IJARCCE

ISSN (Online) 2278-1021
ISSN (Print) 2319 5940

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 5, Issue 1, January 2016

A Cost Effective Flooding Algorithm for AODV Routing Protocol in Mobile Ad Hoc Networks

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Abstract: MANET is consisting of wireless mobile nodes without having any central administration or infrastructure less topology. The Flooding algorithm is simple but it is not efficient and which results in redundant message transmission. The simple flooding algorithm causes high packet collisions and network conjunctions that may degrade the network performance. Flooding must be handled efficiently in order to improve protocol performance. By using the position of node the protocol can reduce the number of retransmissions, which can help to enhance the protocol performance. Here, the enhanced Flooding Algorithm is used that uses the node position to send the packets. This method is applied On Demand Distance Vector (AODV) protocol which reduces the number of Route Request (RREQ) messages. The RREQ message transmission has been improved by using N hop knowledge and concept of distance based method. The simulator output shows that our algorithm reduces the packet overhead and which improves network throughput.

Keywords: distance based scheme, RREQ message, N hop knowledge, enhanced Flooding.

I. INTRODUCTION

MANET consists of mobile nodes which are communicated via wireless connections and here each node sends the message to the next node. Due to infrastructure less topology, the routing is considered as a complex and difficult process in mobile ad hoc network. Hence, routing algorithm should be improved. Routing is important one in MANET, which finds the direct route from a source node to destinations node. There are different routing algorithm is available in mobile adhoc network. This protocol mainly classified as table driven, on demand and hybrid model. In proactive protocol each node maintain the table which contains other node information so, whenever source wants to send the Data first it will find the path using this table then It sends the data. The proactive protocol is mainly subdivided into wireless routing protocol (WRP) and destination sequence distance vector (DSDV) protocol but complexity is more. In reactive routing protocol the node finds the path only when it is needed and this protocol mainly classified as dynamic source routing(DSR),on demand distance vector routing(AODV) protocol, temporally ordered routing protocol(TORA) and location aided routing (LAR). The reactive protocol has some advantages like simple and less complex. The hybrid model uses advantages of both protocols. This protocol mainly divided into zone resolution (ZRP) and cluster based routing (CBRP) protocol. The reactive protocol means the source node sends a route request message whenever it wants and decision is taken based on route reply message that can be sent by intermediate or destination node. In simple reactive protocol a node finds path to destination or intermediate node, by flooding a route request message (RREQ) and after receiving the message each node checks that whether it has received previously or not. In case it has received previously then node drops the route request message, otherwise it checks that it has correct path to destination node, if it has correct path, then node sends Route Reply (RREP) message to source node and if it does not have correct path then node sends the RREQ message to its neighbor nodes. This is called as simple flooding and here, each node rebroadcast one RREQ message, so the maximum number of retransmissions is N – 2, hence which causes excessive retransmissions of redundant message and collisions of message may happen in dense network. Which may increases delay and overhead in the network. Many approaches are used to enhance simple flooding algorithm in which some are defends on lowering the retransmission of redundant messages. In previous algorithm the author has used the 1 hop previous information and GPS information but is less efficient algorithm. In this paper we have used the distance based method and N hop neighbor method where, nominated neighbor is allows sending route request message.

II. LITERATURE SURVEY

a) Counter Based Method

In this method, after receiving a route request message, the nodes initialize the counter with a value one and sets a random time. During this time; the counter is incremented by one for each redundant message received. If the counter value is less than threshold value then the RREQ message will be transmitted. Otherwise, it will be discarded.

b) Probability Based Methods

The probabilistic is same as the simple flooding scheme but here; each node retransmits the RREQ message with a predetermined probability p.

c) Distance Based Method

In distance based scheme distance between neighbor node

IJARCCE

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and destination node is calculated but previous algorithm is defends on location of nodes. Here, the neighbor node which has less distance w.r.t destination node that is chosen as next node so, that number of retransmission of RREQ message will be less .This method is also called as shortest path algorithm.

d) N Hop Knowledge Method
This method is based on 1-hop or 2-hop neighbor information to reduce retransmission of redundant messages. The neighbor information can be obtained by using HELLO message along all neighbor nodes in the network. In N hop neighbor information method the current hop and all previous hop information is taken and the neighbors which are common for the current hop and all previous hop is not considered for next routing process and hence, which can reduces packet collision in the network.

III. PROPOSED METHODOLOGY

Neighbors to Rebroadcast the RREQ (NNRR) improve the propagation efficiency by using N-hop neighbor information algorithm and distance based algorithm. More specifically, NNRR makes use of both in nodes as well as border nodes. In N hop neighbor information method the current hop and all previous hop information is taken and the neighbors which are common for the current hop and all previous hop is not considered for next routing process. In distance based method the distance of neighbor node w.r.t. destination is calculated and a node which has less distance that is chosen as next forwarding node.

IV. DESCRIPTION/METHODOLOGY

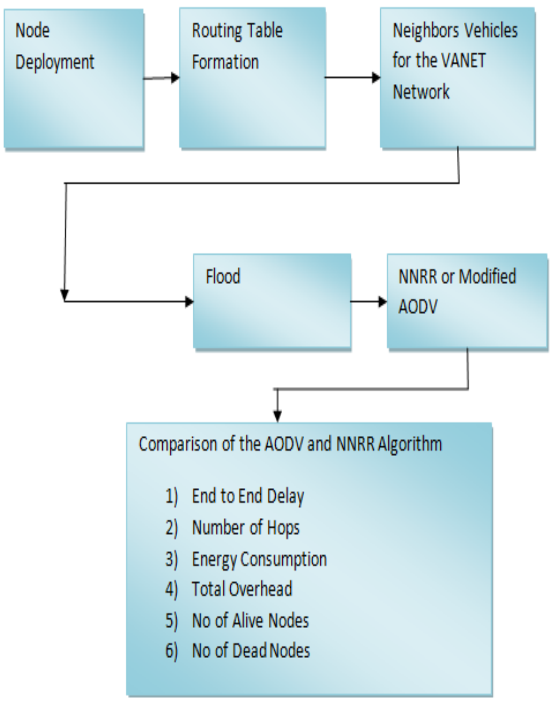

Fig 1: System Architecture

Figure shows the architecture with efficient Flooding scheme

a) Node Deployment
The Node Deployment is the algorithm which is used to place the nodes in the 8 different regions and each of the regions consist of at least 5 nodes.

b) Routing Table Formation
Routing table algorithm is used to find the routing table for each node which contains the other node information and which is used at the time of route formation**.**

c) Neighbor Nodes in the Network
This Module is used to determine the neighbor Nodes for given transmission range.

d) Flood Algorithm
The simple flood algorithm is applied on network and which is used to find path.

e) NNRR or Modified AODV Routing Algorithm
Neighbors to Rebroadcast the RREQ (NNRR) improve the propagation efficiency by using N-hop neighbor information algorithm and distance based algorithm. More specifically, NNRR makes use of both in nodes as well as border nodes. In N hop neighbor information method the current hop and all previous hop information is taken and common neighbors are not considered for next routing process In distance based method the distance of neighbor node w.r.t. destination is calculated and a node which has less distance that is chosen as next forwarding node

<table>
<tr><td>Type</td><td>J</td><td>R</td><td>G</td><td>D</td><td>U</td><td>Reserved</td><td>Hop Count</td></tr>
<tr><td colspan="8">RREQ ID</td></tr>
<tr><td colspan="8">Destination IP Address</td></tr>
<tr><td colspan="8">Destination Sequence Number</td></tr>
<tr><td colspan="8">Originator IP Address</td></tr>
<tr><td colspan="8">Originator Sequence Number</td></tr>
</table>

Fig 2: RREQ message

V. COMPARISON

This module is used to compare the two route discovery protocols namely Flood and Modified AODV or NNRR algorithm with respect to following parameters

a) Total Time
It is the time taken for the RREQ message to go from the source node to destination node and then send the RRPLY message from destination node to source node.

$$E2E_{delay} = t_{stop} - t_{start}$$

Where ,

t_{stop} = *This is the Time at which RRPLY is recieved*

t_{start} = *This is the Time at which RREQ is send*

b) Number of Hops
The Number of intermediate nodes between source node and destination node is called Number of Hops.

c) Energy Consumption
The total energy consumed by node during the routing process the total energy consumption is given as follows

$$TE_c = \sum_{i=1}^{l} E_i$$

$Where\ ,$

$l = number\ of\ links$

$E_i = Energy\ consumed\ by\ the\ i^{th}\ link$

The energy consumed by the i^{th} link given by

$$E_c = 2E_{tx} + E_{amp}\, d^{\gamma}$$

$E_{tx} = energy\ required\ for\ data\ transmission$

$E_{amp} = energy\ required\ for\ data\ generation$

$d = distance\ between\ two\ intermediate\ nodes$

$\gamma = environment\ factor$

$0.1 \le \gamma \le 1$

$The\ Standard\ environment\ factor$

d) No of Alive Nodes

It is the total number of alive nodes which are available after the routing process

e) No of Dead Nodes

It is the total number of dead nodes which are available after the routing process

VI. FLOW CHART

a) Flood Algorithm

The Flood Algorithm is used to find the route from source node vehicle to destination node.

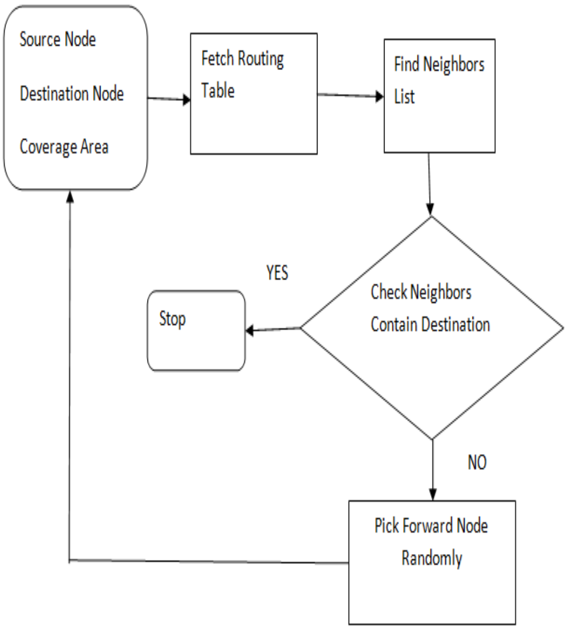

Fig 3: Flood Routing

Fig shows the flowchart for the Flood Routing Algorithm.

1. Source Node, Destination Node and Transmission Range acts as an input.
2. The Source Node will find the set of nodes within transmission range known as neighbor nodes.
3. If the neighbor nodes has the destination node then stop the process.
4. If the neighbor nodes does not have the destination node then pick one of the neighbor as the next forward node.

b) Modified AODV or Enhanced Flood Algorithm

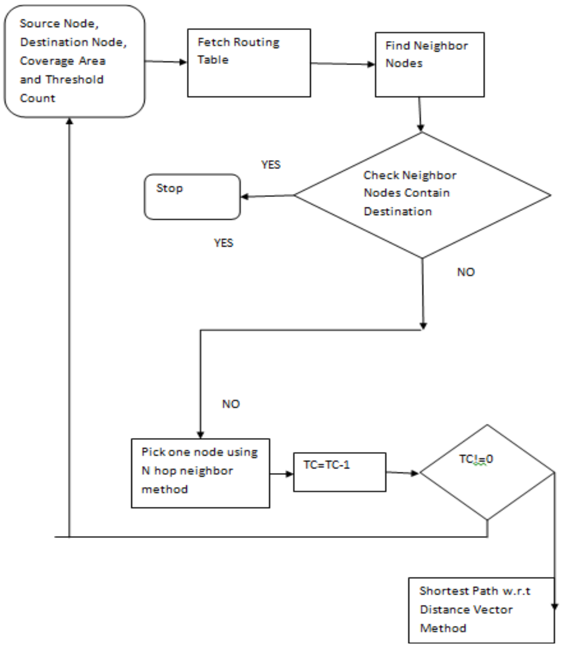

Fig 4: Enhanced Flood Algorithm

1. Source node, destination node, Transmission Range & Threshold Count acts as an input.
2. The set of nodes are found which have the distance within transmission range known as neighbor's nodes.
3. If the set of neighbors has the destination node then stop the process otherwise jump to step4.
4. The set of neighbors which are within the range given by the following criteria are secure zone nodes

$$R \le CA \le R + Th$$

$Where\ ,\ R = Transmission\ Range$

$Th = Threshold\ Range$

5. The secure zone nodes will have the destination node. If destination node is present then stop the process.
6. Decrement the Threshold Count
7. If the Threshold Count is not zero then repeat the steps from 1 to 6 until destination is reached or Threshold Count is zero.
8. If the Threshold Count becomes zero then make use of Shortest Path Distance Vector algorithm is applied.

c) Distance Based Method

The distance based scheme can be described as follows

1. Source Node, Destination Node & Transmission Range acts as an input.
2. The neighbor nodes are computed w.r.t Source Node.
3. If the neighbor nodes has the destination node then stop the process.
4. If the neighbor nodes does not have the destination node then jump to Step5
5. Compute the distance of each of the neighbor w.r.t destination
6. Find the node which corresponds to minimum distance.
7. Repeat the process until destination is reached.

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The distance based scheme used can be described as follows

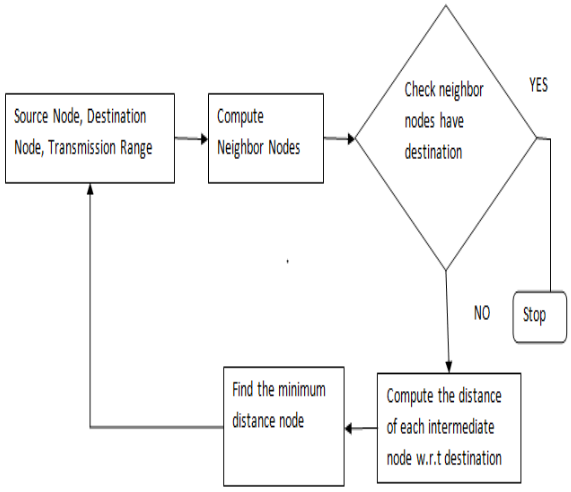

Fig 5: distance based scheme

VII.RESULTS

a) Comparision of Total Time Taken in Different Algorithms

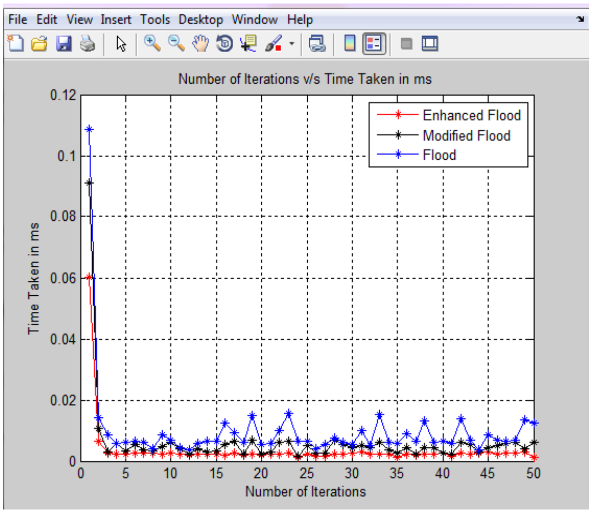

Fig 6: Comparison of total time taken in different algorithms

b) Comparison of No of Hops between Different Algorithms

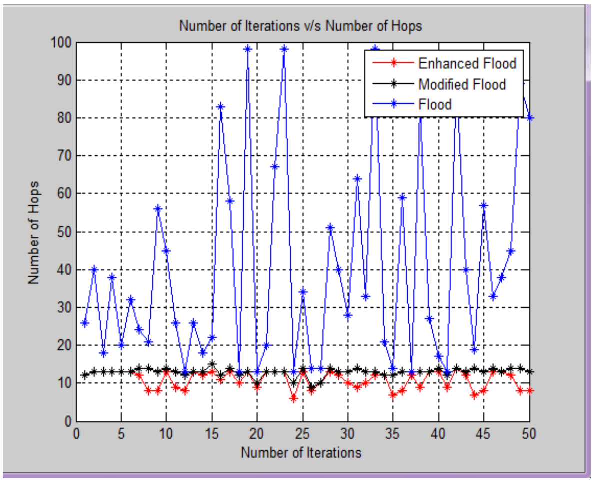

Fig 7: Comparison of no of hops between different algorithms

c) Total Energy Consumed between Different Algorithms

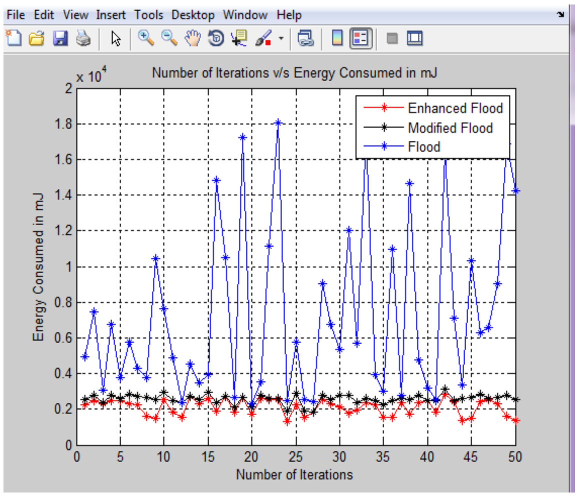

Fig 8: Total energy consumed between different algorithms

d) Comparison of No. of Alive Nodes between Different Algorithms

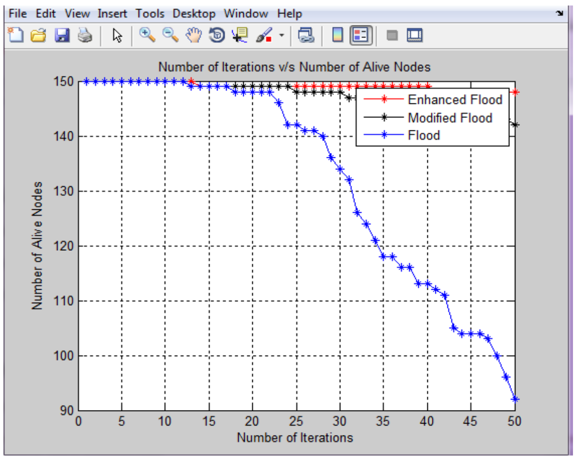

Fig 9: Comparison of no of alive nodes between different algorithms

e) Comparison of No. of Dead Nodes between Different Algorithms

 DOI 10.17148/IJARCCE.2016.5195

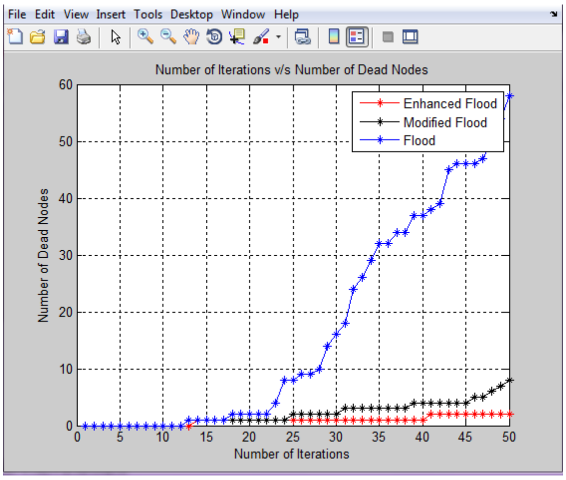

Fig 10: Comparison of no of dead nodes between different algorithms

f) Comparison of Routing Overhead between Different Algorithms

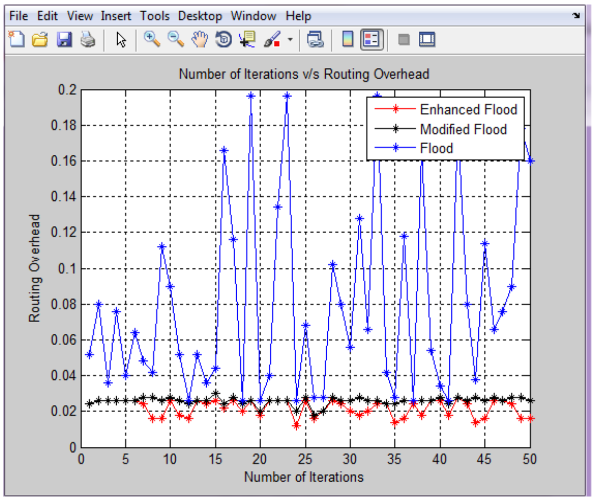

Fig 11: Comparison of routing overhead between different algorithms.

VIII.CONCLUSION

The enhanced flooding algorithm has been proposed. By using the position of node and n hop neighbor information we can reduce the number of RREQ message which improves the protocol performance. In NNRR algorithm RREQ message will be send to nominated nodes instead of sending to every node which reduces congestion problem. In distance based scheme it chooses shortest path to destination hence which reduces total delay and Simulation result shows that our proposed algorithm is better than current algorithm.

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