ISSN 2047-3338

Signal Strength Based Route Selection in MANETs

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***Abstract*– Mobile Ad hoc Network is a Network which contains mobile nodes that topology constantly changing. The mobile nodes can move freely from one place to another place. Most current ad-hoc routing protocols select paths that minimize hop count like AODV, DSDV and DSR .In ad hoc wireless networks; minimal hop count paths can have poor performance because they tend to include wireless links between distant nodes. These long wireless links can be slow or lossy, leading to poor throughput. Due to mobility the link between distant nodes is broken quickly. Therefore, the method can be considered in the routing that select nodes between the source and destination which are more stable than other node as intermediate nodes. In this paper we proposed a method which measures signal strength between nodes and compare with RSSI threshold values if it is greater than threshold value then it is accepted for further processing otherwise it is discarded. The benefit of this scheme is by selecting a strong route to the destination we can increase the lifetime of the network. Simulation results show that SSAODV has performance better than AODV routing protocol in terms of the metrics: End-to-end delay, Packets delivery ratio, throughput, Routing overhead.**

***Index Termss*– MANETs, Routing, RSSI and Route Failure**

I. INTRODUCTION

A mobile ad-hoc network (MANET) [1], [2], [3] consists of a collection of mobile hosts, which does not require no infrastructure or central management to quickly establish a temporary network. A MANET is suitable in applications requiring quick set up and implementation, such as military battlefields or disaster recovery areas. All MANET applications require the dissemination of packets, from node to node, on time-varying channels and time-varying topologies. Communication, between non-neighboring nodes, requires a routing protocol, so a stable and efficient routing method is required for longer live transmission.

Ad hoc networks consist of mobile nodes which suffer from deployment in an unorganized way. Since all nodes in MANET move randomly so topology of the network is constantly changing which lead to frequent route failure between source and destination nodes. Basically two types of routing are used in Ad hoc networks first one is Reactive and second one is proactive. Proactive routing (such as DSDV [4]) create routing table which contains an entry of every node in the network. They update the route table periodically and recalculate the distance to all nodes. In reactive method (such as DSR [5] and AODV [6]), whenever route is required it calculate the route between source and destination.

A stable route in Ad hoc network is defined as routes which gives flexibility in highly mobile network and not fail for an acceptable period of data transfer. Similarly an intermediate node is stable when it does not break the route due to mobility.

II. RELATED WORK

Finding a stable route between source and destination has always been a challenging issue in highly mobile networks. Various methods have been proposed to deal with node mobility.

A. Signal Strength-Based Routing Protocol for Mobile Ad hoc network

In [7] node measure the signal strength of the link and send Route Request to other node, after that intermediate node accept that packet compare the signal strength value of the link with Route Request packet, if it is less than packet value then its modified the packet value with minimum value and forwarded to other node until it reach to the destination, with the help of this approach weak link of the route is calculated ,after receiving Route Request by the destination node ,its send the Route Reply with minimum of the route to source then source node first select earliest established path to forward packets, then changes to the strongest signal strength path for long transmissions.

B. SINR based Multipath routing

In SINR based [8] method protocol maintains multiple path and calculate maximum signal strength of each route when the source node got the reply from destination then it select the route which have maximum signal strength among the multiple route. If the primary path is unavailable, the next one of the alternate path is immediately used for data transmission.

C. M-MAC: Mobility Based Link Management Protocol for Mobile Sensor Network

In this paper [9] every node maintains the RSSI table , RSSI table contain the signal strength value of node's neighbor, with the help of this RSSI table node predict that his neighbor node is moving away from us, after predicting the link failure it performs following steps:

i). Dropping: If the quality of link is severely damaged or the link is already broken, then this method drops the packet.

ii). Relaying: In this technique, a node can become a relay node when both sender and receiver are in its neighbor table and forward the data between source and destination, if the link is fail between source and destination.

iii). Selective forwarding: In this technique, the intermediate node drops the packet if it comes from bad links.

III. PROPOSED WORK

In the MANET, one of the major concerns is how to reduce the link failure due to the mobile node in the network, for this stable route is required which is more flexible in mobile networks. Stable route in MANETs is a route that is established for an acceptable period for transmission. For this purpose in this paper, we propose a new method for routing in MANETs that created routes have more stability. In this method we use signal strength metric to route the data to the destination. The following cases are used to forward the data over the network.

A. Route Discovery

When the route is needed, the source sends the RREQ packet to his entire neighbor after that intermediate node does following steps:

First it checks the signal strength of the packet if it is greater than SIGNAL THRESHOLD value then it process the request otherwise it discard this RREQ packet then intermediate node checks its routing table for the desired destination. If it found then send a reply to the source otherwise it forwards the RREQ to his neighbor.

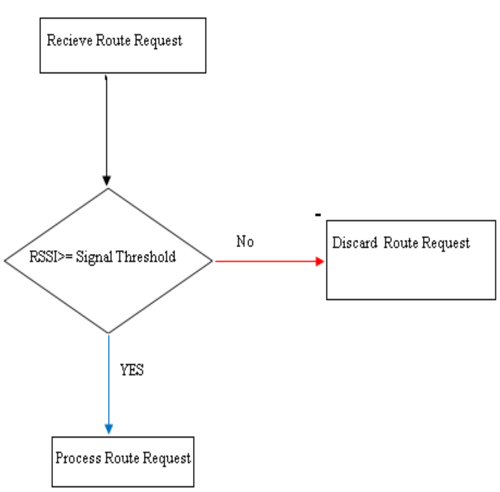

Fig. 1. Processing of Route Requestin SSAODV

B. Route Selection by source node

When several RREPs receive to the source node, it can select the best RREP based on minimum hop count and start sending data.

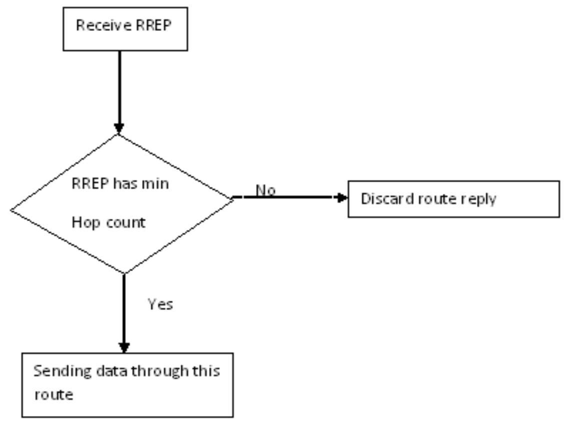

Fig. 2. Route selection in SSAODV

IV. PERFORMANCE EVALUATION

In this section, the performance of SSAODV is evaluated using NS2 [10], [11] and compared with AODV. First we describe how the RSSI value is calculated then the simulation environment is described and the simulation results are discussed with comparison.

A. Calculation of RSSI value

The RSSI value is calculated with the help of two ray ground model

$$P_r(d) = \frac{P_t * G_{t*} G_r * h_t^2 * h_r^2}{d^4 L}$$

P_r: Power received at distance d

P_t: Transmitted signal power

G_t: Transmitter gain (1.0 for all antennas)

G_r: Receiver gain (1.0 for all antennas)

d: Distance from the transmitter

L: Path loss (1.0 for all antennas)

h_t: Transmitter antenna height (1.5 m for all antennas)

h_r: Receiver antenna height (1.5 m for all antennas)

B. Simulation parameters

The simulation parameter has shown in Table 1. Here, we designed and implemented our test bed using Network Simulator (NS-2.34) to test the performance of both Routing algorithms. The data transmission rate is 4 packets/sec. The total simulation time is 100 second.

Table 1: Simulation Parameters

Parameter	Value
Simulation Duration	100s
Topology Area	800 m x 800 m
Number of nodes	20 to 200
Mobility Speed	10(m/s)
Mobility Model	Random waypoint
Transmission Range	250m
Packet rate	4 packets/s
Packet size	512 b
Traffic Type	cbr
Number of cbr connections	8

C. Simulation Results

We simulated SSAODV (along with AODV) using NS2. In this section, we present the simulation results and compare SSAODV with AODV. In this scenario we change the number of nodes.

Fig. 3 shows that as the number of node increases end to end delay in AODV increases rapidly as compared with SSAODV. Reason behind the reduction in end to end delay is because of the selective processing of signals. Weaker signals are discarded at the routing layer after comparing the RSSI with Signal threshold. This makes only selected signals entering into further processing phase thus reducing the end to end delay.

Fig. 4 shows that as the number of nodes increases routing overhead also increases, SSAODV avoid unreliable mobile nodes from the route, it requires less rerouting and leads to less control overhead so in large network SSAODV perform better than AODV. Fig. 5 SSAODV select the most reliable path so number of packet drop is also low as compare to AODV. So the packet delivery ratio is also better than AODV in denser network.

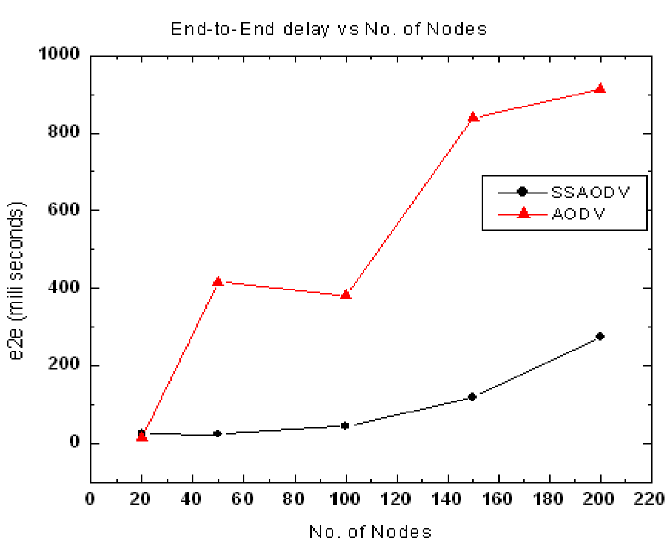

Fig. 3 end-to-end delay vs. Number of nodes

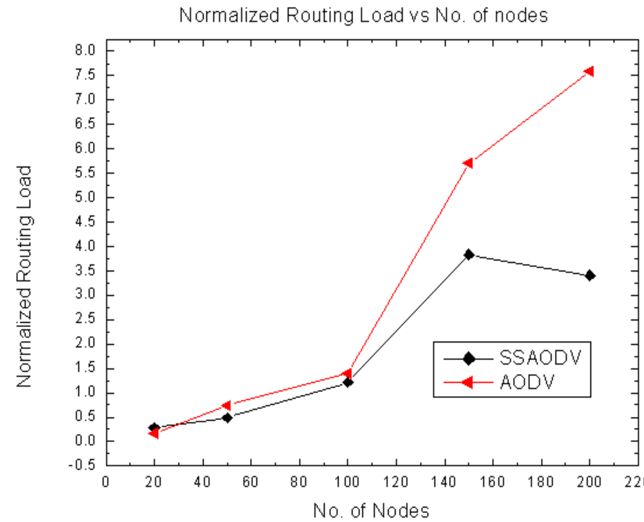

Fig. 4. Normalized Routing vs. Number of nodes

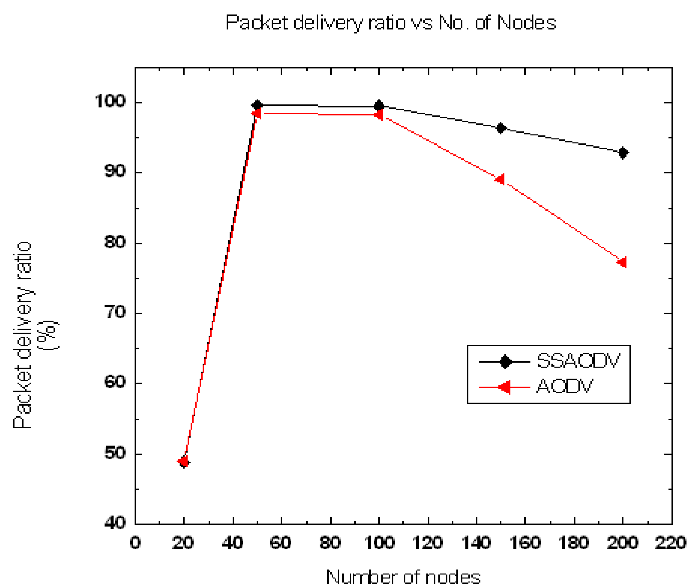

Fig. 5. Packet delivery Ratio vs. Number of nodes

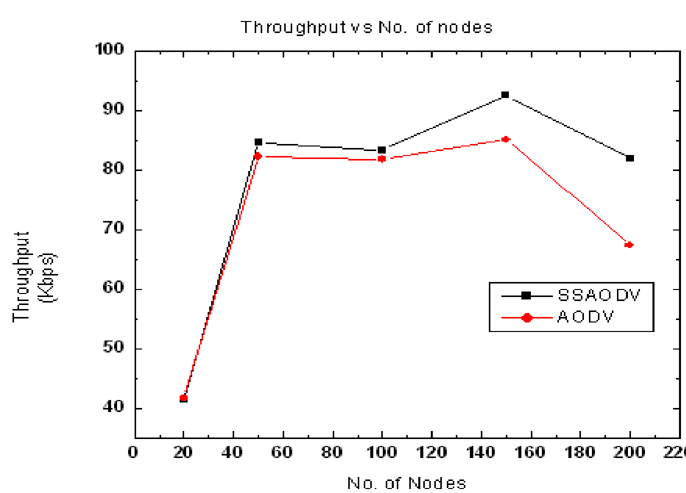

Fig. 6. Throughput vs. Number of nodes

The above figure shows that SSAODV perform better than AODV as the number of nodes increases.

V. CONCLUSION

- For CBR traffic, SSAODV is more beneficial at large network. As the number of nodes increases SSAODV take lesser end-to- end delay than AODV due to lesser retransmissions compare to AODV.
- For CBR traffic, SSAODV performs slightly better than AODV in most cases. SSAODV always seems to offer better performance in terms of Packet Delivery ratio and throughput when compared to AODV.
- SSAODV not only enhance the network performance but also more reliable in data transmission as it reduces the network partition and packet loss in the networks.

ACKNOWLEDGEMENT

The authors would like their thanks to Mr. Vijay Kumar Vishwkarma for his valuable suggestion.

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