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SIMULATION AND ANALYSIS OF PACKET DELIVERY IN EEDR ROUTING

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ABSTRACT

Wireless Sensor Networks (WSNs) are the networks formed by the sensor nodes which are useful in wide range of applications. The sensor network face many challenges with respect to energy consumption and packet delivery. This paper explains the concepts of energy efficient distributed receiver based routing protocol (EEDR) for wireless networks. This concept aims to minimize the energy required to form the network and transfer data to the destination. The objectives of this work includes (1) Random distribution of nodes, (2) Establishment of receiver-initiated routes between the nodes, (3) Channel quality analysis and (4) Analyze packet delivery and comparison with existing works. Simulation results demonstrate the performance of the proposed work to meet the specified objectives.

Keywords: Channel, packet, receiver, sender.

1. INRTODUCTION

Energy conservation is of highest importance in the wireless networks. The network performance degrades with the decrease in stability of nodes in the network [1-2]. Considering the information transmission limit, the lifetime of the wireless networks are persuasive towards the outline of ideal arrangement techniques of wireless systems [3].Wireless Sensor Networks (WSNs) have increased expanding consideration from both the exploration network and genuine clients. As sensor hubs are for the most part battery-controlled gadgets, the basic angles to confront concern how to lessen the energy utilization of nodes, so the system lifetime can be reached out to sensible occasions.

Utilizing alternate sensor node for communication is an amazingly difficult assignment which includes surveying various extraordinary parameters required by the objective application, which incorporates the receiving composition and target innovation, memory, lifetime, security, computational ability, innovation, control, estimate, programming interface and applications. Late advances in remote sensor systems have prompted numerous new conventions particularly intended for sensor systems where strength is a basic consideration given to the steering conventions since they may vary contingent upon the application and system design [4-6].

2. RELATED WORK

The exiting routing protocols may incur a high cost in route establishment and maintenance, hence in [7], the authors present a Trust and Energy aware Secure Routing. Protocol for WSNs must consider the misbehavior of an isolated node. The route establishment decisions are made by judging hop count, level of trust and the residual energy of the node, thereby, achieving improved performance in lifetime of the network, throughput and consumption of energy.

In paper [8] a three-layer framework is proposed which has layers namely sensor layer, cluster head layer and Mobile Collector Layer. The algorithm makes use of Load Balance Clustering (LBC) in which sensors have to organize themselves into clusters. For each of the clusters multiple cluster heads are chosen to balance the work load. The cluster heads also perform cooperative communication in order to maintain the energy savings. Static Data gathering [9] process from non-uniform packet relay nodes suffer from higher energy consumption rate. The disadvantage can be overcome by making use of mobile nodes in order to gather data but this will lead to longer latency. The paper discusses a heterogeneous architecture which divides the nodes into sensor nodes

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which makes use of solar panel and cluster heads which are normal and are in mobile nature. The Cluster heads energy can be improvised by making use of power transmitter.

In the paper [10] a data gathering scheme named Mobile Agent Mobile Server (MAMS) is proposed which has Mobile Agents which collect data and then send the data to the Mobile Server. A good data searching algorithm is also described along with a technique which stores minimum information in nodes memory during the routing process. In the paper [11] wireless energy replenishment and anchor-point based mobile data gathering is proposed which describe a selection strategy to select the anchors and then design a sequence to collect data from anchor points. The impact of the proposed approach is measured against utility weight, link capacity and recharging rate on network performance.

3. EEDR ROUTE DISCOVERY

The receiver-based routing protocol relies on the receiver node to discover paths between the sender node and the receiver node. From each of the neighbor node of receiver, the route towards the destination is found out. Among all the routes the best route is chosen which has the best Channel Quality Indicator (CQI). During the individual route discovery process also the forward node is chosen as the node which has the good CQI value.

This reduces the transmission of control packets and hence reduces the energy consumption in the network. Since the exchange of control packets are reduced, the time consumption in data transfer is also reduced and this makes the improvement in the network life time and overall network reliability. The main performance criteria in the proposed work are reduction in the energy consumption. The routes are discovered on basis of channel quality and the impact of transmitted power, noise, path loss and signal bandwidth for the establishment of the route is taken into consideration.

When a relay node receives the route request packet from destination node or source node has received the best routes to transmit its data to destination node, these nodes compute the channel quality. The channel quality for the channel is computed from the value of signal to noise ratio. The channel state information is needed by the transmitter node to choose the transmission rate and modulation scheme.

Fig.1 shows the best route discovery in EEDR. The EEDR routing protocol has the following three main operations: (1) Broadcast for path discovery, (2) Packet forwarding method, (3) Routing path selection and (4) Data sending procedure. The receiver node broadcast the route request packets to its neighboring nodes for establishing the path to the sender node. The channel quality is calculated along each link. Intermediate node examines its route cache table for a route source node.

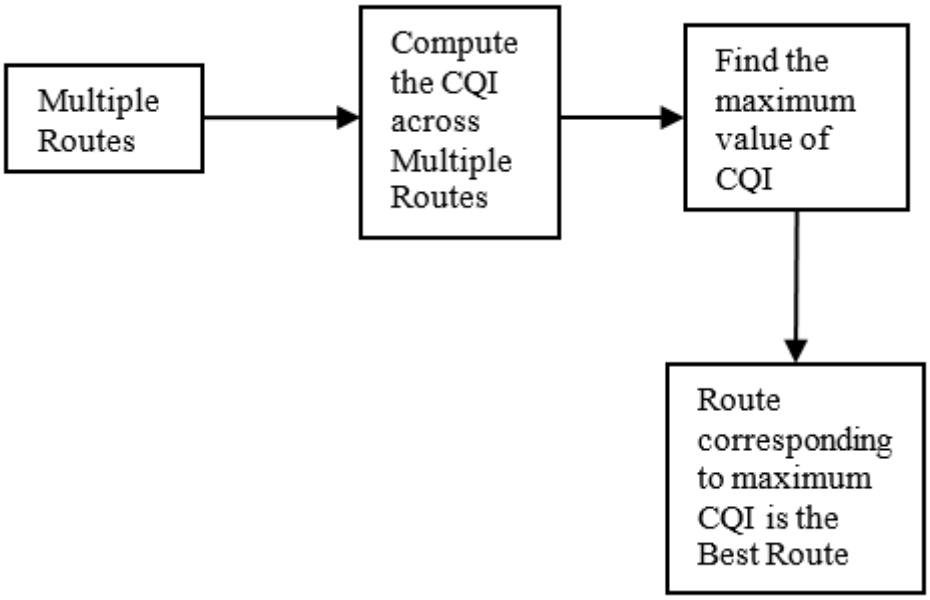

Fig. 1: Block diagram of Route Discovery in EEDR

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The EEDR routing Algorithm is as below

1. Receiver initiate and broadcast the route request
2. Route request is received by neighbor nodes
3. Neighbor nodes checks the quality of the channel/link
4. Neighbor node rebroadcasts if the link quality is good
5. Route request is received by the Sender.
6. Sender checks channel quality of multiple routes
7. Sender sends the data through best route based on channel quality
8. Receiver sends acknowledgement after receiving the data

A route with the highest channel quality is given higher priority over the other routes. Such route is then selected as a primary route and used for transmission of data packets form the sender node. The other routes which are having channel quality above the threshold are stored in the route cache. When the link failure occurs during the data transmission, the sender node is informed by route error. The sender will choose the alternate route based on the next channel quality path which has been stored in the route cache to send the data to the receiver.

4. RESULTS

The simulation is carried by using the MATLAB software. The nodes are deployed in random. The simulation parameters and values considered are as shown in Table 1. The values are user defined and can be varied.

Table 1: Simulation Parameters Setting for Comparative Analysis

Parameter Name	**Value**
Topology Area	2000m X 2000m
Number of Nodes	100
Number of Iterations	25
Transmission Range	500m
Energy required for transmission	15mJ
Energy required for amplification	5mJ
Attenuation Factor	0.5
Initial Battery Power	3000mW
Source Node	14
Receiver Node	95

The random deployment of nodes are as shown in Fig.2. Here any node can be chosen as the sender/receiver. For example, node 14 is chosen as source node and node 95 is chosen to be receiver node. All the node are initiated with fixed amount of energy. The energy required for transmission, amplification, attenuation factors are also considered for the analysis.

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Fig.3(a) and Fig.3(b) shows the x positions and y positions of the nodes deployed. The x and y coordinates of each nodes can be analyzed using the same.

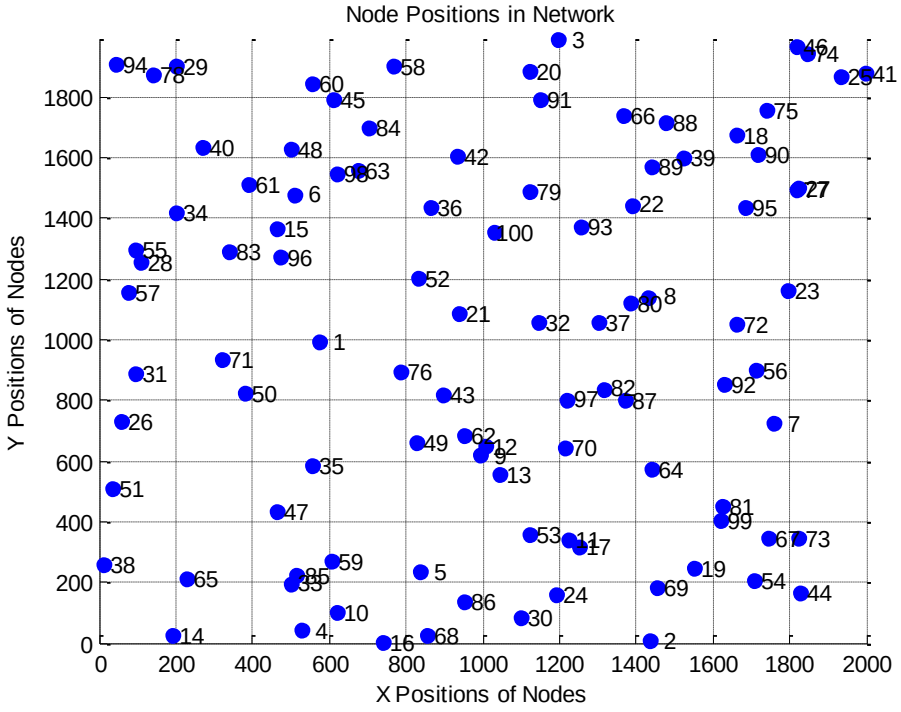

Fig.2: Distribution of nodes in random

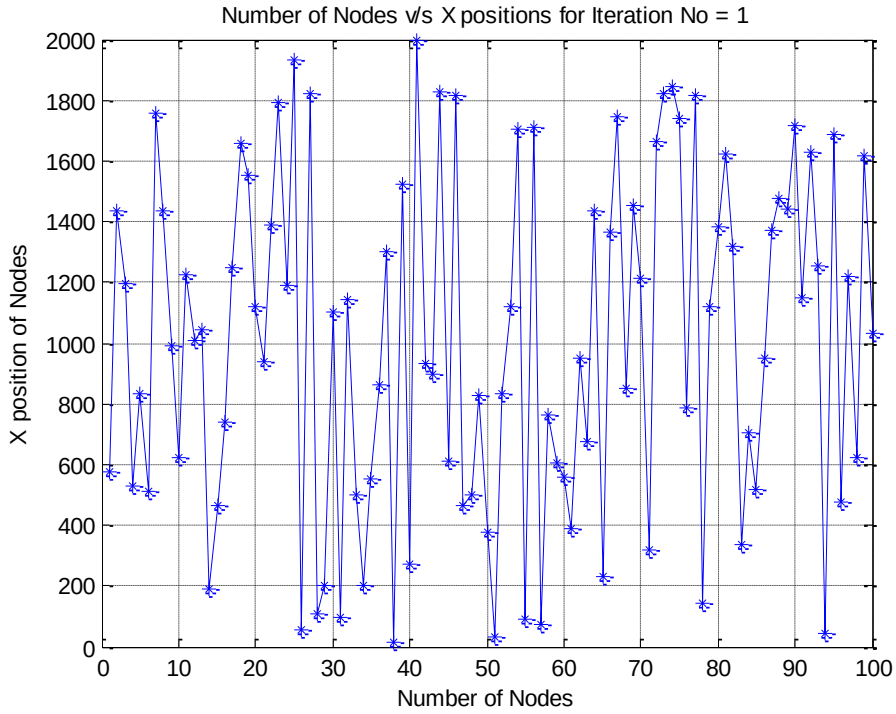

Fig.3(a): x positions of nodes

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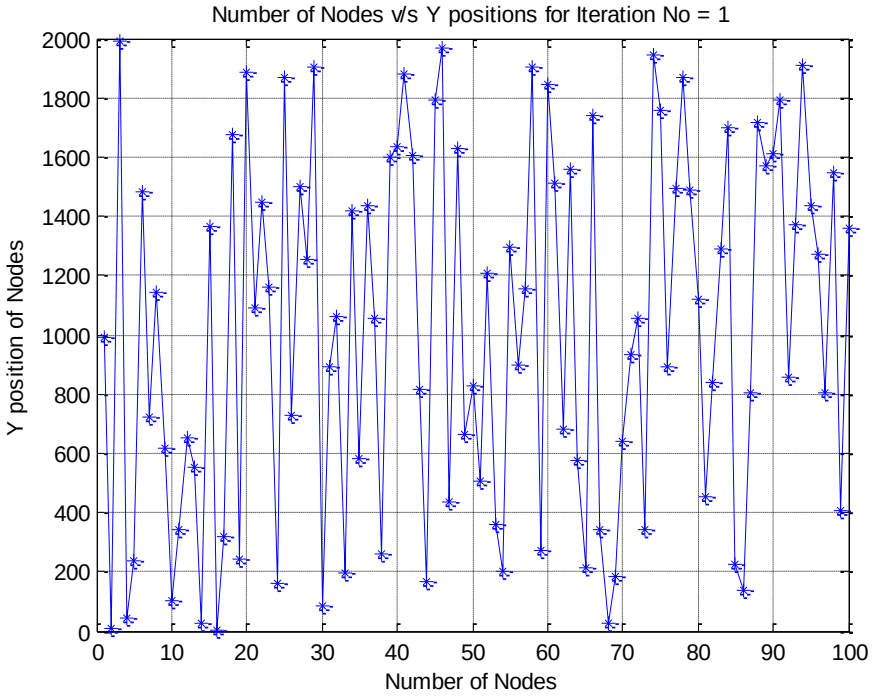

Fig.3(b): y positions of nodes

The Packet Delivery Ratio (PDR) is defined as the ratio of number of packets delivered to the packets generated. PDR is calculated by using equation (1)

$$PDR = \frac{Packets\ delivered}{Packets\ generated} \quad (1)$$

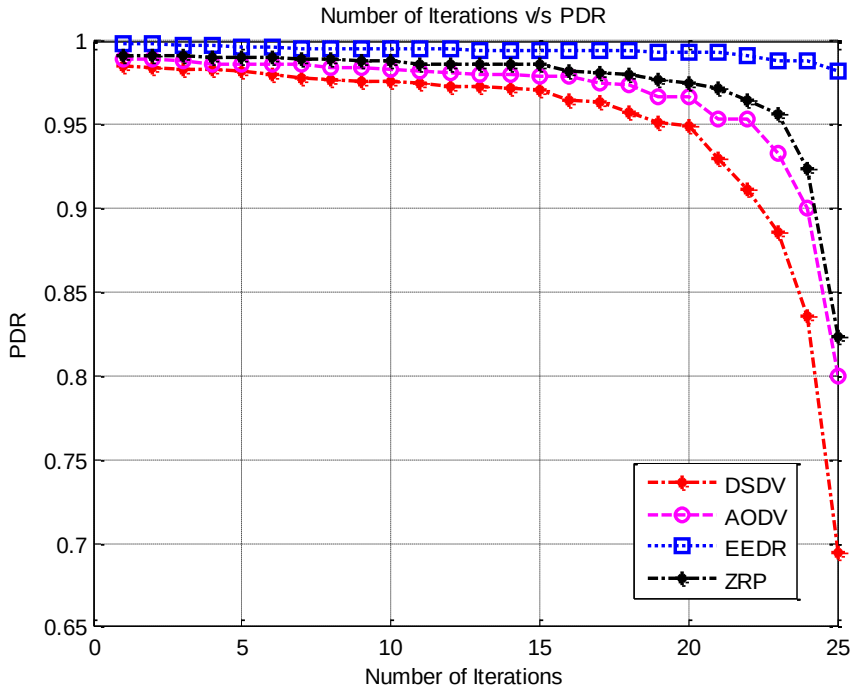

Fig.4(a): Packet delivery ratio

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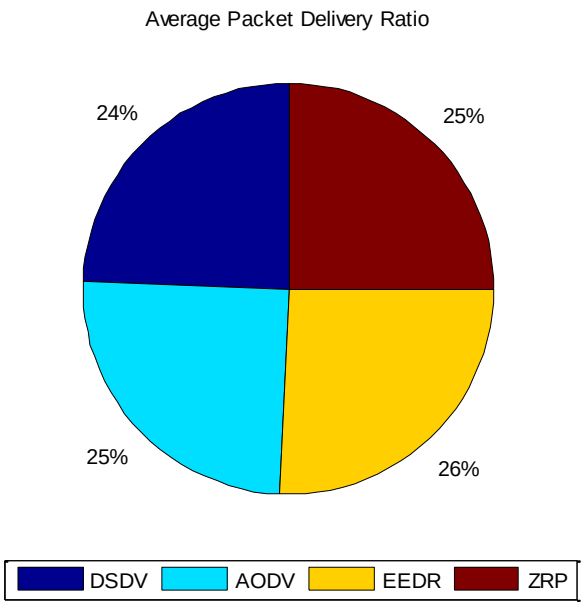

Fig. 4(b): Parentage variation of average packet delivery

Fig.4(a) shows the PDR comparison graph of EEDR with Ad hoc On-Demand Distance Vector Routing (AODV), Destination-Sequenced Distance Vector routing (DSDV) and Zone Routing Protocol (ZRP). Fig.4(b) shows the percentage comparison of average packet delivery. The EEDR gives highest PDR than the existing routing protocols.

Table 2 shows the comparative analysis of packets delivered, packets dropped and PDR of EEDR, AODV, DSDV and ZRP.

Table 2: Packet delivered, dropped and PDR comparison

	DSDV	AODV	ZONE	EEDR
Packets Delivered	1074	1084	1090	1100
Packets Dropped	31	20.8	15	5
PDR	94%	96%	97%	99%

5. CONCLUSION

This research paper discuss the analysis of EEDR routing protocol. The route is initiated from the receiver side and the path for data transmission depends on the channel quality. The path with highest channel quality is given highest importance. The EEDR is executed and the EEDR performance analysis is compared with the existing works in terms of packets delivered, packets dropped and PDR and it is found that the proposed EEDR gives better performance than the existing routing methods.

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