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# Data Compression on Enhanced Z-SEP for Effective Energy Utilization Technique

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## ABSTRACT

As wireless sensor network applications are the major part of our daily life and are emerging trend for the recent technologies. The wireless sensor network works on sensor node, also called sensing device have sense, computation and communication ability. The purpose of sensor nodes is data communication or data transfer, means transfer of data packs from one node to other node with in the network. Clustering is a technique used in WSN to make communication among nodes, this is done by choosing a leader in each cluster. Each cluster leader is called cluster head. This selection depends upon the average energy and the probability concept. There are number of clustering protocols used for the cluster Head selection, the main concept is the life time of a network which depends upon the average energy of the node. In this paper we proposed a model, which uses the residual energy for cluster head selection and LZW compression technique during the transmission of data packets from CHs to base station.

***Keywords :-*** WSN, Heterogeneous network, LEACH, SEP, Z-SEP, Clustering, Residual energy, LZW Compression.

## I. INTRODUCTION

As wireless sensor network works on homogeneous and heterogeneous network and its applications are emerging trends for recent technologies such as defence, medical etc. It works on tiny devices called sensor nodes and consists of hundreds to thousands of low power multi-functional sensor nodes. These nodes have sense, computation and communication ability. To handle these properties there are some basic components, which are a sensor unit, an Analog to Digital Converter, a Central Processing Unit, a power unit and a communication unit [1]. Sensor sense or compute the physical data of the area to be monitor. The frequent analog signal sense by the sensors is digitized by Analog to Digital Converter and sends to controller for further processing. Wireless micro-sensor networks represent a new paradigm for extracting data from the environment. These sensor nodes are very expensive and require large amounts of energy for operation. The most difficult resource constraint to meet is power consumption in wireless sensor networks [5]. The use of wireless sensor networks is increasing day by day and at the same time it faces the problem of energy constraints in terms of limited battery lifetime. As each node depends on energy for its activities, this has become a major issue in wireless sensor networks [2], [3]. The failure of one node can interrupt the entire system or application. Every sensing node can be in active, idle and sleep modes. In active mode, nodes consume energy when receiving or transmitting data. In idle mode, the nodes consume almost the same amount of energy as in active mode. While in sleep mode, the nodes shutdown the radio to save the energy. A wireless sensor network platform must provide support for a suite of application-specific protocols that drastically reduce node size, cost, and power consumption for their target application. There are number of technique in wireless sensor network to handle these problems associated with in the network. Clustering is one of technique in WSN to handle such problems. Number of clustering protocols are invented LEACH protocol, The SEP heterogeneous protocol are best examples, but further some limitations are still there. In this paper we proposed a new method to improve the life time of network and storage space during transmission which increases the capability of network to select best clusters heads among nodes over LEACH and SEP.

## II. LEACH

In this section we present the brief concept of LEACH and its working. LEACH stands for Low-Energy Adaptive Clustering Hierarchy. W. B. Heinzelman et al. Proposed first well known clustering protocol LEACH for wireless sensor networks [9]. It is the first hierarchical routing protocol in Wireless Sensor network. In this protocol, nodes are divided into only two types of categories as normal sensor nodes and cluster heads (CH). At first the normal sensor nodes are

grouped together and form clusters and among all the sensor nodes in a cluster one node are selected as a CH node.

The LEACH protocol consist a concept of round. LEACH protocol during running uses many rounds. Each round is divided into two states: cluster setup state and steady state.

In cluster setup state, LEACH forms cluster in self-adaptive mode; in steady state, it transfers data. The time taken to complete the second state is usually more than the time of first state for saving the protocol payload.

Although LEACH protocol acts in a good manner, it also suffers from many drawbacks such as:

- CHs selection is random, which does not take into account the residual energy of every node.
- The high frequency of selecting CHs wastes a certain amount of energy.
- It can't cover a large area. CHs are not uniformly distributed, where CHs can be located at the edge of the cluster.

## III. SEP

SEP (**Stable Election Protocol)**, a heterogeneous protocol which is an improvement over LEACH protocol [11]. In SEP, some of the high energy nodes are referred to as advanced nodes and the probability of advanced nodes to become CHs is more as compared to that of non-advanced nodes. It assumes that a percentage of the population of sensor nodes is equipped with additional energy resources - this is a source of heterogeneity which may result from the initial setting or as the operation of the network evolves [11], [12]. SEP does not require any global knowledge of energy at every election round.

The drawback SEP method is that the election of the cluster heads among the two type of nodes is not dynamic, which results that the nodes that are far away from the powerful nodes will die first. The modified version of SEP is Zonal-SEP [10].

## IV. DATA COMPRESSION

This Section gives the overall idea about the data compression and LZW compression. primary objective of the data compression is to minimize the amount of data to be transmitted [6]. Data compression is Technique used to reduce the number of bits required of particular information during transmission of data sets. The main function of data compression is to eliminate the redundancy in a data set which reduces its size.

In this paper data compression technique is used for compression of data packets of sensor nodes which improves the energy levels of sensor nodes and helps in transmitting more data in less energy. The compression technique also helps in selecting the cluster head whose energy is efficient and increases life time of network. One the Best lossless data compression technique is LZW (Lempel-Ziv Welch) Compression which is invented by Terry Welch In 1980. LZW algorithm is just like a greedy approach and divides text into substrings. LZW algorithm works in both compression and decompression techniques [4]. LZW compression is one of the Adaptive Dictionary techniques. The dictionary is created while the data are being encoded. It takes each input sequence of bits of a given length in bits and creates an entry in a table called a "dictionary"[4],[9].

LZW compression is divided into encoding and decoding.

- **Encoding:**

The algorithm works on the input string in dictionary and on scanning the input string for successively longer substrings until it finds one that is not in the dictionary. When such a string in the dictionary is found, then it retrieves the index for the string without the last character (i.e., the longest substring that is in the dictionary) from the dictionary and sent to output, and then the heads to the new string (including the last character) is added to the dictionary with the next available code. The last input character is then used as the next starting point to scan for substrings. The following steps accomplished during the processes [7],[8],[9].

1. Initialize the dictionary which contain all strings of length one.
2. Then find the longest string W in the dictionary that matches the current input.
3. Avoid the dictionary index for W to output and remove W from the input string.
4. Then Add W followed by the next symbol in the input string to the dictionary
5. Go to Step 2

This whole compression process is using for compressing packet data of the sensor nodes. Then all data transferred from cluster member to the cluster head have been compressed and sent to the cluster head (CH). This concept uses only less amount of energy of cluster head to transfer the given data [9].

- **Decoding**

In case of decoding phase the compressed data during the compression phase will be transferred from the cluster head to the base station and then the base station will perform the decoding process [9]. Here the received binary data will be back converted in to the character or string. After undergoing all these process we will get the actual data which is sent from the cluster member. The main goal of this LZW compression is to improve the lifetime of the cluster head (CH) and network [8],[9].

## V. PROPOSED METHOD

This section represents the overall idea about the proposed method and the objectives, which is improving techniques of Wireless Sensor Network.

The main objectives of this paper are

- To study the LEACH, SEP and ZSEP clustering protocols.
- To get the better Cluster heads on the basis of residual energy with threshold energy.
- To transfer/receive more packets at base station and sink.
- To get better data transfer by using LZW compressing technique.
- To improve the overall WSN life time and energy consumption.

The working flow is given below:

**Step1**. Initially deploy WSN nodes (N) having average energy.

**Step2**. Apply cluster head selection based on probability and average residual energy and select cluster heads CHs.

**Step3**. Check the condition for residual energy of node if condition satisfies then

Set the node as Cluster head (CH).

else

Set the node as normal node.

**Step4.** Collect the data transferred from cluster members (CMs).

**Step5.** Then apply the LZW compressing technique based on minimum threshold distance value.

**Step6**. Collects the compressed data and sends it to base station (BS) with standard threshold distance value if the distance is less than CH.

**Step7.** Link broadcast average energy information to WSN structure.

## VI. RESULT AND DISCUSSION

In this section the comparison of proposed technique with LEACH, and SEP is discussed. The comparison will show the improvement on network life time and throughput of network affected with the help of residual energy and compression.

The evaluation and the implimentation is done in MATLAB. The simulation has been peformed in the network of 100 nodes and are placed randomly in the network. The nodes are in the diameter of field 400m x400m.

The different parameters and their values used in the network is shown Table 1.

TABLE 1: PARAMETERS USED

| Parameter | Values |
|---|---|
| Area (x, y) | 400,400 |
| Base station (x, y) | 200,200 or mobile |
| Nodes (n) | 100 |
| Probability (p) | 0.1 |
| Initial Energy | 0.5J |
| Transmitter energy | $50*10^{-9}$ |
| Receiver energy | $50*10^{-9}$ |
| Free space(amplifier) | $10*10^{-12}$ |
| Multipath(amplifier) | $0.0013*10^{-12}$ |
| Effective Data aggregation | $5*10^{-9}$ |
| Maximum lifetime | 2500 |

The comparison of different metrics of the protocols are dead node evaluation, alive node evaluation, and, packets to BS.

After applying the residual energy technique and lzw compression on packet transmission the energy levels of the node changes. Fig 1 shows the network life of the dead nodes.

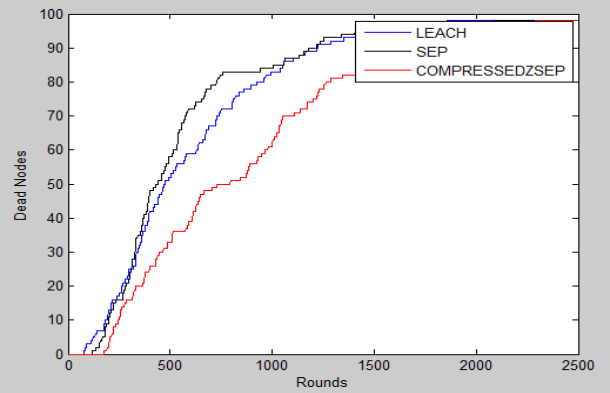


Fig 1 Compressions of dead nodes of the network

Figure 2 shows that the alive node. The comparison shows that proposed protocol is better than LEACH and SEP.

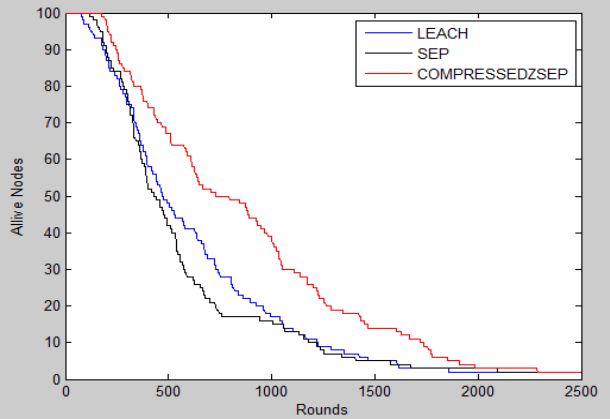


Fig 2 Comparison of Alive nodes of the network

Fig 3 shows comparison for packet to BS.

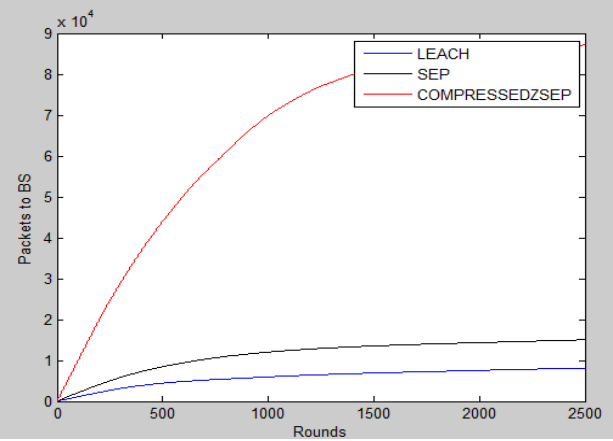


Fig 3 Comparison for packet to BS

## VII. CONCLUSIONS

In this paper brief discussion about the data compression on Z-SEP using effective energy utilization for the cluster head selection in wireless sensor networks is mentioned. This paper proposed a new method for better cluster head selection by proposing a new version of clustering protocol called COMPRESSEDZSEP. The Lzw compression technique minimizes the packet size and selects a better transmission route and uses the energy efficient cluster head replacement for the better energy consumption of the network and a distance transmission for cluster head to base station communication. Moreover, comparison on the performances of these protocols is considering throughput, network life time and energy utilization.

In near future, a new and improved cluster based routing protocol can be proposed to enhance the network life time and optimize the energy level of a node for better selection of cluster head.

Moreover, the use of double probability technique at CHs will also be done for better selection of CH with maximum energy of a node.

## ACKNOWLEDGMENT

The about contents and research method we used is true to my knowledge and the result at every step we concluded is according to my research work.

## REFERENCES

[1] Jing, Yang, Li Zetao, and Lin Yi. "An improved routing algorithm based on LEACH for wireless sensor networks." Control and Decision Conference (CCDC), 25th Chinese. IEEE, 2013.

[2] Beiranvand, Zahra, Ahmad Patooghy, and Mahdi Fazeli. "I-LEACH: An efficient routing algorithm to improve performance & to reduce energy consumption in Wireless Sensor Networks." Information and Knowledge Technology (IKT), 5th Conference on. IEEE, 2013.

[3] Xu, Jia, Ning Jin, Xizhong Lou, Ting Peng, Qian Zhou, and Yanmin Chen. "Improvement of LEACH protocol for WSN.", In Fuzzy Systems and Knowledge Discovery (FSKD), IEEE 9th International Conference on, pp. 2174-2177, 2012.

[4] Simrandeep kaur, Student, V.Sulochana Verma, " Design and Implementation of LZW Data Compression Algorithm", (IJIST) V 2014.

[5] Shekhar Vyas, Pinaki A. Ghosh, " Review and Proposed Work for MODI-LEACH for Improvement of LEACH for Energy Consumption in Wireless Sensor Networks", JAERD-2014.

[6] Shahina Sheikh, Ms. Hemlata Dakhore, "Data Compression Techniques for Wireless Sensor Network", IJCSIT-2015.

[7] Karthick .K et al, "An Energy-Saving Routing Algorithm for Wireless Body Sensor Network using Data Compression Technique", ijca-2015.

[8] R. Swathi, "An Energy Efficient Routing Algorithm based on Data Compression in LEACH-C", ijert-2014.

[9] S.Mohamed Saleem, "Evaluating Effectiveness of Data Transmission and Compression Technique in Wireless Sensor Networks", ijarcsse-2013.

[10] S. Faisal and N. Javaid, "Z-SEP: Zonal-Stable Election Protocol for Wireless Sensor Networks", Journal of Basic and Applied Scientific Research, 3(5)132-139, 2013.

[11] Tenzin Jinpa and Dr. B.V.R Reddy, " The Study of the Energy Efficient Protocols (MODLEACH, SEP and DEEC)", ijcscn Vol 5(1),32-38, 2015.

[12] Yogesh Mishra, Ashish Singhadia, Rashmi Pandey, " Energy Level Based Stable Election Protocol in Wireless Sensor Network", IJETT Volume 17 Number 1 – Nov 2014.