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MODIFIED LEACH ALGORITHM IN WIRELESS SENSOR NETWORK

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ABSTRACT

This project provides new mechanisms for clustering and routing in wireless network to improve energy efficiency. In this project, we modify one of the clustering protocol LEACH by introducing efficient cluster head selection scheme and adjusting transmitting power by introducing the doorway node in the centre of network field.Provide comparison between LEACH protocol and proposed protocol using various metrices as cluster head formation, throughput and network life. Energy conservation is the primary goal issue in the designing of wireless sensor network. In this paper, we divided the network into four zone and facilitate the direct and multi hop communication to base station.

KEYWORDS sensor node, wireless network, energy,leach.

I.INTRODUCTION

Heinzelman et al[15] proposed a new algorithm for sensor networks called Low Energy Adaptive Clustering Hierarchy (LEACH).Leach protocol is a clustering protocol. In this protocol all sensor nodes are randomly distributed in the network field. Implemented the leach protocol on the field, field are divided into the small clusters in variant size. In each round sensor node senses the event and send the manipulated data to the cluster co-ordinator node(cluster head).After receiving the data the cluster head processess the data received from all the sensor nodes and communicate with the base station.Cluster Head nodes drain out energy quickly compared to the other nodes. Nodes which are far away from the base staion are drain out their energy fastly and die soon. A number of simulations , it was found that only 5 percent of the total number of nodes needs to act as the cluster-heads. To reduce inter-cluster and intra-cluster collisions, TDMA MAC is used.The data collection by the sensor nodes are distributed and perform periodically.

Many modification have been done since it was introduced. Modification are done in cluster head selection scheme and MAC.In the cluster head procedure higher energy node become cluster head in that particuler round. A node is eligible for cluster head selection procedure if it has energy greater than thresold value. In each round data are transfer to the base station and it occurs periodically.In each round only 5% of total live nodes are become cluster head.

Hence there is a scope of improvement in leach algorithm by modifying the cluster head election scheme is required to conserve energy of the network life time. In clustering protocols as LEACH, nodes used equal amount of amplification energy to communicate data regardless of distance between sender an receiver nodes. For example, transmitting a data to cluster head from the sensor nodes with same transmitting and amplification power level as required by a node located at farthest end of network to base station results in wastage of energy.

One solution of this problem complete knowledge of network area and than sensor nodes decide how much they energy need to amplify signal. Calculating and locating dist ances with in wireless sensor network topology needs a good amount of knowledge of routing and so, practically this approach for problem solving do not work for conserve energy of the network. To conserve the energy of the network we propose two mechanisms. i.e.energy efficient cluster head selection mechanism and two different level of transmitting power energy.

II. PROPOSED METHODLOGY

We all know that network has a limited lifetime during which nodes have limited energy to transmit the data. Considering this issue all the sensor nodes must be designed extremely energy efficient. Improvement of energy optimization by factor of two enhances the network lifetime by factor two. In this proposed work, used the leach protocol in fixed zones and in remaining zones we provide direct communication to the base station. In this work, base station is situated outside the network and a doorway node is located at the center of the network, so we have divided the whole network into four zones in figure 3.1. The node located in the zone one is directly communicated to the base station and the remaining nodes of the other zone communicate to the base station via doorway node.

1. All the node located in zone one are nearer to the base station. Distance between the zone one nodes and base station is less than two other zone nodes. So the base station is coming in the range of all nodes of zone one. So here we facilitate direct communication between nodes and base station

2. The nearby space of doorway node is known as zone four. It is a small area and node densities are less and the distance between the doorway node and the node located in the zone two is less. So here we also provide the multi hop communication from node to base station. so the node firstly send the data to doorway node and this doorway node bypass the data to base station.

3. The remaining area is divided into zone two and three. The node located in zone three and zone four is far from the base station and the doorway node. So the direct communication to base station and doorway node consume higher amount of energy. So in this zone nodes form a cluster and through this cluster nodes communicate to base station via doorway node. In this zone, we use LEACH protocol for cluster formation and data transmission.

CH formation: In this algorithm data transmissions are performed in several rounds. In each round a new cluster head is elected for the formation of CH randomly numbers between 0 to 1 are assigned to each node in a network, then we calculate the threshold energy value for the node. Comparing this threshold value with the assigned value of each node. If the threshold value is less than the assigned value, the node becomes the CH for this round particularly.

b) Scheduling: in the LEACH code we use TDMA based scheduling for each round to avoid the collision in the network. In each round CH assign a TDMS schedule for each node. The node send the data to the CH in its assigned schedule. After scheduling the CH collect the data and perform the data aggregation.

c) Data Transmission: The CH collects the data from all the nodes and after performing the data aggregation send the data to the B.S. via. Doorway node .

Therefore, the following modifications have been done in the Low Energy Adaptive Clustering Hierarchy (LEACH) in order to improve efficiency and enhance network lifetime:

1. For each and every round, proposed algorithm will check if energy level of Cluster Head has fallen a defined threshold than it will undertake CH and cluster formation process in network.

2. This is a way to conserve the energy of sensor node that goes wasted in election of cluster head scheme. Moreover, control overhead and load balancing are also limitized.

3. In proposed clustering protocol, there can be three kinds of communications w.r.t distances.

(a) Inter cluster communication.
(b) Intra cluster communication.
(c) Cluster head to base station/ sink communication.

4. Using equal signal amplification energy for all of above communications is also not needed. Hence multi power levels are adjusted for all three kinds of communication to preserve energy.

5. Basically, in proposed scheme, three modifications/ enhancements are made

III. SIMULATION

In this scenario , we suppose that a sensor network spread into a field of 100 X 100 m2. Energy that is enough to transmit at far ends of a field of 100 X 100 m2 must be lowered 10 times for intra-cluster transmission. If a node elected as a Cluster head, base station informs it to use high power amplification and in next round, when that node becomes a cluster member, routing protocol switches it to low level power amplification

Simulations are conducted using MATLAB 8.2.0.701 (R2013b) and to get precise plots, confidence interval is taken. Sensor nodes are deployed in random manner and made homogeneous WSN using MATLAB. The wireless channel is used because the nodes deployed in the network are communicating wirelessly based on their distance, transmission range etc. Simulations show that proposed protocol performs better considering metrics of throughput, network life time, location of base station and initial energy of sensor nodes

Network Area(meter)	100x100
Number of Nodes	100
Location of gateway node	50,50
Cluster Radius	100m
Sensing Radius	10m
Initial Energy	0.5 J
ETX	50nJ
ERX	50nJ
Eamp	0.0013pJ/bit/m4
Efs	10pJ/bit/m2
Eda	5nJ/bit/signal
Number of Rounds	2500
Routing Protocol	LEACH

NETWORK PARAMETER

IV.RESULT AND DISCUSSION

As already discussed, energy efficient WSN deployment is not an easy task due to large number of parameters, i.e., energy parameters and cluster head selection then their data transmission procedure. MATLAB programming platform is used for coding of LEACH and proposed work. Finally, the comparative performance of all algorithms is explained.

The parameters considered during simulation have their own significance for the better performance of the network. The important definitions in the WSNs related to this project are:

Packet delivery ratio: The ratio of number of packets sent from the source to the number of packets received at the destination. The greater the value of PDR means better performance of the protocol.

Network Lifetime: The time for the first node or a certain percentage of sensor nodes to run out of power or it is the time interval from the start of operation (of the sensor network) until the death of the first alive node.

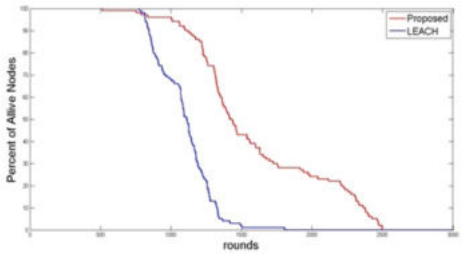
Throughput: Average rate of successful packet delivery. The throughput is the most important parameter to analyze the performance of the network, to get better through- put the error should be corrected, instead of retransmitting the packet. If the error is corrected there is no need of retrans mitting the packet. If the retrans mission traffic is reduced the congestion will not occur. If there is no congestion there is no packet loss that is error. If more number of packets in the network the performance of the network degrades which leads to congestion, which leads to packet loss. If there is an error correction technique which corrects the error instead of going for retrans mission it improves throughput.

Experiments and Graphs

In the experiment it is shown that the proposed protocol perform better than Leach(2002) and L-Leach(2013). The result show that approximate twice improvement in Leach and about 40% improvement shown compare to the L-Leach.in the L-Leach protocol network life time is around 1600 round in my proposed protocol network life time is about 2500 round.

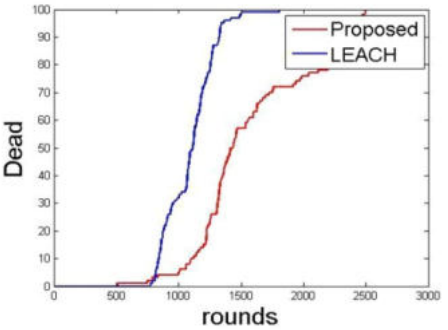
1.Number of Alive Nodes

In this subsection is shown a comparison of the number of allive nodes in Homogeneous LEACH and proposed scheme for routing protocol. The evaluated results are shown below.



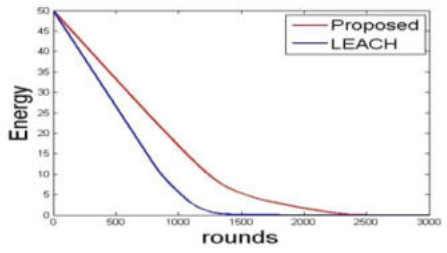
2.Number of Dead Nodes

In this subsection the following figure presents a comparison of the rounds achieved by all the simulated protocols when the all node dies.

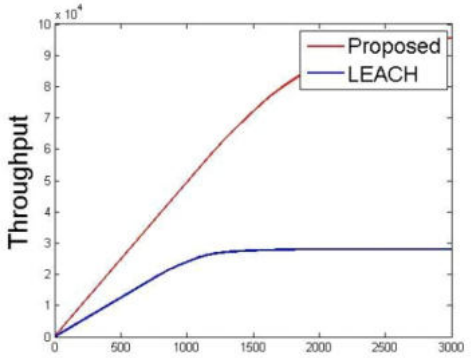


3.Total network energy of proposed protocol

Besides network life time, another metric to judge efficiency of a routing protocol is its energy. A base station receiving more data packets confirms the efficiency of routing protocol. Energy depends on network life time in a sense but not always. Considering the simulated results as shown in below figure, we deduce that, maximum energy is achieved by proposed work.



4. Throughput of the proposed protocol



V. CONCLUSIONS

In this project work, we give a brief discussion on emergence of cluster based routing in wireless sensor networks. We also propose Protocol, a new variant of LEACH that can further be utilized in other clustering routing protocols for better efficiency. Proposed Scheme tends to minimize network energy consumption by introducing technique to raise network lifetime and throughput. In this scheme, dividing the network into four zone, one zone directly communicated to base station and remaining three zones communicated to base stations via gateway node. In the experiment it is shown that the proposed protocol perform better than Leach(2002) and L-Leach(2013). The result show that approximate twice improvement in Leach and about 40% improvement shown compare to the L-Leach.in the L-Leach protocol network life time is around 1600 round in my proposed protocol network life time is about 2500 round.

VI. FUTURE SCOPE

1. Implementation of proposed protocol on Heterogeneous wireless sensor networks.
2. Next improvement can be possible by considering sink mobility and to ensure successful delivery of data.
3. Design of a better routing protocol in case when CH dies before sending the data to the BS.
4. The future work can include some more level of hierarchy and mobility in the network.

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