Energy Efficient LEACH by applying Energy and Distance Factor in Determining Sink Position and Cluster Heads in Wireless Sensor Networks

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Abstract : Wireless sensor network is a network that having of large no of small nodes. LEACH is one of the main protocol in this field of Wireless network and also in this field energy is main problem so, In this paper we are going to introduce the distance and energy factor to determine the cluster head and sink position to Energy Efficient-LEACH. The position of the sink is change after each round according to the energy left in the node and the cluster head is made according to the distance between the sink and node. The main aim of the research is to improve the network lifetime. To simulate the Energy Efficient LEACH protocol and data analysis we uses the MATLAB network simulation.

Index Terms - ***wireless sensor network; LEACH protocol; Energy Efficient -LEACH ; MATLAB***

I. INTRODUCTION

Wireless Sensor Network (WSN) is a inclining research topic within the world. It possesses a large application prospect within the application of the three technologies of computing, communication and sensor. The wireless sensor network consists of the many small sensor nodes. These nodes possess the ability of communication and processing, so that they can cooperate with each other and use the wireless communication to realize the information transmission of some special functions [1]. Some main about point of wireless sensor networks:

1. All the nodes within the sensor network are the source nodes and Send data to the only destination node Sink.
2. Because of the large number of nodes deployed in or near the target the collected data is same or similar. This requires that the routing protocol has the ability of data fusion.
3. The processing power, power and the storage capacity of the nodes are very limited. The development of routing protocols for WSN has become a hot and difficult problem in wireless sensor networks.

II. ANALYSIS AND RESEARCH ON LEACH ROUTING PROTOCOL

A. LEACH protocol model

LEACH is a low power adaptive clustering routing algorithm for wireless sensor networks designed by Chandrakasan MIT et al LEACH defines the concept of "wheel" (round) which consists of two stages. At the first stage the cluster head is selected by the following mechanism. If the sensor nodes generate random number between 0, 1 if the T is greater than the threshold, then the node is selected as the cluster head T's calculation method is as follows:

$$T(n)=\frac{P}{1-P\times\left(r \bmod \frac{1}{P}\right)} \qquad \forall n \in G$$

$$T(n)=0 \qquad \forall n \notin G$$

Where 'P' is the number of nodes , 'r' is the number of rounds at present . After selecting the cluster head the node which is assigned as the cluster head is active to program itself as the cluster head (ADV_CH)[6]. The node that receives the message, in keeping with the intensity of the received signal it selects the cluster to which it is to be added and the synchronized message updates the analogous cluster head (JOIN_REQ)[7]. Constructed on Time (Division Multiple Address (TDMA), a cluster head node is consigned a communication slot for each member, and the cluster nodes (ADVSCH) are alerted in the form of broadcast[6]. This warrants that every node within the cluster is transmitted to a quantified transmission time slot and rest of the time is in the sleep state which lessens the energy intake [6]. In the stable operation stage, the nodes continuously collect and

monitor the data and transmit the monitoring data to the cluster head node (DATA). The cluster head node is sent to the Sink node, which is a reasonable working mode to reduce the amount of communication traffic. After a period of time, the entire network into the next round of work cycle, re select the cluster head node.

Dynamic transfer cluster head method is used in the LEACH protocol to control consumption of the energy in the network, so that the nodes with energy exhaustion and fiasco are disseminated unsystematically, so the LEACH can prolong the network lifetime by 15%. Conversely, the LEACH protocol in the progression of isolating the cluster head after each fixed cluster head node has a large overhead. As the selection of cluster head node cannot achieve the best, it's possible that the cluster head node is selected in such a way that itt is at the edge of the network or in between the two cluster head node. Certain nodes have to transmit an elongated distance to the cluster head communication, which leads to a lot of energy ingesting. Besides, the LEACH protocol employs the continuous data transmission mode and single hop path selection mode to communicate with the Sink protocol, so that the energy consumption of the cluster head nodes is gigantic, subsequently it is not appropriate for large scale sensor networks[8].

B. Energy Efficient-LEACH

Through the study of LEACH we have found many point where if we can modify then it is possible that we can get better result in terms of throughput or in the lifecycle and many more. As we have talk about the point of modification like:-

1. In LEACH the sink is in static mode means there is no movement of sink in the area of range.
2. The selection of Cluster Head is in random way in the LEACH.
3. And many more but we have concentrated on this two area only.

We have modify following two area of modification in our Energy Efficient-LEACH and we get better result. As we know that the LEACH protocol have static Sink, So, in order to remove this static sink we introduce mobile sink whose position changes according to the energy level of the sensor node present in the network. The position of the sink changes after each round means the sink changes its position after each round complete. The position of the sink means where the sink has to move is determine by the energy present in the node of the network. The sensor node which has less energy after each round the sink move close to that particular node for that particular round .again after one round sink move to that node which has less energy. Now, after selecting the sink position for a particular round our next job to determine the Cluster Heads for that particular round. For that first we have to calculate the distance between the node and the sink. After calculating this the process of formation of Cluster Head starts for that we have to see that which node has less distance with the sink that node will consider first or we say that node is the first contender to become the Cluster Head.

III. LEACH AND ENERGY EFFICIENT LEACH MATLAB SIMULATION COMPARISON

A. LEACH and Energy Efficient LEACH simulation results In the MATLAB programming environment, we first generate a 300 x 300 region and in its internal random generation of a 100 node (coordinate different) of the connected graph. It is supposed that each node is identified to need a data type before the network is formed. It can be detected in the event of its detection range. Sink in the network area; do not ponder on the energy consumption of Sink. The initial energy of the common node is 5J. The experimental results in MATLAB are shown in Fig.1 to 5.

In order to compare the performance of Energy Efficient LEACH and LEACH protocol, we first generate a 300 x 300 region in the MATLAB programming environment and at that juncture unsystematically generate a Connected graph with 100 nodes (coordinate different) . It is anticipate that each node is known to require a data type before the network is shaped and it can be detected in the incident of its detection range. Sink in the network area; do not deliberate the energy consumption of Sink. The initial energy of the common node is 5J .

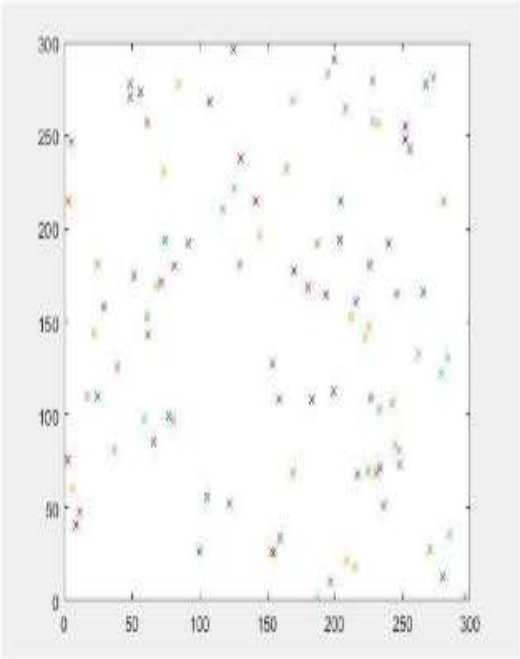

Fig:1 Distribution of node

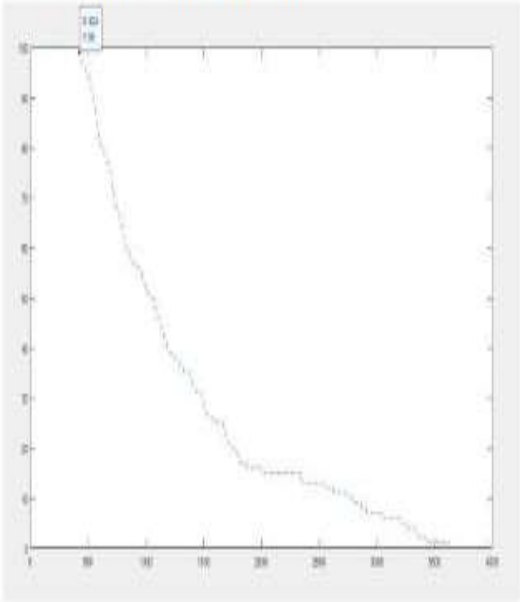

Fig:- 2 In LEACH protocol First Node Dead after 424 rounds

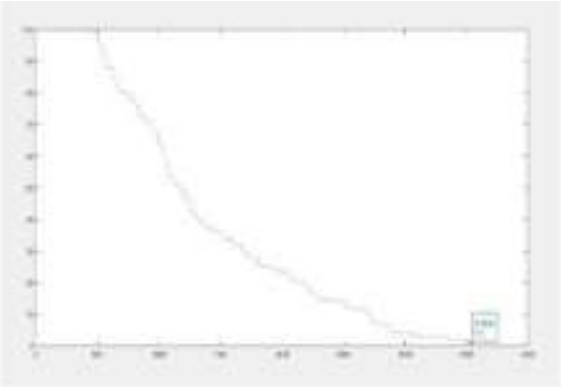

Fig:- 3.In LEACH protocol Last node dead after 3533-rounds

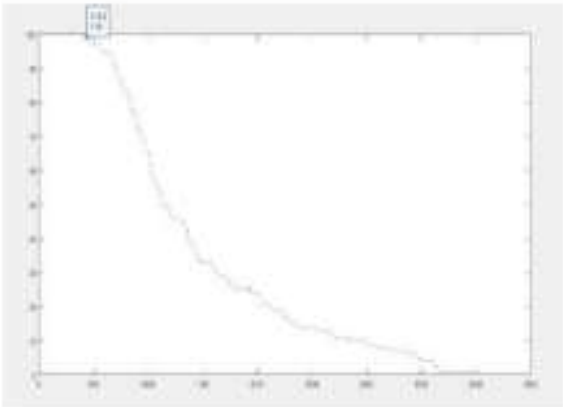

Fig:-4. In Improved-LEACH protocol First node dead after 453-rounds

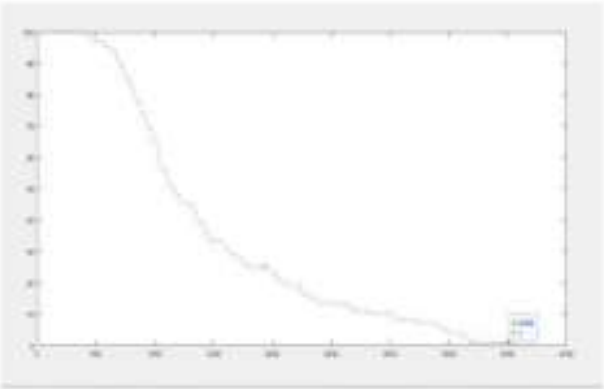

Fig:-5 In Improved - LEACH protocol Last node dead after 4004-rounds

IV. CONCLUSION

In this paper, we carefully examine the up-to-date research on LEACH protocol detail and particularize the pros and shortcomings of them. The conventional hierarchical routing algorithm LEACH is scrutinized and deliberated. The amended Energy Efficient LEACH algorithm is recommended. The Energy Efficient LACH algorithm is planned by setting different energy level of node at each round to determine the sink position in each round and distance between the sink and node to determine the cluster head in each round. It can be seen that the first node of the LEACH protocol is dead faster that is at after 424 rounds the than the Energy Efficient-LEACH in which the first node dead at the after 453 rounds, also the LEACH protocol survive much less rounds then the Energy Efficient LEACH which can be seen in the Fig: 1 to 5 that is in LEACH protocol the last node dead in after 3533 rounds where as in the Energy Efficient LEACH the last node dead after 4004 rounds. This is due to the Improve LEACH protocol using the energy level of the node to determine the sink position and the distance between the sink and node to determine cluster head. Compared with the LEACH protocol, the Improved LEACH protocol is extended, and the throughput, lifetime is also increased.

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