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A Research Paper: Energy Efficient Protocol to Increase Network Life in WSN

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Abstract

Wireless Sensor Networks (WSNs) is composed of sensor nodes. These sensor nodes are heterogeneous and mobile. Due to mobility, when nodes are communicate to each other, they easily loss their energy or we can say the network life time will reduce by time. To improve the network life time, many protocols have been developed i.e. Leach, EEP. Distance and energy are the main parameters to select cluster head. This paper presents how life time of network can be increased by these protocols. This work presents the improvement over LEACH protocol.

Keywords: Wireless Sensor Networks, LEACH, EEP, CH, Energy

1. Introduction

A WSN is composed of large number of sensor nodes which are distributed in the wireless environment. The sensor nodes transfer message in the form of packets to other nodes. Due to mobile nature, the sensor nodes become passive after some time. In the wireless technology, the sensor nodes collect data, receive the information and then pass this data to other nodes or users. They do not require any infrastructure. Each network sensor node is made up of four basic components-a sensing unit, a processing unit, a transceiver unit and a power unit or some energy source usually abattery.

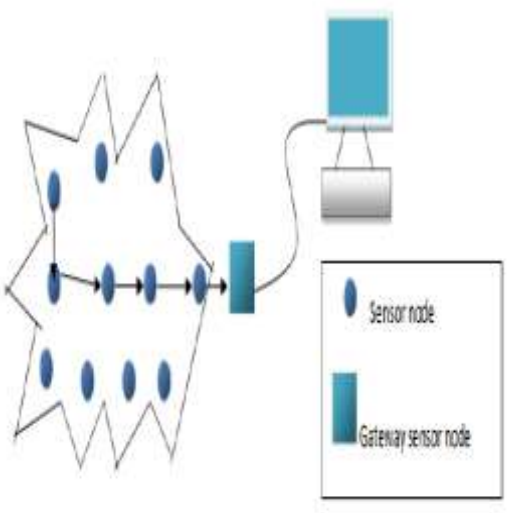

Fig1: WSN Model

The WSN is composed of processing unit, sensing unit, battery. These devices are used to collect the information, data acquisition and then nodes transfer the data to other nodes and monitor the all activities. If any network has many nodes, then WSN require some infrastructure so that all nodes can perform their work properly. So Clustering is required to group the nodes.

1.1 architecture of WSN

The WSN consists of four basic units:-

- Sensing unit
- Processing Unit
- Transceiver unit and
- Power unit.

Battery - The battery supplies power to the complete sensor node. It plays a vital role in determining sensor node lifetime.

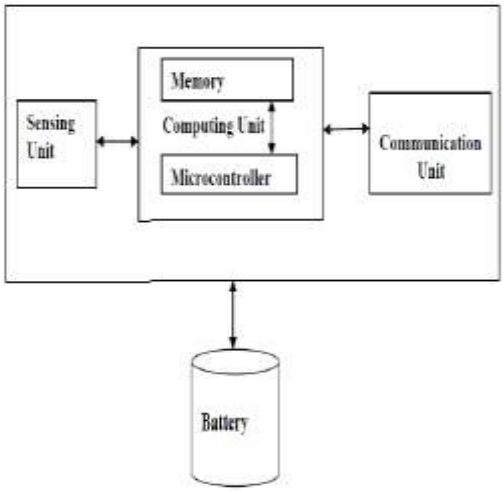

Fig 1.1: Wireless Sensor Node architecture

2. Proposed Work.

Leach Protocol decide the next node on the basis of distance parameter. In cluster, firstly cluster head CH is elected on the basis of least distance from base station. Then CH sends or transfers the packets to base station. In this manner, routing is done or we can say nodes are communicated in the cluster based manner. The cluster head have to take all responsibility to transfer the packet to the base station. Since the BS is typically located far away. So the nodes in a network will die very quickly. So to improve the life time of network, an improved approach has been implemented in this paper so that the efficiency of network can be increased. This work has been represented by EEP protocol. By comparison of Leach & EEP protocol, we can easily found the improved network life time of network.

3. Comparisons between Leach and EEP

Table shows the steps taken in each round of LEACH and EEP when the base station located far from the field. There are some difference between two algorithms while there are some common areas in LEACH and EEP. Table of basic differences between LEACH and EEP is given below:

Steps	LEACH	EEP
Cluster head selection	a. Defines a threshold that resets in every N/K rounds: T(t)= K/N-K*(r mod N/K) b. Nodes select random number between 0 and 1 and Compare it to T(t).	a. Calculates a probability for each node base on distance of each node to base station b. Nodes select random number between 0 and 1 and compare it to their assigned Probability values.
Cluster formation	Based on the received signal	Based on the received signal strength of

	strength of the advertisement message sent by CHs nodes choose their clusters.	the advertisement message sent by CHs nodes choose their clusters
Data transmission	Based on TDMA schedule nodes send data to their CHs afterwards CHs send the aggregated data to BS.	Based on TDMA schedule nodes send data to their CHs afterwards CHs send the aggregated data to BS.

4. RESULTS AND ANALYSIS

The number of alive nodes decides the lifetime of network. If number of dead nodes are more in any network, then network life time will decreases. To increase the life time of any network, many parameters are used to decide the life time of network. These parameters are:

Alive Nodes

Dead Nodes

Packet Transmission Rate

The experimental result shows that comparison of LEACH & EEP protocol. It decreases the amount of dead nodes and increase alive nodes. This experimental result will shows that the life time of network is enhanced because of dynamic clustering and increased packet transmission rate. In this paper, we have taken two scenarios i.e.

1) No. Of nodes =50
2) No. Of nodes=100

The simulation tool is MATLAB.

4.1 Scenario One

Parameters which are used for simulation in scenario one:

n= 50

P= 0.1;

Eo= 0.6; It means total number of nodes are 50. Here n is number of nodes, p is the probability factor, Eo is the thresh hold energy value.

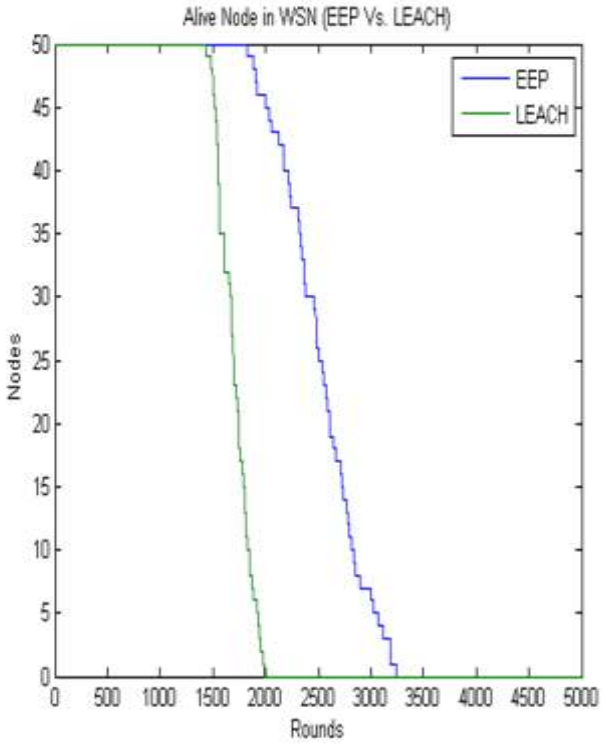

Fig 4.1: No. of Alive nodes in 50 nodes network

This graph represents the no. of alive nodes. The life of nodes in EEP is more than the LEACH protocol. The number of nodes is alive between rounds 1400 to

1500 in Leach protocol. The number of nodes is alive between 2400 to 3200 rounds in EEP protocol.

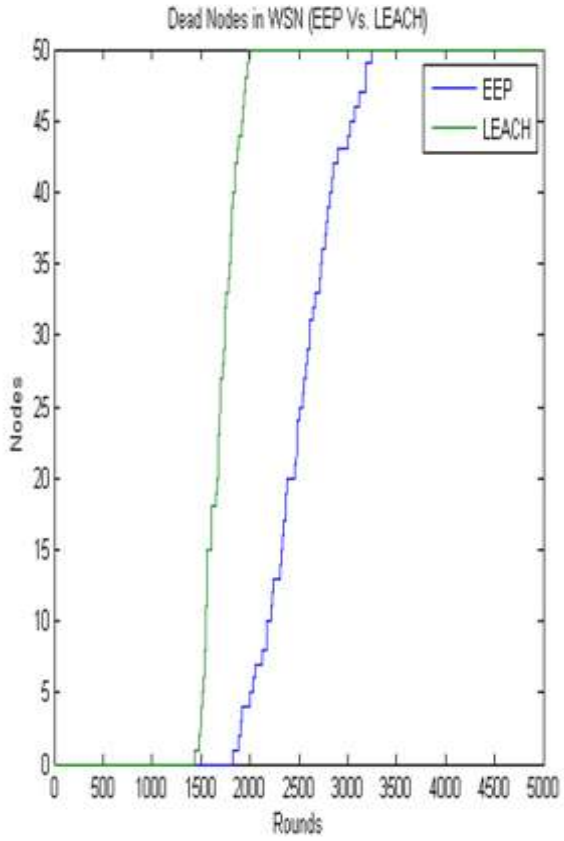

Fig 4.2: No. of Dead nodes in 50 nodes network

This graph will represent no. of dead nodes in WSN. The life of nodes in EEP is more than the LEACH protocol. The nodes start to die around round 1400 in Leach protocol. In this graph, we can see Up to 1500 rounds the network is fully dead in leach. The network life of smaller network is highly increased in EEP due the reason that time and energy is saved in cluster head selection as we have all ready a vice cluster head. The vice cluster head becomes cluster head once energy is below the thresh hold energy and next vice cluster head will be selected on the distance and energy factor. So, the life of network in EEP will be more than LEACH.

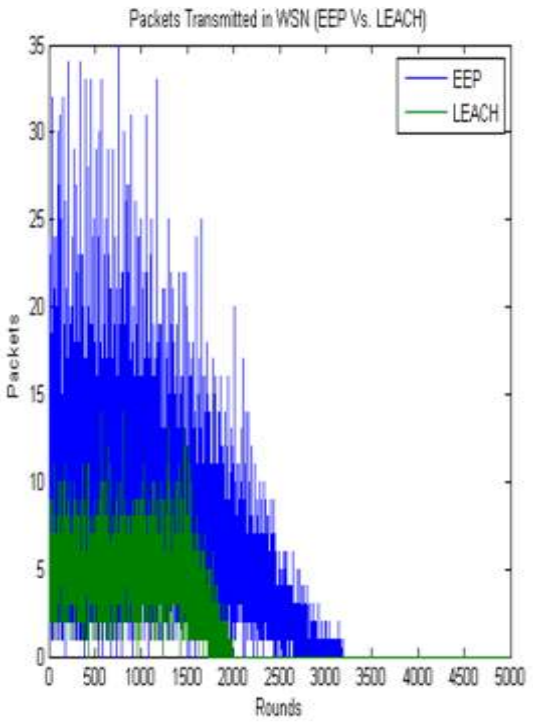

Fig 4.3: No. of Packets transmitted in 50 Nodes WSN

The number of packets transmitted to base station in EEP is higher than the LEACH protocol. Due to higher network life of EEP, the packet transmission rate of EEP is better than as compared to Leach protocol. In EEP the transmission is also for a longer duration i.e. up to 3200 rounds.

Now in the next scenario we will increase the network size and see what results EEP will give for a larger network.

4.2 Scenario Two

Parameters which are used for simulation in scenario two:

n= 100

P= 0.1;

Eo= 0.6; It means total number of nodes are 50. Here n is number of nodes, p is the probability factor, Eo is the thresh hold energy value. Now we will give the comparison graph of EEP with existing LEACH protocol for the network consists of 100 nodes.

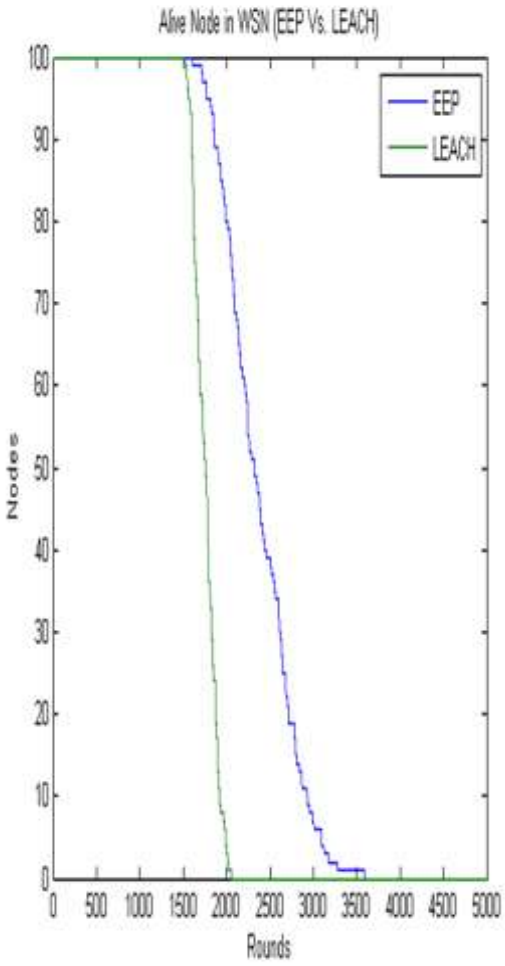

Fig 4.4: No. of Alive nodes in 100 nodes network

This graph represents the no. of alive nodes. The life of nodes in EEP is more than the LEACH protocol. The number of nodes is alive between rounds 1500 to 2100 in Leach protocol. The number of nodes is alive between 2100 to 3600 rounds in EEP protocol.

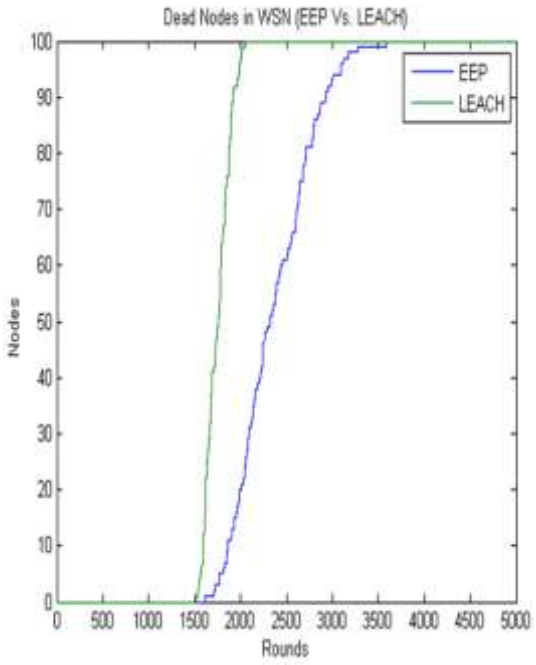

Fig 4.5: No. of dead nodes in 100 nodes network

This graph will represent no. of dead nodes in WSN. The life of alive nodes in EEP is more than the LEACH protocol. The nodes start to die around round 1500 in Leach protocol. In this graph, we can see Up to 2100 rounds the network is fully dead in leach.

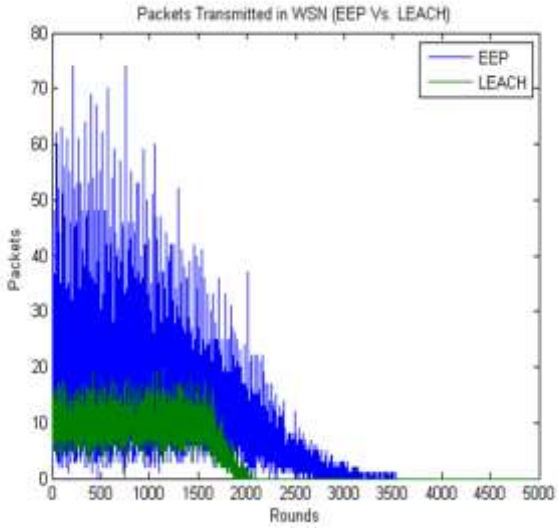

Fig 4.6: No. of Packets transmitted in 100 Nodes WSN

The number of packets transmitted to base station in EEP is higher than the LEACH

protocol. Due to higher network life of EEP, the packet transmission rate of EEP is better than as compared to Leach protocol. In EEP the transmission is also for a longer duration i.e. up to 3600 rounds.

5. Conclusion & Future Scope

The main objective of this paper is to collect the information by sensor nodes. This paper present EEP protocol is more energy efficient as compared to Leach protocol. The experimental result shows that the number of alive nodes is more in EEP protocol as compared to Leach protocol.

In future, to increase the life time of network, we can increase the number of nodes.

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