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Relay Node Selection in Wireless Sensor Networks using Opportunistic Routing Algorithm

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***Abstract*: As we are aware the there is limited rechargeable power in the sensor nodes we must design the routing protocol in such a way that we can obtain optimum energy saving. Henceforth we are focusing here on the minimization of the energy utilization in the wireless sensor networks and also increasing the network lifetime. Here we follow the principle of opportunistic routing wherein we consider that the multihop relay decision is made based on the comparison of energy of the sensor nodes and also the distance to the sink. Specifically, an Energy Saving via Opportunistic Routing (ENS_OR) algorithm is designed to provide minimum power cost during transmission and also providing protection to those nodes having low residual energy, therefore improving the network performance.**

I. INTRODUCTION

There is wide range of application of wireless sensor network in the field of medical care, robotic exploration and surveillance of agriculture. Development in the field ofelectronics and wireless communication has enabled us to develop wireless sensor nodeshaving low power, low cost and multifunctional characteristics in a integrated manner. InWSN senor nodes are distributed in harsh land areas and in most of the cases it is alaborious task to recharge the energy of the nodes via replacement of batteries. The main job of sensor nodes is to collect the data and transmit it to the desired receiver. Much of the energy is consumed during transmission of the data than during collection of data. In order to get better energy efficiency throughout data transmission the majority of the routing protocols lean to find the minimum energy path between the source and sink to achieve optimal consumption of energy. In WSN the design of efficient energy routing protocol is a tedious task, since it not only includes the discovery of minimum energy path from the source to destination but also must take into account how the distribution ofenergy is balance in the whole sensor network. Moreover, network partition and unpredictable wireless links may cause the loss of data packets and cause multiple retransmissions in a preselected good transmission path. Retransmission of packets overthe preselected good path certainly causes a significant increase in energy cost of thenetwork. So for efficient WSN appropriate proportion must be there between reducing network time and reducing energy consumption. For1-D queue network an energy efficient algorithm is designed in this project. Forselecting relay nodes based on the opportunistic routing theory, for saving the energy,improving the network lifetime and to obtain optimal transmission path from source tosinkenergy saving via opportunistic routing (ENS_OR) algorithm is used.

II. BACKGROUND

In the paper titled "An energy-balanced routing method based on forward-aware factor for wireless sensor networks," the authors propose that wireless sensor networks have become an important field of research especially in industrial applications over the past few decades. Designing of a routing protocol has become essential for effective data transmission, as a result of the way that there is constrained vitality and correspondence capacity of sensor hubs. The idea of vitality adjusted steering strategy in view of forwardmindful component (FAF-EBRM) is proposed in this paper. In FAF-EBRM, the familiarity with connection weight and forward vitality thickness is the criteria behind choosing the following jump. In the examinations, FAF-EBRM is entrusted and LEACH and EEUC, comes about demonstrate that FAF-EBRM has great execution attributes contrasted with LEACH and EEUC, adjusting the vitality utilization, drags out the capacity lifetime andgives high caliber of administration to the remote system.

In the paper titled *"*Opportunistic routing for wireless ad hoc and sensor networks: resent and future directions*,"* the authors propose that Opportunistic improves the performance of wireless sensor networks and wireless ad hoc networks therefore, it is gaining much attention in the field of research. In opportunistic routing method, the intermediatenodes collaborate in a consistent and localized manner for forwarding the data packet. Theadvantage of the broadcast nature of the wireless network is utilized by the opportunistic algorithm in order to increase the network throughput and transmission reliability.

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III.ALGORITHMS

A. *MTE Algorithm*

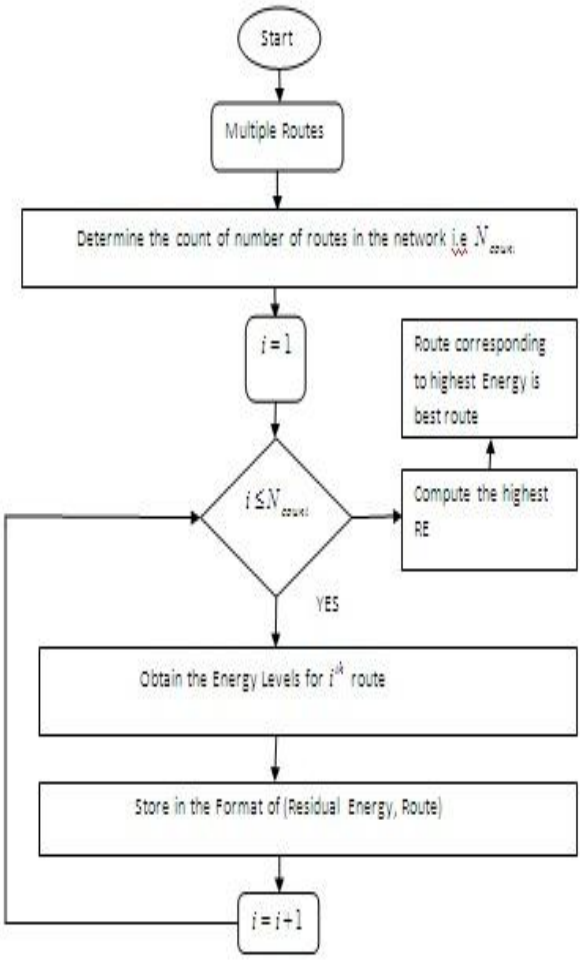

Figure1: MTE Algorithm

Minimum Transmission Energy (MTE) algorithm first determines the set of neighbors, from each neighbor to destination a single route is determined which gives the path based on random selection process so that the route is undeterministic. Then a route which consumes minimum transmission energy is chosen as the best route.

Disadvantages of MTE:

- MTE Algorithm finds randomized routes. During the forward node pick there are chances that the same node is picked multiple times.
- The End to End Delay is very high.
- Energy consumption is very high.

B. *ENS_OR Algorithm*

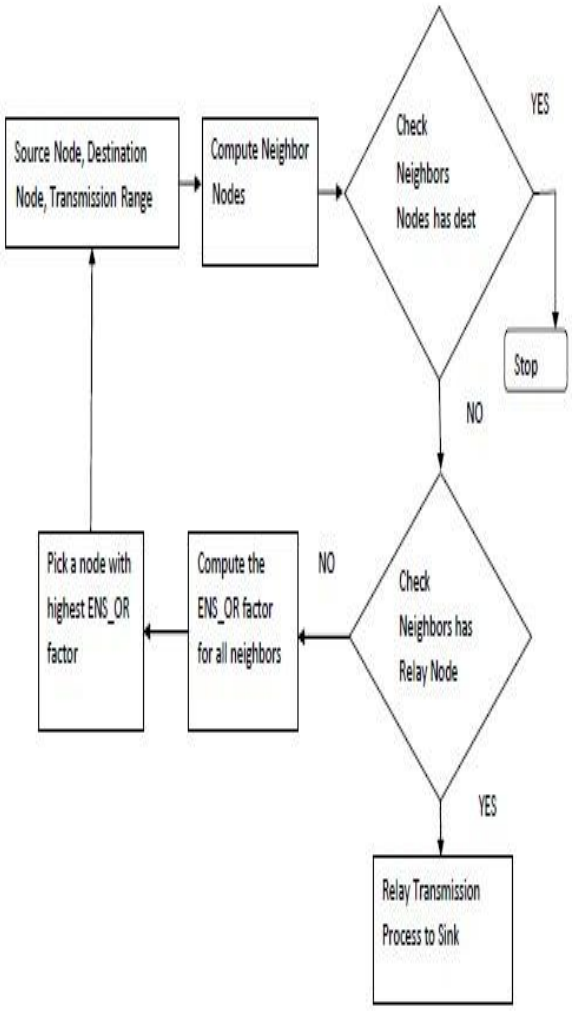

Figure2: ENS_OR Algorithm

The algorithm places the EEN nodes at regular intervals (distances) towards the sink. The source node will find neighbors. If the sink is found in the neighbor's range then the process is stopped and the packet is transmitted to the sink. Otherwise it picks the forward neighbor which is closer to relay node and has maximum residual energy. The procedure is repeated until a relay node is reached or destination is reached.

Advantages of ENS_OR:

Predefined set of relay nodes are used which are placed at regular intervals in the network so that any node can transmit to relay node and then the data can reach the sink.

- The transmission range is also adjusted dynamically based on the residual energy for the nodes in the network.

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IV. RESULTS

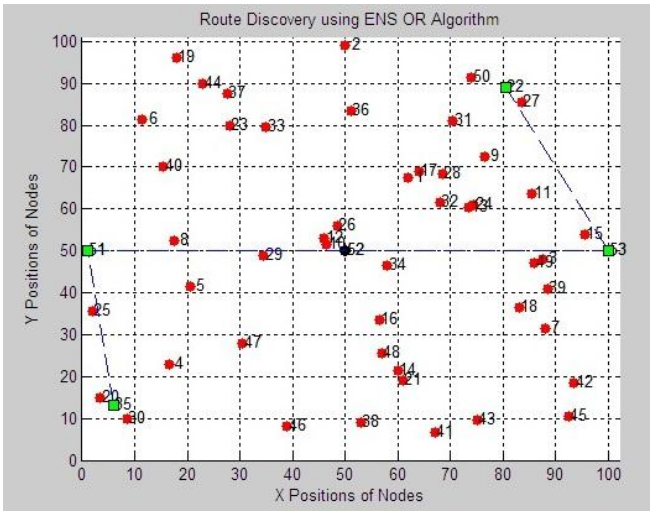

Figure3: Best route discovered using ENS_OR

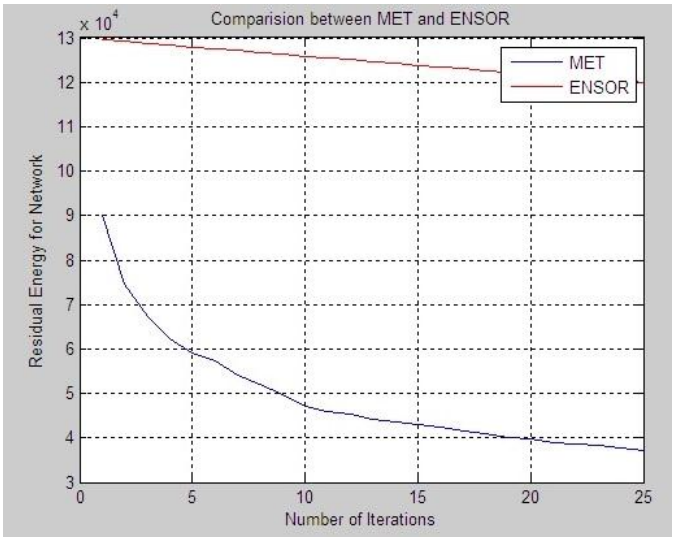

Figure 4: Residual Energy

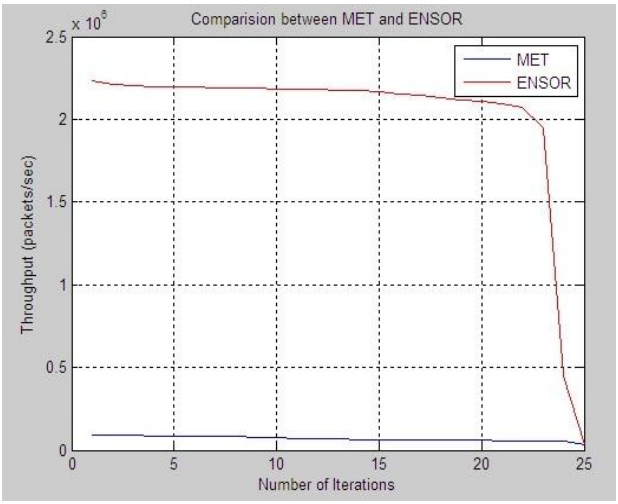

Figure 5: Throughput

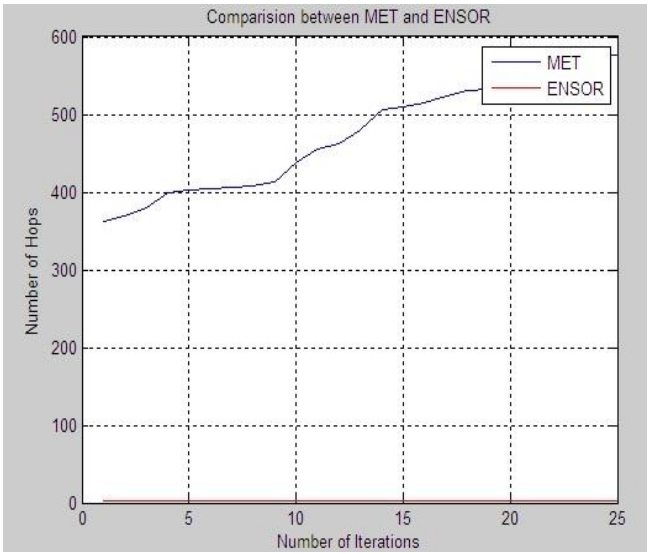

Figure 6: Number of Hops

Figure 3 shows the best route discovered using ENS_OR algorithm.

Figure 4, 5 and 6 shows the comparison of MTE and ENS_OR algorithm in terms of residual energy,throughput and number of hops.

V. CONCLUSION

In our day to day life wireless sensor networks are being widely used for controlling and monitoring due to its favourable features, such as low cost, low power, easy implementation, and maintenance. However, most of sensor nodes have limited non rechargeable battery power. Therefore designing a routing protocol in WSN, energy savings optimization becomes the top priority. For 1-D queue network reduction of energy consumption and improvement of network lifetime is focussed. For this matter, we employ opportunistic routing theory in order to optimize the network energy efficiency, by considering the distance of all the sensor nodes to the sink and also the residual energy of all nodes. This will increase the network

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lifetime. In this project energy efficient opportunistic routing strategy with minimum network cost and proctection of nodes from low residual energy is achieved. Simulation results show that the above described method ENS_OR gives significant improvement in preserving the energy of the network as compared with other existing routing algorithms.

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