc.) use hops as the basic technique to disseminate control messages. During the last decade, the interest has almost exploded maybe because of the fast rising Internet[1]. Mobile ad hoc networks are created by mobile nodes. Some of these mobile nodes are used to forward packets for neighbours[2]. These networks have no fixed routers and every node could be used as a router. The total network is mobile, and the individual nodes are allowed to move freely. In this type of network pairs of nodes may not be able to communicate directly with each other and have to rely on some other nodes so that the messages are delivered to their destinations. The nodes of these networks function as routers, which discover and maintain routes to other nodes in the networks. The nodes may be located on airplanes, ships, trucks, cars, perhaps even on people or very small devices. Ad hoc networks are emerging as the next generation of networks. In Latin, ad hoc literally means "for this," further meaning "for this purpose only and thus usually temporary[3]. In this paper, we propose a new approach that can find the suitable path between source and destination using angle direction. The proposed algorithm dynamically calculates the host angle direction in order to stay connected with other nodes as long as they are moving in a similar direction. We evaluate our proposed approach against the simple AODV[4] approach by implementing it in a modified version of the AODV protocol. The simulation results show that broken links can be significantly reduced through the proposed approach. The rest of this paper is structured as follows. Section 2 includes the background and related work of dissemination in MANETs. Section 3 presents the proposed algorithm. The parameters used in the experiments and the performance results and analysis to evaluate the effectiveness and limitation of the proposed technique are presented in Section 4. Section 5 c**onc**ludes the paper and outlines the future work.

II. Related Work

Early work on (MANETs) depends primarily on applying the traditional approaches of routing in wired networks, such as distance vector or link state algorithms. While many optimizations to these algorithms exist, each of them is primarily concerned with finding the minimum hop route from source to destination Assumed that all nodes wishing to communicate with other nodes in the network and each node is willing to receive and forward packets for other nodes. Each mobile node in the network is equipped with a digital compass that provides the heading direction angle of the mobile device hosting it. Each mobile node in the network will classify its neighbours and they are categorized within the eight different zones. According to the direction of those neighbours .the node can assort each neighbor in one of these zones [5, 6].

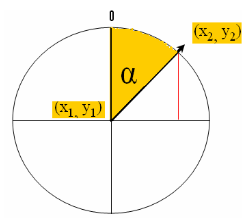
III. Angle Direction Algorithm

The algorithm proceeds according to the following steps:-

1- We calculated the heading angle for all nodes depending on the node position and figures 1-4 show angles in different quadrants of the networks.

Previous position x1, y1

Current position x2, y2

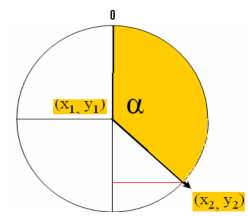


Y=Y2-Y1

X=X2-X1

angle=90-atan(y/x)*180/pi

Fig1: first quarter

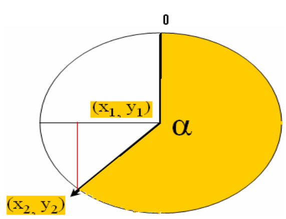


Y=X2-X1

X=Y1-Y2

angle=180-atan(y/x)*180/pi

Fig2: second quarter

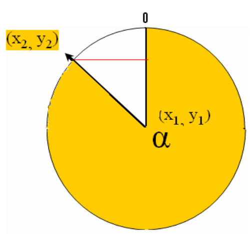


Y=Y1-Y2

X=X1-X2

angle=270-atan(y/x)*180/pi

Fig3: third quarter



Y=X1-X2

X=Y2-Y1

angle=360-atan(y/x)*180/pi

Fig4: fourth quarter

2- Procedure: Handle Request (angle process)

a) If packet received for the first time add it to Routing Table.
b) If the rout is new, update the Routing Table.

3- Procedure: Handle Reply.
Calculate the Angle between the two Nodes:

Nod1: the sender node.

Node2: the receiver node .

Def = |Node1Angle-Node2Angle|

If Def>180

Angle=360-Def

Else

Angle=def;

End if

Return Angle;

If the new route (new angle) is a better than the available (current angle) update the Routing Table.

3- After selecting the lowest angle difference, than we can send the data.

IV. Performance Analysis

We evaluate our proposed Angle direction algorithm by a comparison with the AODV protocol. The algorithm provides better results by reducing the number of broken links compared the AODV algorithm. Our algorithm gives good results under certain conditions such as, increasing the speed and increasing the number of packets sent.

A. Mobility Models

Different mobility models can be differentiated according to their spatial and temporal dependencies. Spatial dependency: this is a measure of how two nodes are dependent in their movement. If two nodes are moving in the same direction then they have high spatial dependency. The Random Waypoint model is the most commonly used mobility model in this research area. A node randomly chooses a destination and moves towards it . After reaching the destination, the node stops for a time defined by the 'pause time' parameter. After this duration, it again chooses a random destination and repeats the whole process until the simulation ends[7].

B. Simulation Setup

The GloMoSim network simulator (version 2.03) [8]. We have used to perform extensive experiments to evaluate our new angle direction algorithm we called our algorithm EAODV (Enhanced +AODV). The MAC layer protocol is IEEE 802.11[9]. The parameters used in the simulation experiments are shown in table 1

Table1. Simulation Parameters

Simulation Parameter	Value
Simulator	GloMoSim v2.03
Network Range	1000m x 1000m
Transmission Range	250m
No. of connections	40
Mobile Nodes	100
Traffic Generator	Constant Bit rate(CBR)
Band Width	2Mbps
Packet Size	512 bytes
Packet Rate	1 packet per second
Simulation Time	900s
Speed	1-5,1-7.5,1-10(m/s)
No. of Packets Sent	50,100,150 Packets

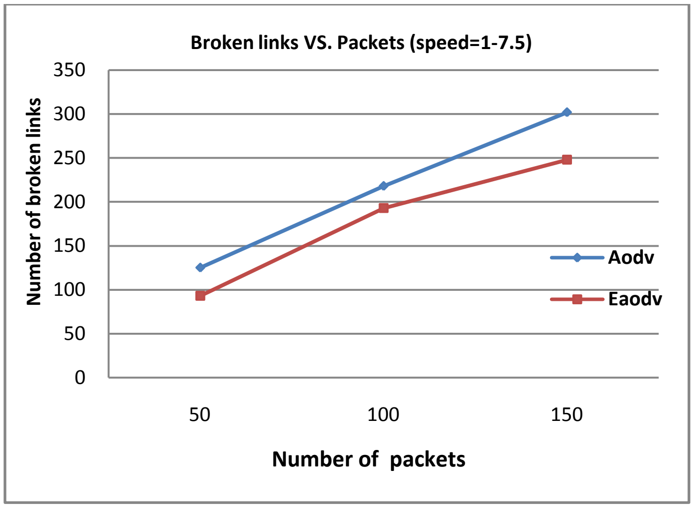


Figure 5 Broken links vs. Packets

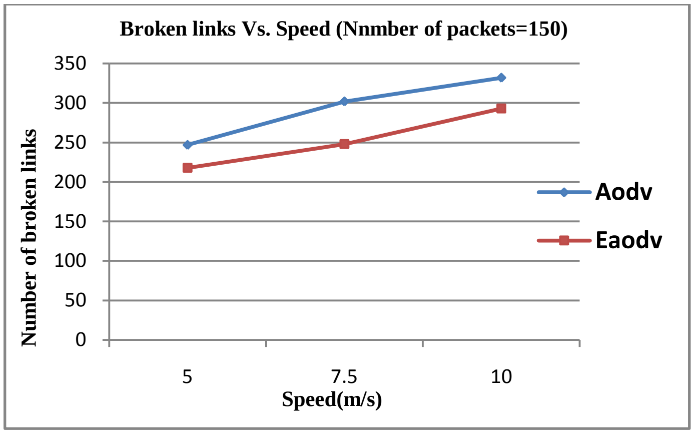


Figure 6 Broken vs. Speed

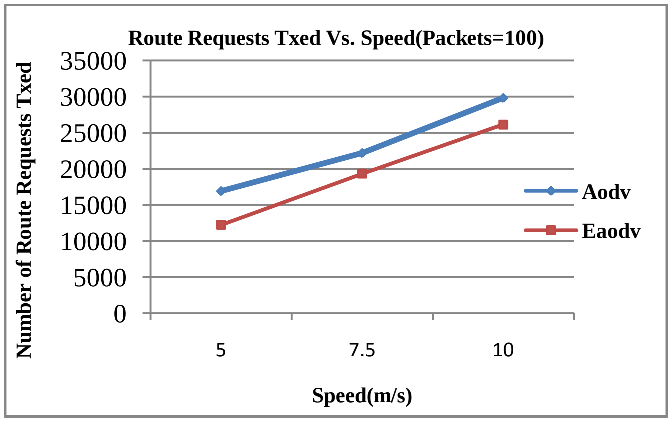


Figure 7 Route Requests Txed vs. Speed

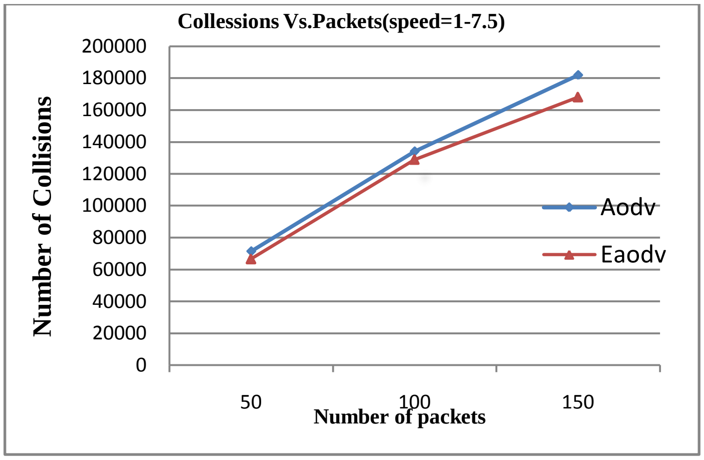


Figure 8 Collisions vs. Packets

The main aim of our EAODV algorithm is to decrease the number of broken links in the route phases during the simulation time for all nodes. Fig. 5 and fig. 6 shows that our EAODV algorithm can significantly reduce the number of broken links for the network with variation Speed (1-5, 1-7.5, 1-10 m/s) and different number of packets sent to destination (50 ,100 ,150 packets). As a result of reducing the broken links the Collision and the number of Route Requests Txed are reduced too. Fig.7 and Fig.8 are show the results with different speeds and numbers of packets.

V. Conclusion.

Our paper presents a new algorithm for using the heading angle direction for routing in MANETs.Our simulation results shows the new algorithm (EAODV), generates a smaller number of broken links ,smaller number of route requests txed and fewer collisions than the AODV protocol. In our future work, we will use different mobility models, such as Manhattan grid and freeway mobility models. We will also continue to enhance the performance of our algorithm by adding additional features, such as hop count, velocity or node density.

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