PERFORMANCE EVALUATION OF LEACH AND ZSEP UNDER THE INFLUENCE OF NETWORK AREA

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ABSTRACT

In a Wireless Sensor Network, there are many number of nodes deployed randomly in the network. Though, these nodes are very tiny in size and thus are battery constrained and in most cases it is not feasible to replace it. Therefore, energy consumption is a very important issue in wireless sensor network and hence, the network should be setup such that they can sustain for longer period and nodes can deploy energy efficiently. According to the requirement in the wireless sensor network, selection of right kind of protocol is also necessary as it can significantly affect the performance of the network. One of the requirements in setup of a wireless sensor network is its network area. This paper compares and analyses the performance of three protocols which are LEACH and ZSEP under the influence of varying network area. One of the attacks which affect the network is sinkhole attack. This paper mainly includes the optimization of data packets and data route for sinkhole attack using weight function over the network based on genetic algorithm and compare the results with and without optimization of sinkhole attack in the network.

Keyword*: Wireless Sensor Network, LEACH, ZSEP, energy consumption.*

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1. INTRODUCTION

A wireless sensor network can be defined as wireless network that consists of locally distributed self governing nodes with sensors which senses and monitors physical and environmental conditions. Routing protocols are the set of rules which govern the network path for its transmission. Once sensor nodes are deployed in a network, they must be able to self-organize themselves. They are also battery constrained, so once deployed in a network; it is not feasible to replace battery. Therefore, due to the energy constrained nature of such networks, it is very necessary to apply right kind of protocol in the network according to the requirements. Also there are other few parameters like throughput, energy consumption and network area in which the wireless sensor network has been deployed.

1.1. LEACH PROTOCOL

LEACH is Low Energy Adaptive Hierarchical protocol. It is the first hierarchal protocol introduced to reduce power consumption. It uses the clustering technique in which clusters are used to elongate the network lifetime. Cluster head is formed to transmit the data directly to base station. The operation of LEACH is divided into two phases; setup phase and steady state phase where steady state phase is longer than the setup phase. In setup phase, the network is organized into clusters, cluster head advertisement is done schedule for transmission is created. In steady

state phase, data is aggregated, then compressed and transmitted to the base station. LEACH is very sensitive to heterogeneous environment.
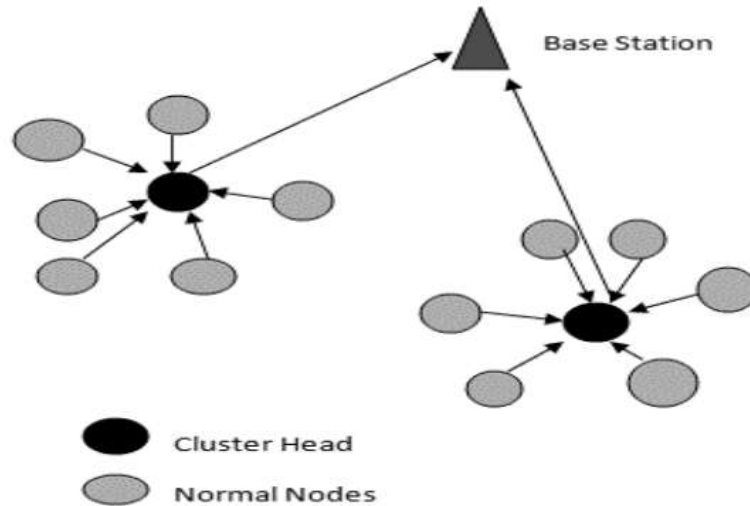

FIG 1. LEACH PROTOL NETWORK ARCHITECTURE

1.2. ZSEP PROTOCOL

ZSEP is Zonal Stable Election Protocol in which there are three zones in network area where nodes are deployed. It is the extension of SEP and hybrid approach is followed that is direct transmission and transmission via cluster head. On the basis of energy level and Y coordinate of the field, there are three zones in network area; Zone 0, Head zone 1, Head zone 2. It is assumed that a fraction of total nodes n is fitted with more energy. The fraction of nodes is assumed m and α is the more energy than other nodes. Thus, the nodes with α time more energy are advanced nodes and others are normal nodes. In zone 0, normal nodes are deployed in the area between $20<Y<=80$ 0 in random fashion. In Head zone 1, half of advanced nodes are deployed inconsequentially between $0<Y<=20$. In Head zone 2, other half of advanced nodes are deployed between $80<Y<=100$ randomly. In direct communication process, nodes in zone 0 sense data and gather the required information for transmission to base station. In transmission via cluster head, nodes in head zone 1 and head zone 2 selects cluster head in their respective zone and then cluster head sense data and gathers information from member nodes after the cluster head assigns its member cluster the TDMA schedule to send their data to cluster head. After gathering information and compressing it, the cluster heads send data to the base station.
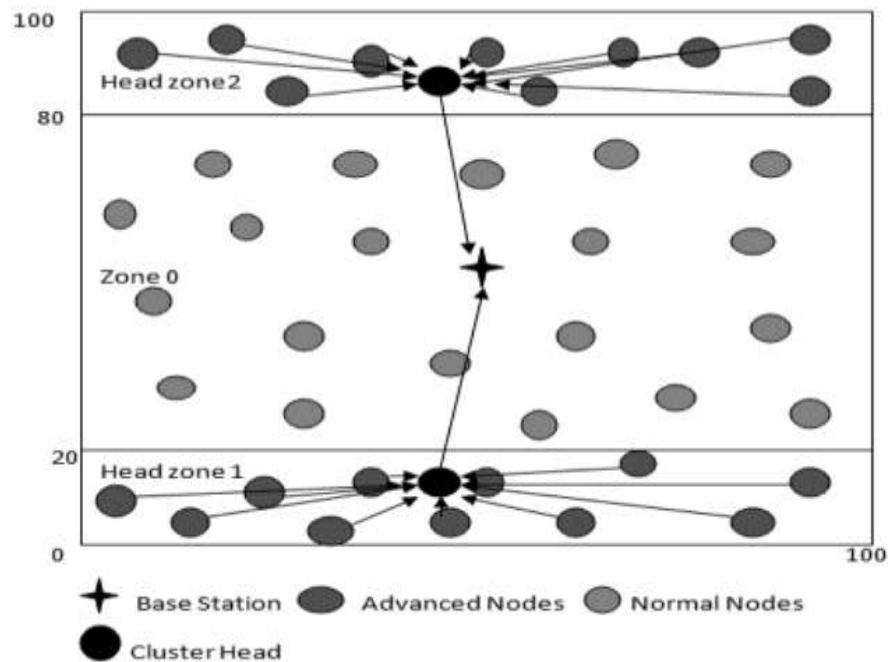
FIG 2. ZSEP PROTOCOL NETWORK ARCHITECHTURE

2. RELATED WORK

Edwin Prem Kumar Gilbert, Baskaran Kaliaperumal, and Elijah Blessing Rajsingh et al. presented an overview on various problematic issues in wireless sensor network. The various applications of wireless sensor network have been studied in various areas like healthcare, military, environmental and industrial applications. Shio Kumar Singh, M P Singh, and D K Singh et al. gave a survey for protocols in wireless sensor network for the study of their strengths and comparison. By taking into account several classification criteria based on data aggregation capacity, physical and environmental conditions, Quality of Service and various other, they surveyed sample of protocols. Chunyao FU, Zhifang JIANG, Wei WEI and Ang WEI et al. They proposed that there is one parameter which is very important to be considered and that is energy efficiency as while designing of protocol there is constraint of energy in nodes. A new protocol is proposed, LEACH-TLCH that reduces energy consumption and helps in increase of network lifetime. Upasana Sharma, Sunil Tiwari et al. For different base stations and terrain area, this paper analyses the performance of LEACH in terms of alive nodes and number of rounds. If the base station is closer than the base station far way the network node dies after a greater number of rounds. Reenkamal Kaur Gill, Priya Chawla, Monika Sachdeva et al. they analyse that in wireless sensor network until the battery dies, the node is useful. They analyse various advantages and disadvantages of LEACH protocol and attacks on it. In 2004, Georgios Smaragdakis, Ibrahim Matta and Azer Bestavros et al. they proposed protocol which is heterogeneous routing protocol, to prolong the stability period in wireless sensor network which is very important for many applications where reliability is needed.

3. PRELIMINARIES

An attempt is made to study the significance of the application of the network area for the accurate functioning of the wireless sensor network in an environment. We get the parameters which are total number of nodes, number of rounds, width and length of network, optimal probability and other parameters. The simulation is carried out using MATLAB. Three routing protocols are used in heterogeneous environment to modify the network parameters that we use. We assume that n number of nodes is deployed in the network randomly. Initial energy is taken Eo with network area 150m X 150m, 200m X 200m and 250m X 250m. The goal is to study the effect of change in network area over the performance of protocols. In LEACH, when cluster is formed, each node selects a random number

between 0 and 1 and then this number is compared to a threshold value let us say T (η). If the number is less than this threshed value then that node becomes the cluster head for that round and if it is greater than the threshold vale, the node remains as a normal node for that round. Similarly, in ZSEP, it follows hybrid approach in which each node decides to become cluster head in the current round by choosing a random number between 0 and 1. If the number is less than the threshold value then it becomes the cluster head otherwise remains as normal node for that round.

4. SIMULATION SCINARIO

A simulation is performed using MATLAB and LEACH and ZSEP protocol is used to modify the network parameters. In the simulation, 100 nodes are deployed in heterogeneous environment with initial energy 0.5J. The various parameters are evaluated like number of alive nodes, number of dead nodes and number of packets to base station, all with respect to number of rounds. Dimensions of network range is 100 square meters. Maximum number of rounds are 9000.

5. RESULT AND DISCUSION

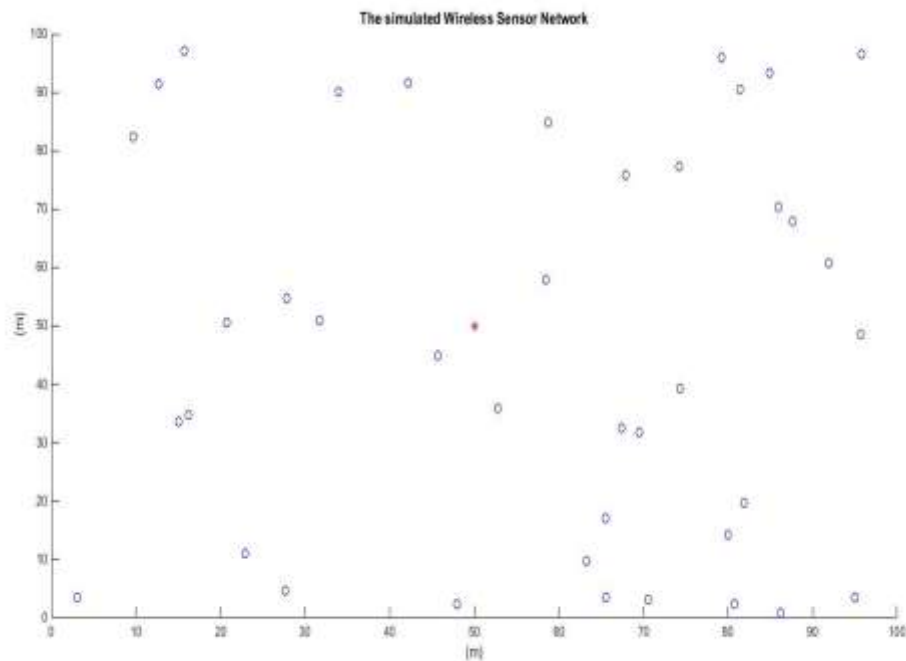In figure 3, we see the network area in which wireless sensor nodes are deployed randomly.

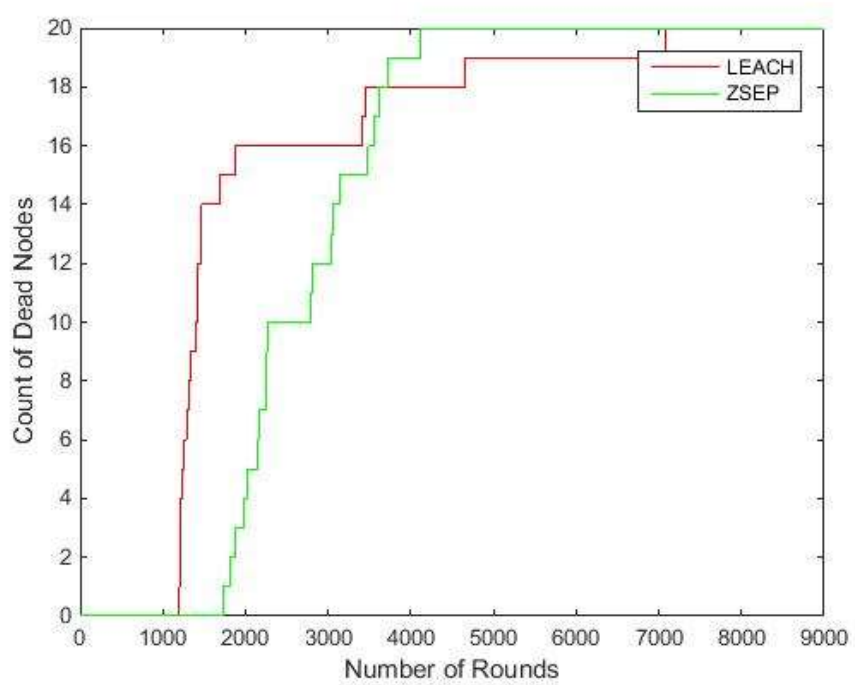FIG 3. THE SIMULATED WIRELESS SENSOR NETWORK

FIG 4. GRAPH DRAWN BETWEEN COUNT OF ALIVE NODES VS NUMBER OF ROUNDS

In figure 4, we can see the performance of LEACH and ZSEP in terms of count of dead nodes and number of rounds. At beginning of simulation LEACH protocol has a greater number of dead nodes compared to ZSEP but as time goes on ZSEP protocol nodes are before LEACH protocol nodes.
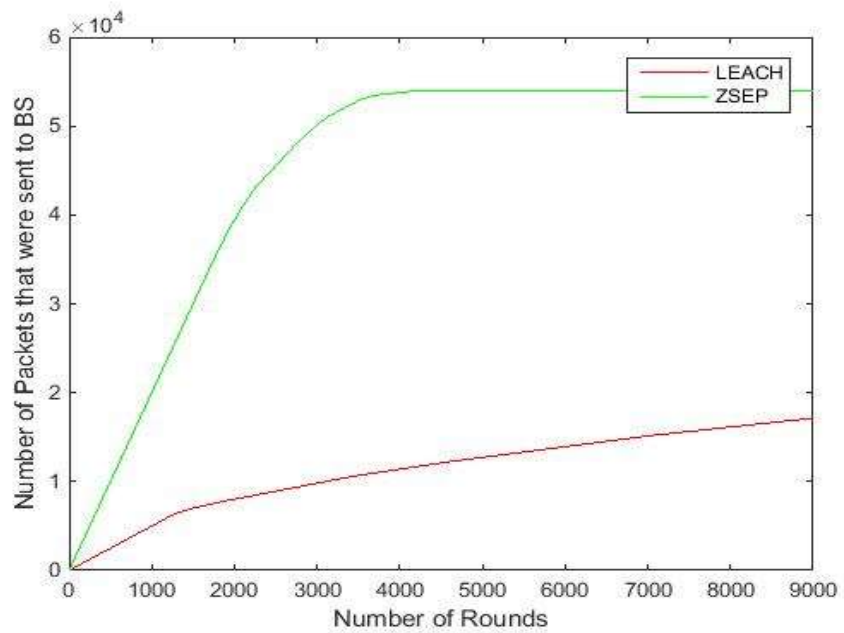

FIG 5. GRAPH DRAWN BETWEEN NUMBER OF PACKETS THAT WERE SENT TO BS VS NUMBER OF ROUNDS

Figure 5, shows that number of packets sent to base station vs number rounds here we can see that clearly ZSEP sent more number of packets compared to LEACH.
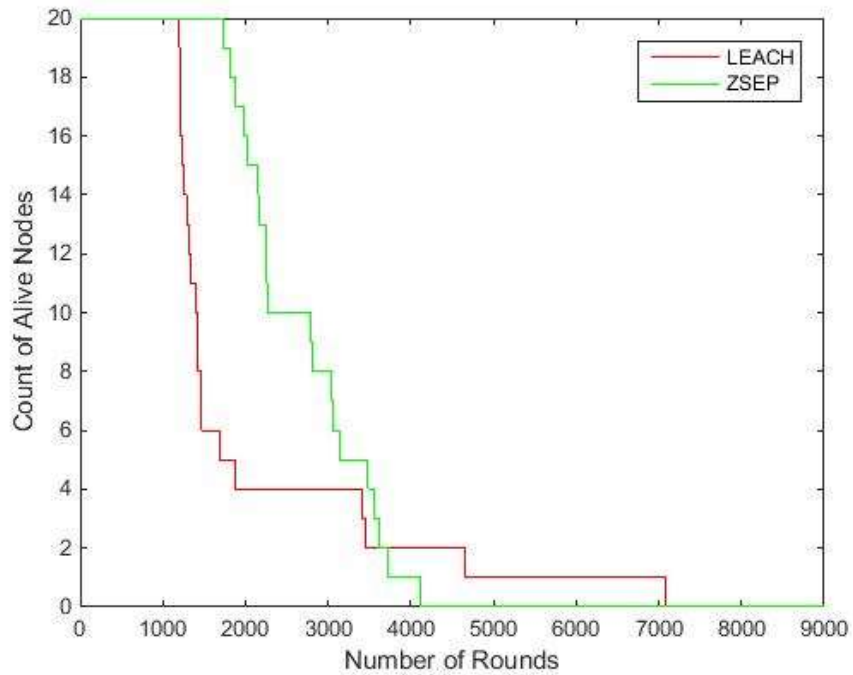

FIG 6. GRAPH DRAWN BETWEEN COUNT OF ALIVE NODES VS NUMBER OF ROUNDS

In fig 6, we can clearly see that at first count of alive nodes are more in ZSEP compared to LEACH but at the end In ZSEP alive nodes are less compared to LEACH.

6. CONCLUSION

This paper studies the effect of variation in network coverage on protocols and analyzes the performance of protocols and compares their performance with each other. The network coverage is a sensitive issue in wireless sensor network and there should be a tradeoff between the various parameters taken during the setup of the network. Also, not every protocol gives same kind of performance in the same environment. They should be wisely selected to setup the network according to the requirement. The selection of protocols, the initial energy of the network, and the coverage area of the network, there should be an accurate tuning between them to perform the network at its best. It should be adaptive in case if there is a requirement to change in certain parameters in emergency case. It has a wide scope mainly in military and urban areas. The improvement can be done to cover the maximum area with better performance for wireless sensor network.

7. FUTURE SCOPE

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8. REFERENCES

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