Provide a method to Prediction of nodes movement to optimize Routing Algorithms in Ad Hoc Networks

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Abstract

Ad hoc networks have been of great interest among scholars of the field, due to their flexibility, quick setup, high potentiality, and also their application in the battle field, fire, earthquakes, where there is no hope to setup infrastructure networks. network dynamic, high mobility of nodes, the nature of broadcast communication ,short durability of mobile devices batteries, transmission errors and as a result packet loss and limited bandwidth of bands, all cause the routing in those networks to be more difficult than the other networks.

Key words: ad hoc networks-routing protocols-predicted motion

1. Introduction

One of the major problems in *ad hoc* networks is routing problems.
In this type of networks, route breaking is commonplace due to the movements of nodes.
Thus when a protocol finds a route it is most probable to lose track of it .many algorithms have been presented so far , which have been able to solve this problem to some extent some of them are as follow:

1.1. Multi route routing
In these methods, in the routing phase, it is tried to find several routes between source and Destination so as to use alternative routes when route breaking. [3, 4]
1.2. Local recovery of broken links.
We use these methods when there has been a blockage in the route because of a broken link .the broken link is repaired locally at the same nodes so the source node doesn't have to start the routing protocol again so we can highly reduce the number of controlling boxes[5,6]
1.3 link breaking prediction
We use these methods to predict the breaking of the links and anticipate a new link before their breaking so as to keep the route.
These methods can be divided into three categories:
1.3.1 Methods based on received signal strength
In these methods the nodes using received signal strength from neighboring nodes try to estimate the link setup duration .thus they can predict breaking instances and before occurrence they can choose an alternative route for sending information. [8, 9]
1.3.2. methods of location-based information nodes (motion predication)in these methods the nodes use geographic information and try to predict the time of breaking of links, and before breaking by using the present distance and radio range can find the alternative routes so as to not to have any stoppage in the transmission of information. [2, 7, 10, 11]
1.3.3. Methods based on exchange hello packets in these methods the nodes become aware of each other by periodical exchange called hello packets. [12, 13]
In this article we have concentrated on the prediction of motion nodes and try to propose a method to reduce the routing overhead.
1. It limits the packet route discovery which every node sends to its neighbors.
2. It predicts the breaking routes and before occurrence fields a new alternative route and by this the protocol is prevented from re-routing phase

In order to evaluation the efficiency of our suggest method we put our method on the AODV protocol. (according to the studies done in this regard AODV protocol in networks where the speed of nodes isn't high and the number of nodes is between 30 to 80 ,has been distinguished as the best protocols)and we compare the results of the suggest method and the results of the AODV protocol shows the efficacy of our method.[14,15]

2. Describe suggest method

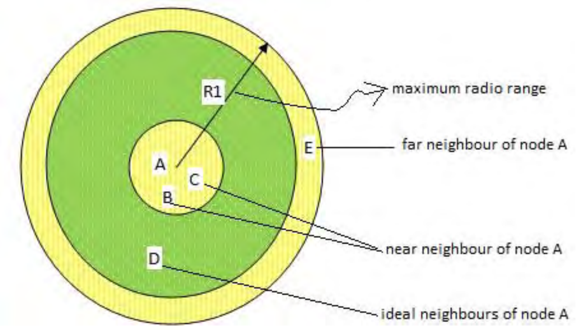
2.1. Improved AODV protocol (EAODV)

In this protocol we have tried to focus on the limitation of sending the routing packet and also by using the local information of the nodes improve AODV protocol.as we know the on-demand protocols have been comprised of main phases.1.routing 2.supporting the route.

Our suggest mechanism by changing in the first phase or the very routing phase or the routing phase tries to find more dynamic routes we protocol with minimum overhead routing. This mechanism also is in its best condition in support phase.to being more exact it tries to predict the breaking route and before occurrence field the alternative nodes. Also by this mechanism we find the nodes which are near to each other and the presence of one of them is not necessary .the max-distance shows two consecutive nodes before breaking. We use this limit when the distance between two consecutive nodes is extended.it can be figured out that there would be a breaking therefore; we should take care about the route before breaking. The second limitation is min-distance which shows the minimum distance allowed between two nodes. We use this limitation where two nodes approach close to each other, in a way that the first node without the interference of the second node sends its packet to the next node. We omit the second node and by this we both shorten the route and also we save the nodes energy for further usages.in our suggest method at first each node periodically sends geographical information to the neighbors which have a distance of one step .it should be mentioned that the length of these periods varies relation to the nodes speed. Every node after receiving the information about the situation of the neighboring nodes calculates the last reception and also calculates its distance to its neighbors and stores it in the routing table. If a node, for the two consecutive times, doesn't receive this packet it concludes that the node has left its neighborhood and omits it from the table of neighbors

2.1.1. Routing phase

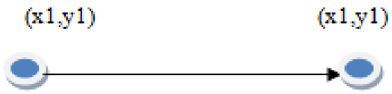
In our suggest mechanism ,when discovery route step, the source node (x2,y2)finds a route to the destination by using geographical information which has received from its neighbors and comprises an array in the routing table.in this array ,according to the node distance from its neighbors there columns are established. The first column is called close neighbors, the second one is called ideal neighbors on the third one is called far neighbors. The nodes near neighbors are those whose distance to the node is shorter than min-distance. Ideal neighbors are those whose distance to the node is longer the min-distance and shorter than max-distance .far neighbors, are those whose distance to the node is longer than max-distance.as shown in the figure



In the previous algorithm the number of route discovery controlling packets which each node sends to its neighbors, its neighbors, is infinite.in the suggest method we force each node to send a specific number of route discovery controlling packets.to discover the route, the source node, based on the limitation in sending the discovery controlling packets in the algorithm and neighboring time tables, first sends the discovery route packets to the ideal neighbors. If these route controlling packets are less than the determined number, then the packets and first send to the near neighbors then to the distant neighbors.by using this strategy ,first the number of controlling packets resulting from route discovery packets diminishes and secondly the nodes which have been closer in the route ,in a way which the first node without the interfering of the second node sends its packets to the next node ,the second node is omitted in the route and by delete this node the route gets shorter and also the energy of the nodes is saved for future usages.

2.1.2. Support phase. The mechanism of the supporting phase is as follows:

When a node wants to send a packet to the next node on the route, since it has its distance to the next node in its neighbors time table there forest; three conditions may occur:



$$D=\sqrt{(x2-x1)^2+(y2-y1)^2}$$

D is called Euclidean distance.
Now by having this distance three condition are possible.
1. min-distance <D<max-distance. The area of ideal neighbors
2. D<min-distance. The area of near neighbors.
3. D>max-distance. The area of distant neighbors.
In the first case the route is in its normal condition and it isn't necessary to do a special node, it just sends the packet to the next node .in the second case the current node and the next node are very close to each other and the following node should leave the route. so the current node sends a message to the next node on the route and wants the next step and its distance to the node on the routes. The next node sends this message and the address of its next node and its distance to that node.to the current node. The current node adds up the Euclidean distance of the next node in the routing table with the Euclidean distance sent from the next node. Then if this distance was located in ideal neighbors' area of the current node, then the node replaces two steps forward instead of the next step in the routing table. And the next node is deleted .as it was mentioned by doing this the route grows shorter and as a result the delay of the end to the end of the route becomes smallest and the next advantage in saving energy for the next operations and there is no misuse of energy which in long term causes the longevity of the network.in the third case the current node determined that its distance to the following node is beyond the norm and we would have a disconnection. The current node sends a message to the next node and it wants the next step and the destination node. After receiving the answer from the next node the current starts a new routing phase in order to find a route to the destination, by sending a route request. RREQ to its neighbors. if they know an answer then they reply if they don't have an answer then they distribute this packet to their neighbors. Now if this packet by means of one or two linking steps reaches the next node or a node which has an active route to the destination node it will answer otherwise this packet starts distributing until it reaches the destination and it itself answers .here we should mention again that in routing phase the packet is send to the nodes which are located in the ideal neighbors area and if it were not found then to the near or far neighbors. Its worst condition is when it cannot find a new route and when there is disconnection between two nodes. In this situation the routing protocol phase is started and tries to find a new route from the departure to destination. Here, we can refer to the two advantages
1. Before current route breakdown, it tries to replace a new route and it will prevent the delay sending the data.
2. Close routes are deleted and the route for sending the information becomes shorter.
3. Simulation results.
To simulate the suggest approach we have used glomosim 2.03 simulation program. Simulation in a region of 1000*1000 square meters which is composed of 50 nodes and the movements of the nodes in the simulating program has been a based on random way point algorithm and the allocated 500 seconds for simulation.
Our criteria for evaluating the simulation have been the followings:
1. End to end delay 2.the number of lost packets 3.total number of broken routes 4.total number of route steps 5.total number of controlling packets
Figure 3-1. Shows the end to end delay AODV protocol and EAODV protocol
By increasing the speed of nodes end to end delay of EAODV by a little slope is increasing

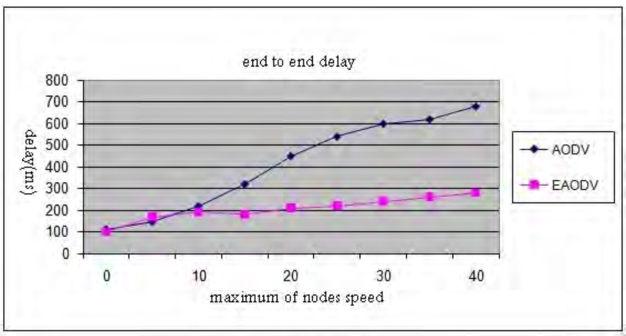


figure 3-1. end to end delay

Figure1. Shows losing data packets in AODV and EAODV protocols. Since in EAODV for sending the data we use stable routes and also repairing the breakdown of routes is done locally the amount of losing packets in EAODV is considerably less than AODV.

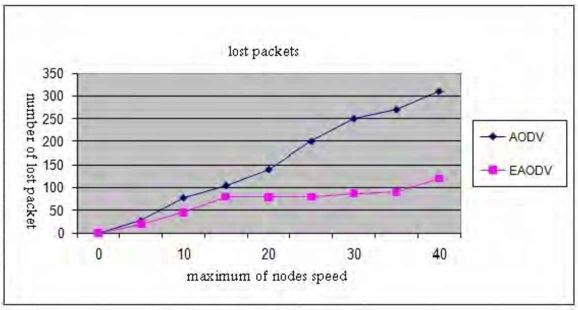


figure 3- 2 number of lost packet

Figure 2. Shows the number of breaking routes

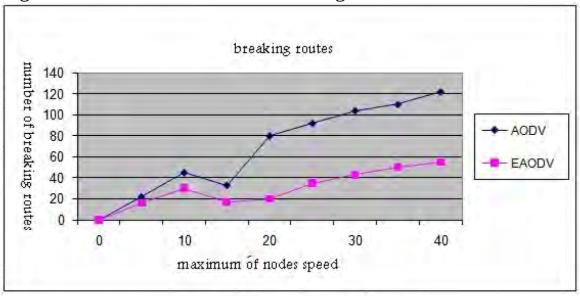


figure 3-3.number of breaking routes

Figure 3. Shows the total number of present nodes for connection in two protocols.as we can see EAODV has performed better again.it has two reasons:

1. The reduction of the total number of established routes
2. Delete extra nodes from the routes

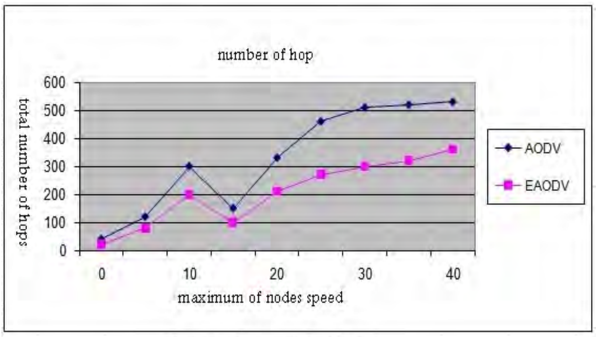


figure 3-4.total number of hops

Figure 4. Shows the total number of controlling packets in AODV and AODVprotocols.by increasing the speed of nodes in two methods, the number of controlling packet exchanged between the increased .but in EAODV since the number of selected routes and also the number of disconnected routes is less than AODV ordinary

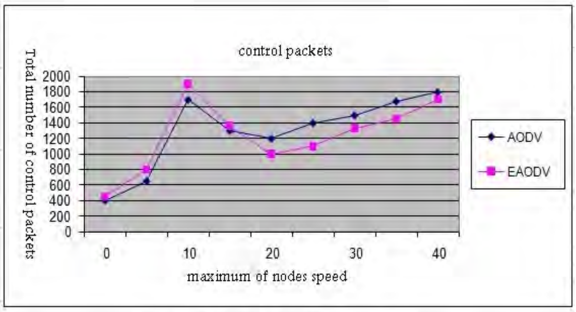


figure 3-5. Total number of control packets

Protocol, the number of exchange controlling packets would also be less .but this amount in simulation of the two protocols is so close and the reason behind it is the hello packets which have been used in EAODV for supporting the route.

4. Summary, conclusion and further research

In this article we refer to three stages for solving the AODV algorithm problems
1. It limits the number of discovery routes
2. Diagnosing network topology in future by dividing the neighbors of node according to their distance into three groups, close neighbors
Ideal neighbors and far neighbors
3. The prediction of breaking routes in support phase and measures for repairing the route locally
In this paper only used the UDP traffic to transfer data .you can use TCP traffic for the focus of later research and efficiency of suggest method can be examined under these condition.

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