

A Hybrid Algorithm for Balancing Load in Wireless Sensor Network



Midhu Mathew, Santosh Anand, Somnath Sinha

Abstract: *Wireless sensor network are a kind of network in which the communication between the sensor nodes are in a peer-to-peer fashion. Hence, WSN is an ad-hoc network. Sensor node performs operations like sensing, gather information and transfer the data to all other nodes, which will increase the loads. This proposed research work is based on the comparison of on demand protocols for WSN that will enhance the load balancing in network. A performance comparison of DSR and AODV protocols are demonstrated using ns2. The parameters used for the comparison of the protocols are energy, PDR, packet drop and throughput. We also discuss the concept of a new one combining the efficiency of AODV and DSR.*

Index Terms: WSN, AODV, DSR, RREQ, RERR, RREP.

I. INTRODUCTION

WSN is a complex structure that consists of large amount of node and a selected node as source. The main motivation of WSN is for military commitments. The nodes in the network help to know the physical parameters like natural maladies. The network is unstructured hence the nodes can be placed in different sites but with the same functionalities. The major research challenges in Wireless sensor network are Load balancing, Energy Efficiency, Distributed processing and security. Load balancing can be considered as a major research challenge. Numerous protocols are anticipated for proficiently balancing the load among all the nodes in the network. Hence an efficient protocol is required to achieve an optimize path. Based on the reactive protocols discussed it is found that both the protocols have some defects which could be overcome using an algorithm that combines the properties. AODV are a kind of protocol that does not require keeping track of the node that is inactive in communication. However, DSR

will keep of whole information regarding each and every node in the network. Both the techniques have advantages and disadvantages where there required a new protocol to enhance the eminence of service in WSN.

Ad-hoc on demand and dynamic source routing protocols are both demand driven protocol where it creates a path only when there is a requirement. First it will have sent the route request to all the nodes and get a reply for that. Then the protocol will check whether there is a link failure. But the deviation in the process is that the source routing method. DSR require more storage when compared to AODV protocol and in other way AODV cannot be applicable for multi-path routing. Hence, a new scheme can be proposed on the comparison of these protocols that could include properties of both this protocols.

II. RELATED WORK

Chia-Pang Chen [2015] has proposed Maximum Connected Load-balancing Cover Tree procedure to conquer maximum coverage as well as improve the load balanced routing cover tree. This algorithm is capable of improving the lifetime of network and the connectivity maintenance which enhance load balancing. A full sensing coverage and connectivity can be achieved using this algorithm. The future work can be for k-coverage and k-connectivity.

Seema shivapur , suvarna g kanakaraddi ,a k chikaraddi [2][2015]proposed a literature survey on different methodologies like cluster based, protocol based and algorithm based method. The algorithms proposed will improve the performance and also helps to decrease the congestion in the network. The future work can be done on LEEP protocol that can be used to improve the load balancing of WSN.

Rita Devi, Amit kumar, Vinay Dhawan[3] [2017]proposed LEACH protocol to overcome the issues like energy criticality and load balancing by implementing the cluster based protocol which uses Division multiple access schedule.

The major advantage of the proposed system is that the load is used optimally over network and hence the lifespan of the set-up will be improved and also the V leach protocol has been implemented in a way that the distance between the x and y coordinates are in meters and the values could be changed.

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Hui Dai , Richard Han[2017] has proposed an algorithm that help in achieving a routing tree that will be more efficiently balanced than the BFS and Dijkstra's algorithm. The major advantage is that they will identify the importance of node centric approach and the load balancing is been improved. This method will help to balance the load in top balanced method where the branches close to the base station will have the same load. This algorithm has an issue in balancing when it comes to uneven load generators. It can be improved thereby making more efficient for utilization of resources and storage.

T an Ming-hao ,Yu Ren-lai Li , Shu-jiang,Wang , Xiang- dong[5][2003] has proposed a multipath routing protocol for energy saving and Load balancing. The simulation is done in ns2 platform. The DSR protocol is improved were it will reduce the congestion and path delay between the nodes. The algorithm also considers network load balance problem. Path discovery process is considered which will reduce the linking cost.

Hang Zhang, Liang Li , Xin fang Yan, Xiang Li[6] [2011]has proposed a load balancing clustering algorithm for data gathering were the load variance that occur after optimization can be minimized. The major advantage is that this algorithm is that in EAMCT-G algorithm the nodes are selected based on optimized load randomly, hence the path delay and congestion will be reduced so that the cluster head will die prematurely. The LCA-DA algorithm will reduce this problem by using some strategies for selecting the sensor head hence lifetime can be further improved.

Abdulrauf Montaser Ahmed [7][2017] proposed a congestion recognition practice for multipath routing and load balancing, which considers three factors such as remoteness between the sender and the receiver, comparative success rate and the buffer occupancy. The major advantage is that the congestion can be controlled and the data loss can be reduced.

Damodar Reddy Edla[8][2006] have proposed a Shuffled Frog Leaping Algorithm (SFLA) considers the load balancing in the gateways. The novel function is used to evaluate the solution of the proposed algorithm. The proposed algorithm will improve the quality of services and also various simulations are done to check the various performance parameters and it is to demonstrate against state- of-the-art load balancing techniques.

Pilla iAtulya Radhakrishna, Santhosh Anand [9] [2018]have proposed a neighbor discovery algorithm which will help in finding the details about network deployment and numerous traditions to increase the network enactments. The upcoming work can be done so that the system recital can be enhanced by adding more

energy proficiency and sensor signal behavior.

Chiara Petrioli[10] [2014] presented a ALBA-R (adaptive load balancing algorithm) for solving the problems regarding varying loads and node placement. ALBA-R is capable of solving the intense traffic load and low compactness. This algorithm has a remarkable achievement in the case of packet delivery ratio performance and end to end latency.

Chengjie Wu , Ruixi Yuan[11] [2008] proposed a novel approach for load balancing were the potential model will have the topology information and the state information regarding the sensor node and also the sink screens the traffic load. Hence there is an improvement in strength, reliability and the lifetime. Low and moderate loads can be simulated and observe the result.

III. PROTOCOLS IN WSN

The two efficient algorithms in wireless sensor network are AODV and DSR. On demand routing protocol AODV establishes the route only when there is a requirement. This protocol uses two different broadcast messages such as RREQ and RREP. The advantages of AODV over DSR are that they require less storage. The hello messages will be sent to the network to see whether the nodes are active. If there is no response to the message, then it is considered that the links are broken. Due to which communication overhead is formed in the network. Dynamic source routing will have all the details included in the packet header. It is also a demand driven protocol. These protocol uses route detection and conservation. Network is formed via sending the route request and when the packets remain not sent, a fault message is sent to entire nodes in the network. The main variance between these two algorithms is direction-finding feature. The novel approach will consider high storage space with less communication overhead. These improve the time of the network activated.

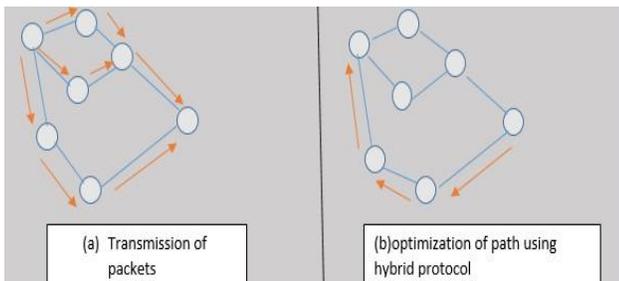
Scenario	AODV	DSR
Demand driven	Yes	Yes
Source routing	Computes and Updates the route	Route detection and maintenance adds sequence number multipath.
Routing load	Comparatively high	Less

Route overhead	Find routes in Caches hence reduces	More compared to DSR because there is no caching used
Standardized MAC load	Less when Compared to Lower pause time	Relatively High
Performance	Higher when it is in complex Mobility scenarios	Comparatively less.

Table 1 Comparison of AODV and DSR

In AODV the hello message will be sent when there is a demand of creating the network. RREQ will be sent to all the nodes in the network. This request will contain all the details in the network. The sequence number will help us know the destination address of the packet to be sent. RREP is the route reply from the node if packet reaches the destination node.

DSR protocol needs an extra storage capacity since it uses caching technology. Here the route detection is initialized when a node needs a route to be established in the network. Flooding technology is used in this protocol. All the packets sent in the network will have all details regarding the routing of data. In case of a link failure RERR is sent among the source. Here energy is not considered as a factor.



I. FIGURE 1: OPTIMIZATION OF PATH ILLUSTRATION

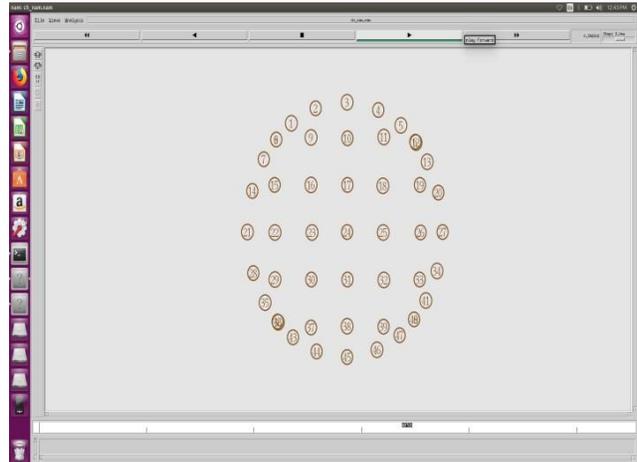
II. TABLE 2: SIMULATION PARAMETERS

Parameters	Values
Mobile nodes	20,60,80,100
Routing protocols	AODV, DSR
Channel type	Wireless channel

Parameters compared	PDR ,packet drop, throughput, energy
Simulation time	100 sec,200 sec,300 sec

IV. SIMULATION

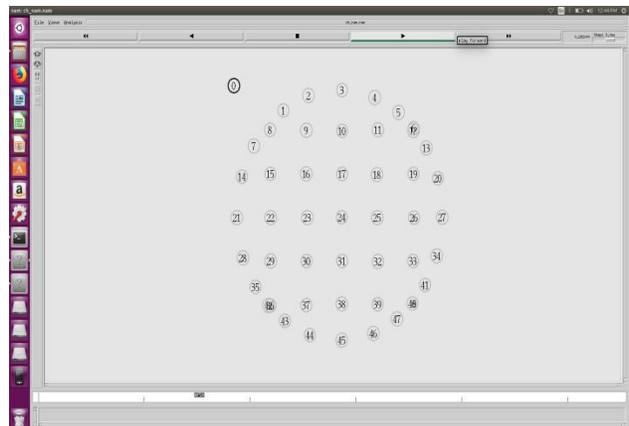
The comparison of the on reactive protocol AODV and DSR are done using the NS2 simulators. The performance is compared by using the parameters such as PDR, packet drop, throughput and energy. The simulation is done in 100, 200 and 300 sec.



III. FIG2. CREATION OF NODES

In fig 2 shows the creation of nodes in WSN. All Nodes are homogenous in nature but the deployment of nodes is in different distances. Hence the parameters like energy, functions, quality of the nodes will be same.

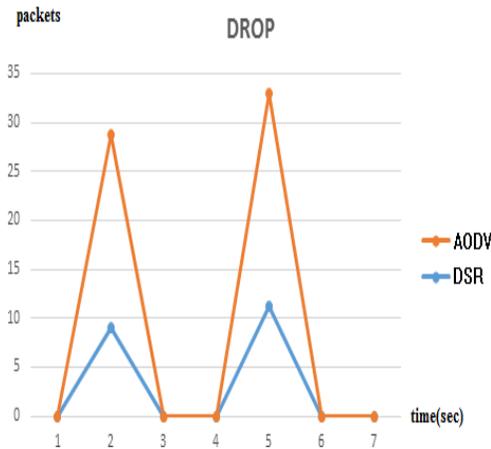
IV. FIG3. POSITIONING OF NODES AND SELECTION OF SOURCE NODE



In fig 3 shows the arrangement of nodes and assortment of source node. Source node will gather all the details regarding the route request and route reply. The failure in the link will be informed to the source node selected.

V. EXPERIMENT RESULTS

All the figures below describe the comparison of network parameter between two routing protocol AODV and DSR (figure 4 to figure 7). The figure reveals that AODV is better than DSR when we consider the packet delivery ratio, throughput. But DSR is better in packet drop and energy consumption. So we require a newly defined protocol that will the efficiency of both AODV and DSR.



V. FIGURE 4 PACKET DROP COMPARISON OF AODV AND DSR

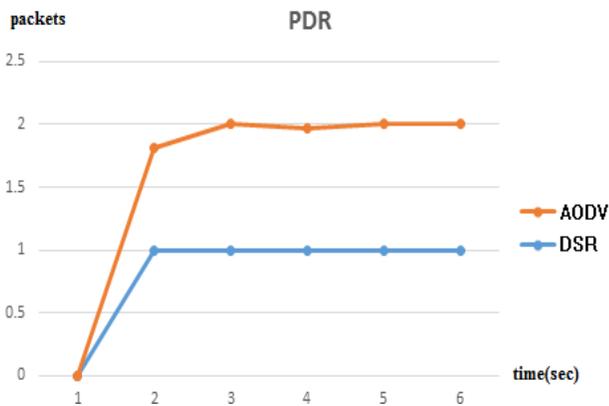


Fig4. Comparison of PDR in AODV and DSR

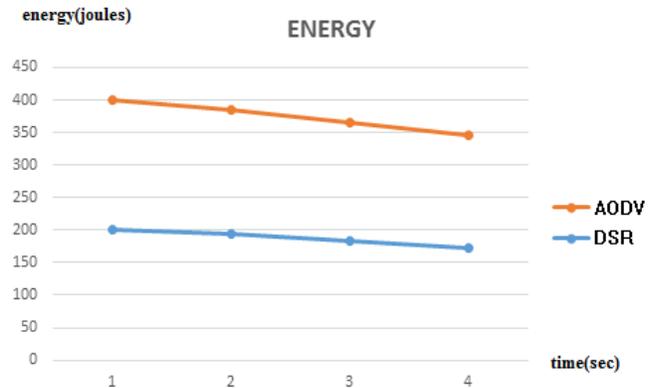


Fig5. Comparison of energy consumption in AODV and DSR

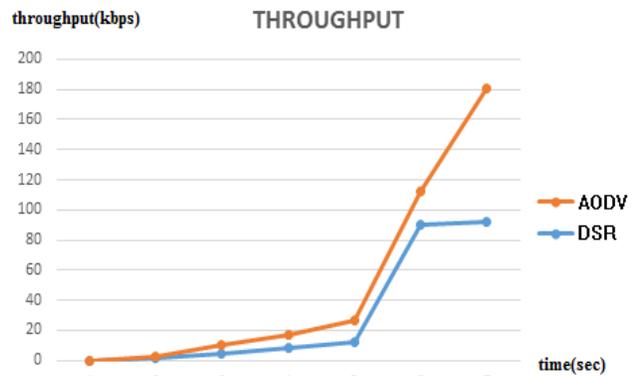


Fig6. Comparison of throughput in AODV and DSR

VI. PROPOSED METHOD

The experiment result shows that AODV is better than DSR. Here in our proposed method we are going to modify AODV routing protocol. AODV maintains two separate concept for communication – RREP and RREQ. This route request and route reply decides the path of the data packets from source to destination. For establishing any link we are going to consider an extra parameter in RREQ data packets. This parameter will indicate the minimum energy require for establishing the communication link. The nodes that send the RREP check their ability then only send a positive reply to the node sending the request. We are considering a threshold energy or a residual energy of the nodes establishing a secure communication link. Not only by using an extra field in the RREQ we are also able to count the path having lowest energy for sending the data packets.

VII. CONCLUSION & FUTURE WORK

In this paper, we compared between AODV and DSR two routing protocols in terms of energy consumption, packet delivery ratio and throughput.



This comparison is shown graphically to show their efficiency. We also proposed a new idea of implementing the routing protocol which will be the modification of AODV but will be more energy efficient than AODV. We had used NS2 for implementing the routing protocol. In future, we are going to use the idea to derive the new protocol and test the energy efficiency of it. Again, energy is not only the factor it should be also secure. The authors are also trying to make it more secure in the future.

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