New Performance Analysis of Angle Routing AODV Protocol in MANETs

Mohamed S. El-azhari, Othman A. Al-amoudi, Mike Woodward and Irfan Awan
Mobile Computing, Networks and Security Research Group
School of Informatics, University of Bradford,
Bradford, BD7 1DP, U.K.
{ m.el-azhari, o.a.al-amoudi, m.e.woodward, i.u.awan }@bradford.ac.uk

Abstract

The ultimate goal of the MANET community is to provide a set of standardized protocols that can be both robust and scalable. This paper proposes routing protocol based on the best heading direction angle route. The protocol is designed to calculate the average of all heading direction angles in the route and find the best route from the source to the destination. We measure the performance of the proposed approach by comparing it with the well known On-Demand (reactive) routing protocol (AODV).

I. Introduction

Many ad hoc network protocols (e.g., routing, service discovery, etc.) use hops as the basic technique to broadcast control messages. A mobile ad-hoc network (MANET) is a kind of wireless ad-hoc network, and is a self-configuring network of mobile routers (and associated hosts) connected by wireless links – the union of which form an arbitrary topology . Some of these mobile nodes are used to forward packets for neighbors[1]. During the period of the last decade, the interest in MANETs has almost exploded because of the rapidly developing Internet[2]. 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]to compare and analyze MANETs routing protocols, appropriate classification methods are important. Classification methods help researchers and designers to understand distinct characteristics of a routing protocol and find its relationship with others. One of the most popular methods to distinguish MANET routing protocols is based on how routing information is acquired and maintained by mobile nodes. Using this method, mobile ad hoc network routing protocols can be divided into proactive routing, reactive routing and hybrid routing. The Dynamic Source Routing (DSR)[4] and Ad hoc on- demand Distance Vector routing (AODV) [3]are examples of reactive routing *protocols* for mobile ad hoc networks. The Zone Routing Protocol (ZRP)[5], which is a hybrid routing protocol has been proposed to combine the merits of both proactive and reactive routing protocols and overcome their shortcomings. The most widely used metric in MANET routing is hop count .It is used in both the static and dynamic networks. In this paper, we propose a new approach that can find the suitable path between source and destination using angle direction if there is more than one path available calculate the average of all heading direction angles in every path and fined the best one from the source to the destination. We evaluate our proposed approach against the simple AODV hop count approach by implementing a modified version of the AODV protocol. The simulation results show that broken links, collisions and number of hops can be significantly reduced through the proposed approaches. The rest of this paper is structured as follows. Section 2 includes the background and related work of in MANETs. Section 3 presents the proposed algorithms. 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 concludes 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. 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. This section analyses the related work which directly or indirectly aims at using the angles to form the route which consist of a number of legs (nodes) between the source and the destination. The proposed protocol is based on the heading angle and a mobile node that propagates a message in the network in order to find the best route to the destination, where each node is assumed to be equipped with a digital compass. Also, each node classifies its neighbor into eight different zone ranges according to their direction [6].This paper proposes a routing protocol based on the angles (directions) of the adjacent mobile nodes. Each pair of nodes that form a hop should ideally be moving in the same or similar direction, so the connection between the source and the destination will consist of a series of nodes that are moving in a similar direction[7].The Random Waypoint mobility model has been used in many studies the results show that the Random Waypoint mobility model is a good approximation for simulating the motion of vehicles on a road, but there are situations in which a different model is better suited[8, 9].

III. Algorithm

At hand are varieties of ad hoc routing protocols. No matter how different they may be, in every routing protocol it is a key common task to find a "good" path between a source and a destination. Evaluation depends on a path metric such as hop count, expected delay, expected lifetime, etc. As a result, we have to find out a path that is optimal or at least nearly optimal with respect to the given or used path metric.

Figure1**:** explain the suggested metric if there is more than one path available calculate the average of all heading direction angles in every path and find the best average from the source to the destination. In the figure we can compare the paths, node S1, node2, node3, node4and node D5, and path node S1, node6, node7, node8, node D5.

The algorithm proceeds according to the following steps.
1- Calculate the heading angle for all nodes in the network.

2- Calculate average of all heading direction angles in every path and take the best average form all routes between the source and the destination.

```
Calculate the Angle between the two Nodes:
Node1: the sender node.
      Node2:  the receiver node.
      Def = |Node1Angle-Node2Angle|
     If Def>180
Angle=360-Def
 Else
      Angle=def;
 End if
      Return Angle;
```

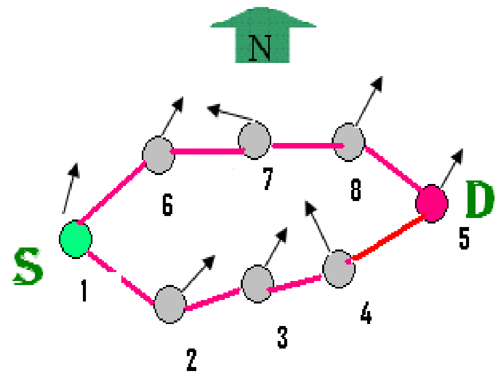

Figure 1: Mean of all Direction Angle in the rout.

IV. Performance Analysis

We evaluate our proposed algorithms by a comparison with the AODV protocol. The algorithm provide better results by reducing the number of broken links, collisions and number of hops compared with the AODV algorithm. Our algorithm give good results under certain conditions such as, increasing the number of nodes and 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 and this is used in the paper. 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 [10].

B. Simulation Setup

We have used the GloMoSim network simulator (version 2.03)[11] to conduct extensive experiments to evaluate the behaviour of the proposed algorithm. We study the performance comparison with the hop count approach, i.e AODV protocol (3, 10, and 11) which is included in the GloMoSim package. The MAC layer protocol is IEEE 802.11[8]The original AODV protocol uses hop count for discovering and maintaining routes between source and destination nodes. We have thus implemented AODV additionally using angle direction, we use a 1000m × 1000m area The parameters used in the simulation experiments are shown in table1.

Table1. Simulation Parameters

Simulation Parameter	Value
Simulator	GloMoSim v2.03
Network Range	1000m x 1000m
Transmission Range	250m
No. of connections	40
Mobile Nodes	100,120,140
Traffic Generator	Constant Bit rate(CBR)
Band Width	2Mbps
Packet Size	512 bytes
Packet Rate	1 packet per second
Simulation Time	900s
Speed	30(m/s)
No. of Packets Sent	25,50,75,100 Packets

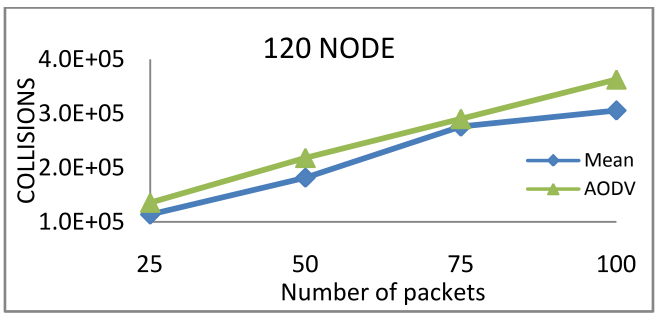

Figure 2: Collisions Vs. Packets

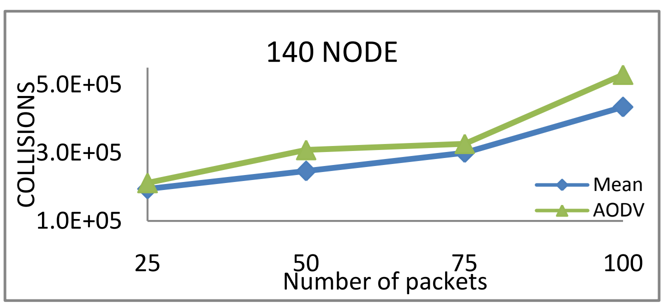

Figure 3: Collisions Vs. Packets

Figures 2 and 3. Shows the number of collisions for network with 120, and140 nodes, different packets (25, 50, 75, and 100). As shown in Figures our algorithms incur fewer collisions than AODV.

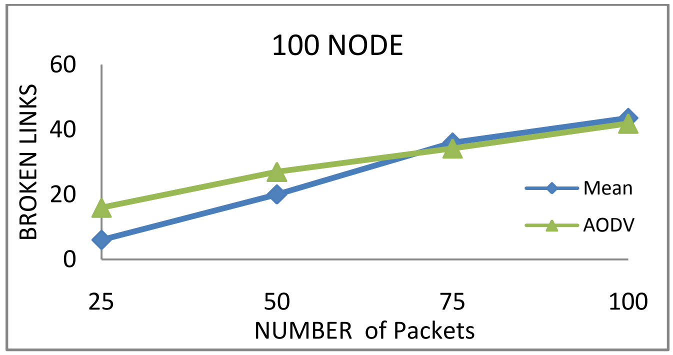

Figure 4: Broken Links vs. Packets

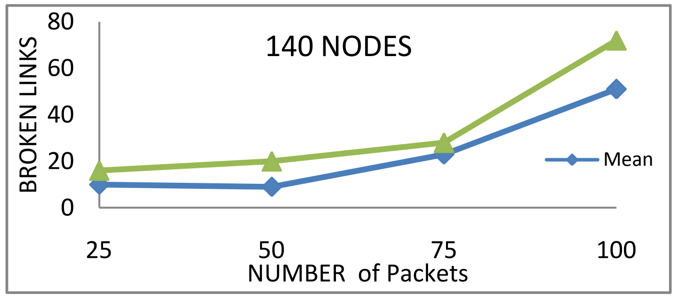

Figure 5: Broken Links vs. Packets

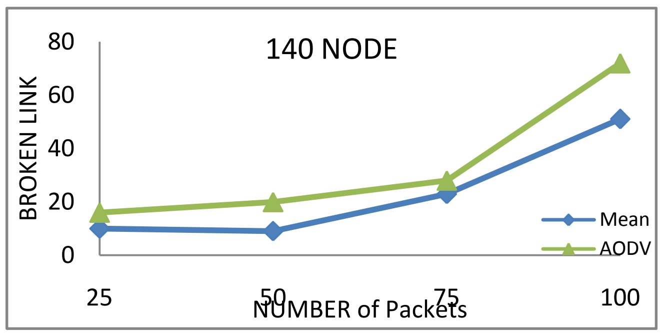

Figure 6: Broken Links vs. Packets

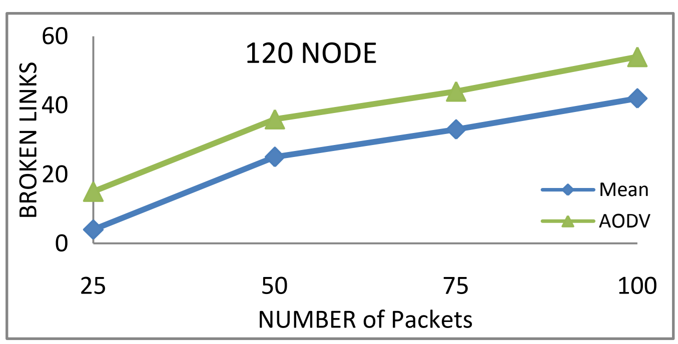

Figure 7: Broken Links vs. Packets

Figures: 4,5,6 and 7 shows that our improved algorithms can significantly reduce the number of broken links for networks of 100, 120and 140 nodes and varying number of packets

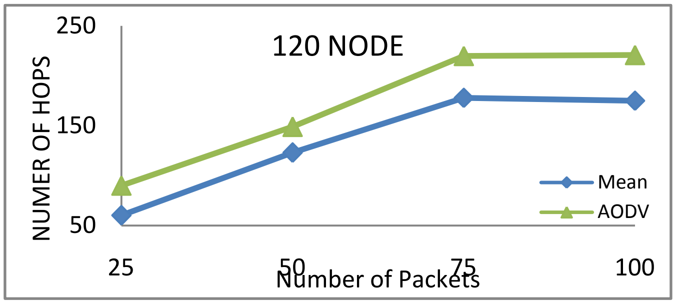

Figure 8: Number of Hops Vs. Packets

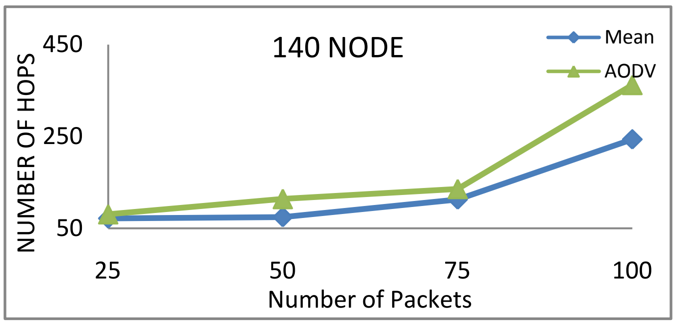

Figure 9: Number of Hops Vs. Packets

Figures: 8 and 9 shows the number of hops for a network with 100, 120,140 nodes, (25, 50, 75,100) packets. The improvement in reducing hops is now more significant with a large number of packets.

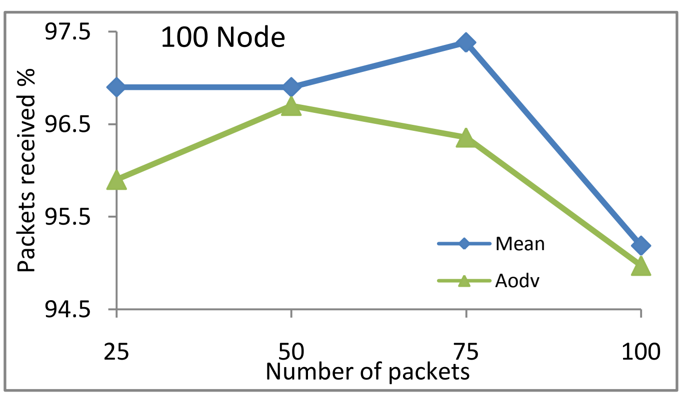

Figure 10: Number of Packets received Vs. Packets

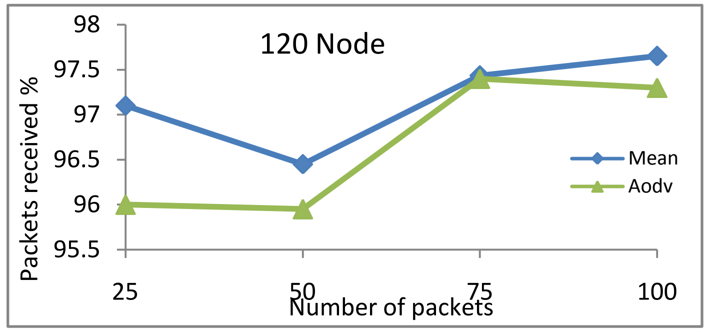

Figure 11: Number of Packets received Vs. Packets

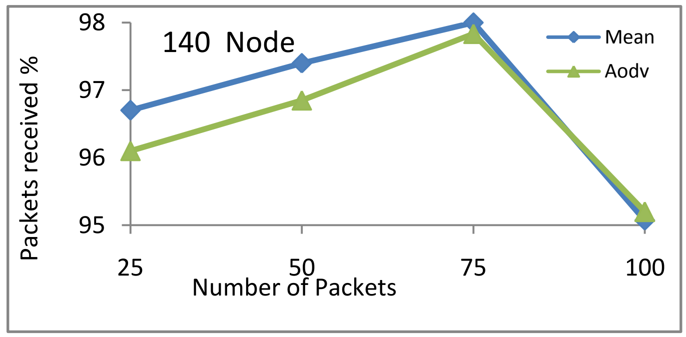

Figure 12: Number of Packets received Vs. Packets

Figure 10, 11 and 12 shows the number of Packets received for a network with 100, 120, and140 nodes, (25, 50, 75, 100) packets. The improvement in percent is more significant with a small number of packets.

V. Conclusions

The paper has presented new algorithms for using the (heading angle direction +Hop counts, Hop counts+ Angle direction and the mean of all angle direction in the route) for routing in MANETs. The simulation results shows the new algorithms, generates a smaller number of broken links, smaller number of hops 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 algorithms by adding additional features, velocity or node density

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