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ENERGY EFFICIENCY MULTIPATH ROUTING PROTOCOL FOR MOBILE AD-HOC NETWORK USING THE FITNESS FUNCTION

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ABSTRACT--MANET is a collection of wireless mobile nodes that dynamically form a temporary network without the reliance on any infrastructure or central administration. Energy consumption is considered as one of the major limitations in MANET, as the mobile nodes do not possess permanent power supply and have to rely on batteries, thus reducing network lifetime as batteries get exhausted very quickly as nodes move and change their positions rapidly across MANET. The research proposed in this paper highlights this very specific problem of energy consumption in MANET by applying the Fitness Function technique to optimize the energy consumption in AOMDV routing protocol. The proposed protocol is called AOMDV with the FF-AOMDV. The fitness function is used to find the optimal path from the source to the destination to reduce the energy consumption in multipath routing. The proposed FF-AOMDV protocol was evaluated by using NS-2, where the performance was compared with AOMDV and AOMR-LM protocol. The comparison was evaluated based on energy consumption, throughput, packet delivery ratio, end-to-end delay, network lifetime and routing overhead ratio performance metrics, varying node speed, simulation time. The results clearly demonstrate that the proposed FF-AOMDV outperformed AOMDV and AOMR-LM under majority of the network performance metrics and parameters.

I. INTRODUCTION

The performance of computer and wireless communications technologies has advanced in recent years. As a result, it is expected that the use and application of advanced mobile wireless computing will be increasingly widespread. MANETs are envisioned to support effective and robust mobile wireless network operation through the incorporation of routing functionality into mobile nodes. In MANETs, the limited battery capacity of a mobile node affects network survivability since links are disconnected when the battery is exhausted. Power-aware routing protocols deal with techniques that reduce the energy consumption of the batteries of the mobile nodes. This approach is basically done by forwarding the traffic through nodes that their batteries have higher energy levels. This will increase the network lifetime. The research in this paper presents an energy efficient multipath routing protocol called AOMDV with the FF-AOMDV. The FF-AOMDV uses the fitness function as an optimization method, in this optimization.

II. AOMDV Routing Protocol

AOMDV creates a more extensive AODV by discovering, at every route discovery process, a multipath between source and destination. The multipath has a guarantee for being loop-free and link-disjoint. AOMDV's primary idea is in discovering multiple routes during the process of route discovery. The design of AOMDV is intended to serve highly dynamic ad-hoc networks that have frequent occurrences of link failure and route breaks.

destination
sequence number
hopcount
nexthop
expiration_timeout

(a) AODV

destination
sequence number
advertised_hopcount
route_list $\{(nexthop_1, hopcount_1), (nexthop_2, hopcount_2), ..\}$
expiration_timeout

(b) AOMDV

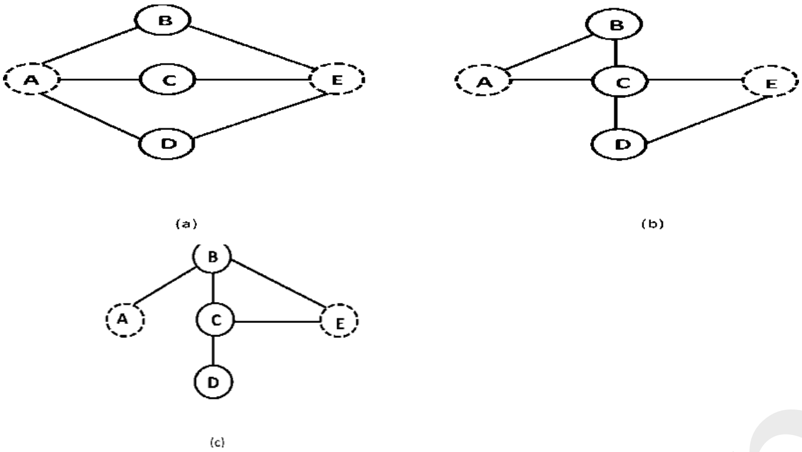
A. Routing discovery and maintenance

Route discovery and route maintenance involve finding multiple routes from a source to a destination node. Multipath routing protocols can try to discover the link-disjoint, node disjoint, non-disjoint routes AOMDV utilizes three control packets:

- Route request (RREQ)
- Route reply (RREP)
- Route error (RERR)

B. Disjoint path

Two types of disjoint path exist, the node-disjoint path and link-disjoint path. In a node-disjoint path, there is no common node exists in a specific path other than the source and destination nodes. In a link-disjoint path, there is no common link at all router.



III. Fitness function

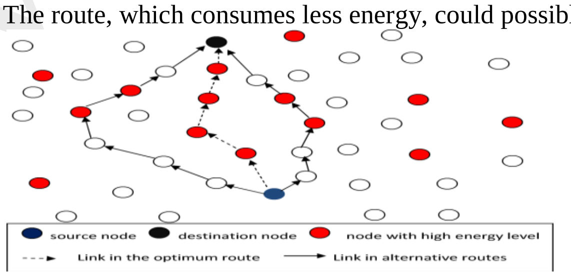
Fitness function is the objective function, its used to achieving the solution in optimal. The fitness function is an optimization technique that comes as a part of many optimization algorithms such as genetic algorithm, bee colony algorithm, firefly algorithm and particle swarm optimization algorithm. The factors that affect the choice of the optimum route are:

- The remaining energy functions for each node.
- The distance functions of the links connecting the neighbouring nodes
- Energy consumption of the nodes
- Communication delay of the nodes

IV. Proposed FF-AOMDV

FF-AOMDV is a combination of Fitness Function and the AOMDV's protocol. The source node will have types of information in order to find the shortest and optimized route path with minimized energy consumption. This information include

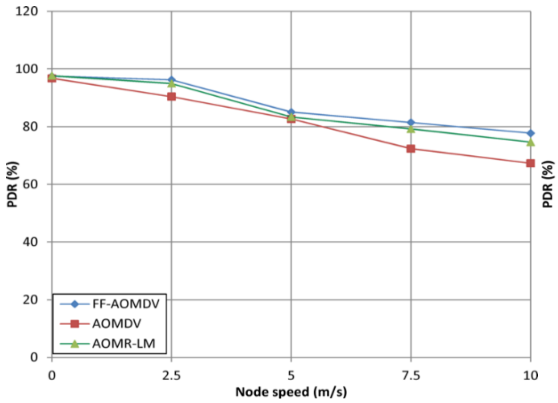
- Information about network's each node's energy level
- The distance of every route
- The energy consumed in the process of route discovery
- The route, which consumes less energy, could possibly

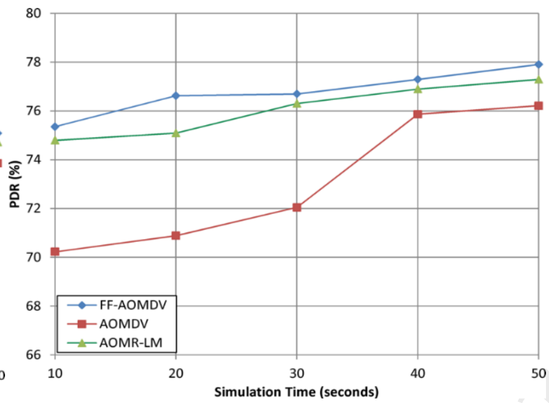


V. Packet Delivery Ratio: (PDR)

The ratio of the data packets that were delivered to the destination node to the data packets that were generated by the source, this metric shows a routing protocol's quality in its delivery of data packets from source to destination. The higher the ratio, the better the performance of the routing protocol

- $PDR=(numberofpacketsreciever/numberofpacketssent)*100$

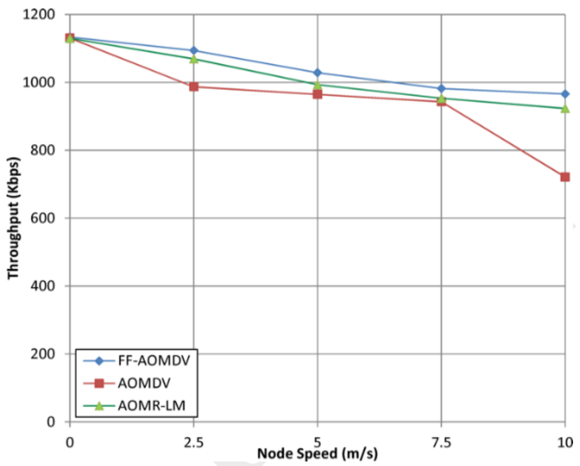




VI. Throughput

Throughput is known as the number of bits that the destination has successfully received. Throughput measures a routing protocol's efficiency in receiving data packets by destination.

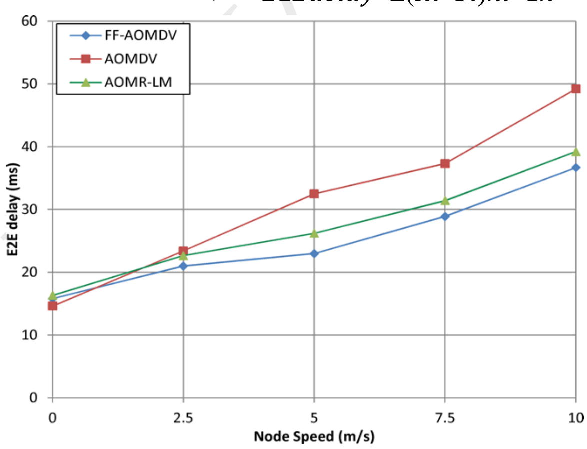
- *TP = (number of bytes received * 8 / simulation time) * 1000 kbps*

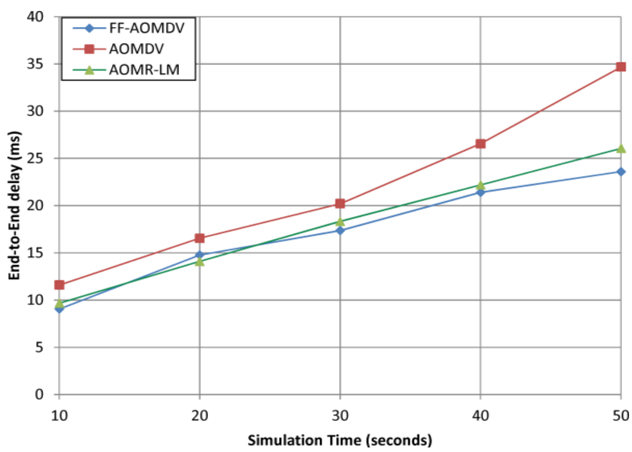


VII. End-to-end delay

End-to-End delay refers to the average time taken by data packets in successfully transmitting messages across the network from source to destination.

- $E2Edelay=\Sigma(Ri-Si)ni=1n$

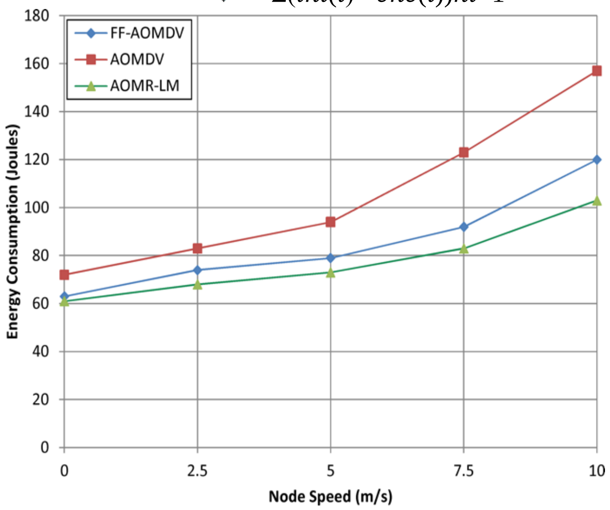


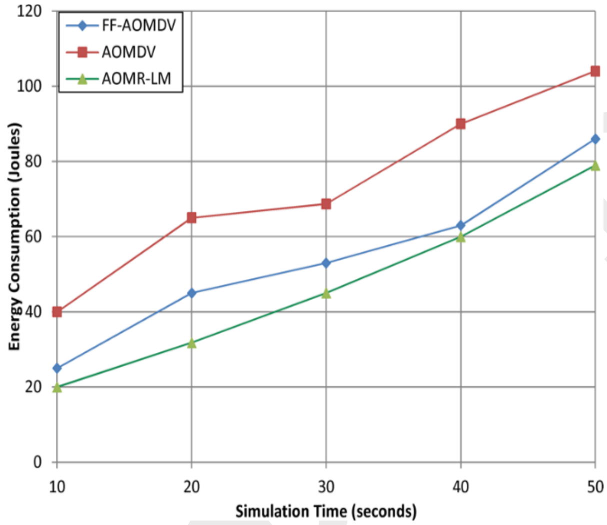


VIII. Energy Consumption

Energy consumption refers to the amount of energy that is spent by the network nodes within the simulation time.

- $\Sigma(ini(i) - ene(i))ni=1$

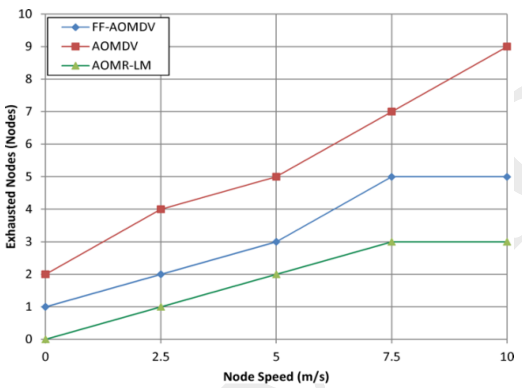


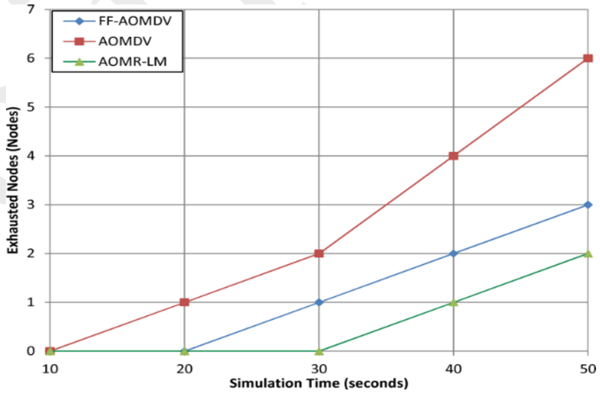


IX. Network Lifetime

The network lifetime refers to the required time for exhausting the battery of *n* mobile node

- $\Sigma(ene(i)=0)ni=1$

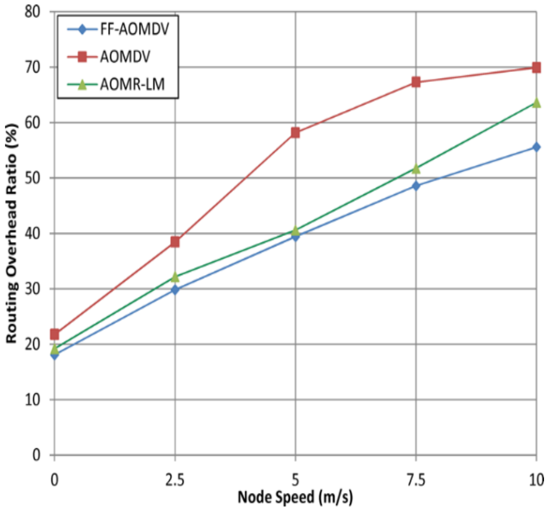


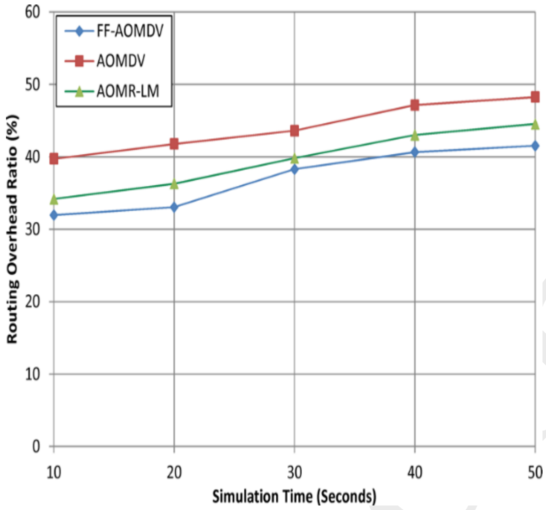


X. Routing Overhead Ratio

The routing overhead ratio metric is the total number of routing packets, which is divided by the overall number of data packets that were delivered.

- $Routingoverhead(\%)=NoofroutingpacketsNoofroutingpackets+Noofdatapacketssent*100$





XI. Conclusion

In this research, we proposed a new energy efficient multipath routing algorithm called FF-AOMDV simulated using NS-2 under three different scenarios, varying node speed, and packet size and simulation time. The results showed that the proposed FF-AOMDV algorithm has performed much better than both AOMR-LM and AOMDV in throughput, packet delivery ratio and end-to-end delay. It also performed well against AOMDV for conserving more energy and better network lifetime. Basically this will consider many network resources which will prolong the network lifetime and enhances the QOS. Another possibility is to test the fitness function with another multipath routing protocol that has a different mechanism than AOMDV and compare the results with the proposed FF-AOMDV.

References

[1] ALI, S., MADANI, S. A., KHAN, A. U. R., & IMRAN, A. K. (2014). Routing protocols for mobile sensor networks: a comparative study.Computer systems science and engineering, 29(2), 183-192.
[2] Chen, H. H., Li, G. Q., & Liao, H. L. (2009, August). A self-adaptive improved particle swarm optimization algorithm and its application in available transfer capability calculation. In *2009 Fifth International Conference on Natural Computation* (Vol. 3, pp. 200-205).IEEE.
[3] Gujral, R. K., Grover, J., &Rana, S. (2012, September). Impact of transmission range and mobility on routing protocols over ad hoc networks In IEEE International Conference on Computing Sciences (ICCS), pp. 201-206.
[4] Hu, X., Wang, J., & Wang, C. (2011) Mobility adaptive Routing for Stable Transmission in Mobile Ad Hoc Networks. JOURNAL OF COMMUNICATIONS, 6(1), FEBRUARY 2011, pp-79-86.
[5] Hiremath, P. S., & Joshi, S. M. (2012). Energy efficient routing protocol with adaptive fuzzy threshold energy for MANETs.*International Journal of Computer Networks and Wireless Communications (IJCNWC), ISSN: 2250-3501 Vol, 2*.
[6] Manickavelu, D., &Vaidyanathan, R. U. (2014). Particle swarm optimization (PSO)-based node and link lifetime prediction algorithm for route recovery in MANET.*EURASIP Journal on Wireless Communications and Networking*, *2014* (1), 1-10.
[7] Nasehi, H., Javan, N. T., Aghababa, A. B., &Birgani, Y. G. (2013). Improving energy efficiency in manets by multi-path routing. *arXiv preprint arXiv:1303.1635*.
[8] Poonam M. and Preeti D. (2014). Packet Forwarding using AOMDV Algorithm in WSN. International Journal of Application or Innovation in Engineering & Management (IJAIEM), 2319 – 4847, 3(5), May 2014, pp. 456-459.
[9] Smail, O., Cousin, B., Mekki, R., &Mekkakia, Z. (2014). A multipath energy-conserving routing protocol for wireless ad hoc networks lifetime improvement. *EURASIP Journal on Wireless Communications and Networking*, *2014* (1), 1-12.
[10] Sharma, D. K., Patra, A. N., & Kumar, C. (2013). An update based energy-efficient reactive routing protocol for mobile Ad Hoc networks. *International Journal of Computer Network and Information Security (IJCNIS)*, *5*(11), 17.