HETEROGENOUS BASED LEACH PROTOCOL USING WIRELESS SENSOR NETWORK

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ABSTRACT

To improve the hierarchical routing protocol LEACH invents a novel advance method known as LEACH-H that is based upon LEACH. This protocol says the problem of finding a CH node based upon node residual energy. This approach sagacity at the time of head nodes selection. Furthermore, the strength of network is increased and it can improve the network life cycle. The resulted calculation shows the behaviors of proposed algorithm have better performance as compare to leach in following manner, energy consumption, Transmission of data and quantity of life nodes.

KEYWORDS: WSN, Leach, CDMA,QAS ,Cluster.

1. INTRODUCTION

Wireless sensor networks [1] are one of the most important topics of consideration in the field of network technologies because of their capability to accomplish task without any communication infrastructure. Wireless communication enables the co-operation of nodes to fulfill bigger tasks that single nodes cannot. Nodes in WSN are densely deployed and are greater in numbers as compared to mobile ad hoc networks. The sensor network is made up of major number of base station and sensor nodes. The base station is an access point for the sensor on its network and it process and stores the data it collect from the node and if need it transmit the whole data to the middle server for observing.
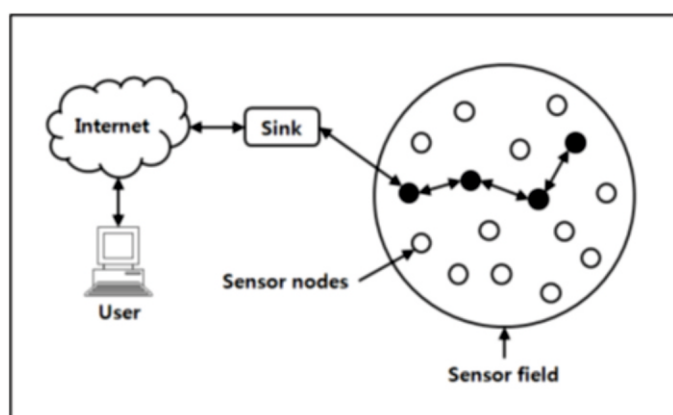

Figure 1.1: Network architecture of Wireless Sensor

The sensor node associate with other sensor nodes send the physical quantities like light ,moisture, gas, Heat of the environment and compile the data received and hand over it to base station despite of its limited energy. So we can say that this network basically made up of thousand of node that are arbitrarily Scatter in a broad area, because of this reason after they are deployed. it is very difficult to exchange or recharge their power supplies. Since consumption of energy in a sensor network is more during the time of routing. So it becomes very necessary to make an efficient energy protocol.

2. LEACH PROTOCOL

Leach is one of the clustering protocols and in compare with non-clustering protocol it rescues a huge amount of energy. This protocol comes under hierarchal network and uses hierarchal topology by which data is combined and send to BS. It is a self-organizing network and is consider as a protocol which use random distribute energy between nodes. Dense network of nodes are split into cluster with Same size and a CH are selected for every cluster. The nodes of the cluster head can be categorized as coordinate nodes, cluster member, normal nodes. The related data is collected by the sensor node by using TDMA schedule. The energy of the CH start exhausted if any of the node continuous to remain as cluster head. There is also some possibility of node die. To avoid such possibility, the header ship of the cluster is passed to other nodes of the cluster after each particular operation or after some specific time. All the node in a cluster pass their data to the cluster head and the CH collect the data from all of its member and the CH combine the data and forward this data to the base station.
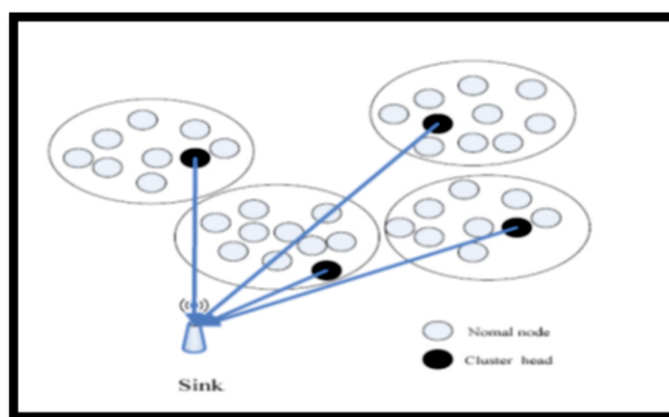

Fig 2.1 Architecture of leach

Cluster head is responsible for creating and manipulating a Time division multiple access (TDMA) schedule and it send combined data from member nodes to Base Station where these data is required using Code division multiple access(CDMA)

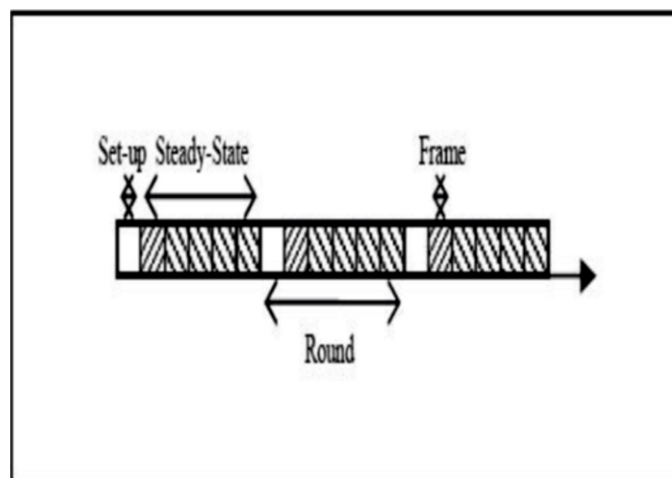The operation of Leach is split into two phase[5]:
1. Setup

2. Steady state

Fig 2.2 Leach Protocol Phase

1. Set-Up Phase

In setup phase all the node are dynamically divide into different cluster and the head of each cluster is choose randomly. While the establishment of each cluster a range is set from 0 to 1 which is then compared with threshold, t(s) value. If the

choose value is less than the threshold (choose value <t(s)) value then that node is set as a cluster head otherwise that node remains as it is that is cluster member. An advertisement message has been advertise by the cluster head once they are selected and these advertise message is perceived by all the member of clusters. To notify them about CHs and based on their received signal strength indication (RSSI) each member of cluster head transmit a joint request message associated with ID to its selected CH with the help of Carrier Sense Multiple Access(CSMA). After end of the setup phase all the node knows about their CH and the IDs of the nearby nodes. The threshold T(n) is calculated as

$$T(n) = \begin{cases} \dfrac{p}{1-p\ (r*\mathrm{mod}(1/p))}, & \text{if } n \in G; \\ 0, & \text{else} \end{cases}$$

P = required nodes percentage which are head of cluster

r = it is denoted as present round.

G = it is denoted as the set of nodes that has not been elected as heads of cluster in the past 1/P rounds.

To avoid interference of signal close to the cluster, head of the cluster determine the Code Division Multiple Access (CDMA) codes that are used by all the nodes. The TDMA timing information and CDMA codes which are used in the current phase will be transmit together. When nodes of cluster get the message, they will transmit data to the cluster head in their own time slot. Algorithm will enter a stable phase.
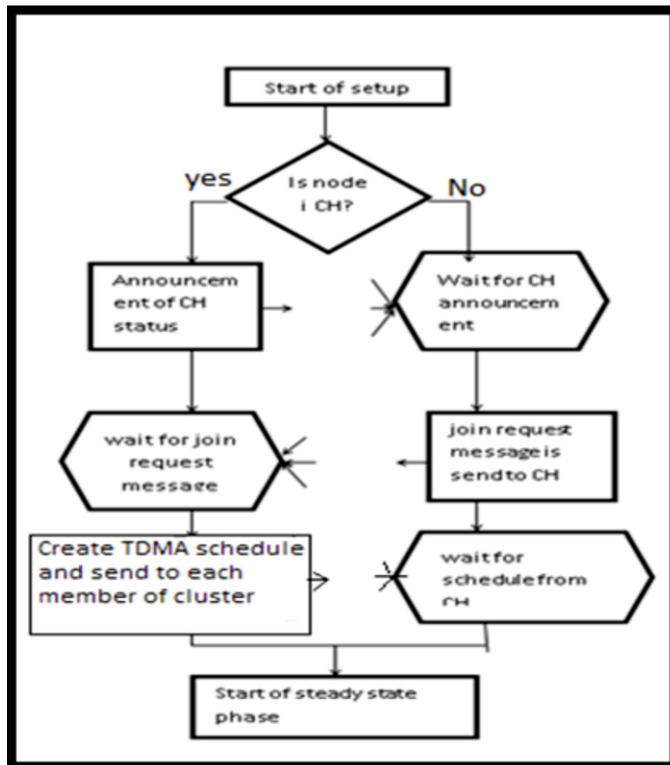

Fig2.3. set up phase in LEACH [6]

2. Steady Phase
In this phase [10] a Time Division Multiple Access schedule of Cluster head is allocated to all the member nodes of the cluster after the formation of cluster. On the basis of this schedule the nodes send their stored data to their respective CH. When a head received all the data from all its members then it calculate the sum of data of its own data and data comes from other nodes and then it transmit this aggregated value to the base station and the duration of steady state phase is higher than setup phase. After every round the new CHs selected the timeline operation composed of steady state phase & setup phase

3. Heterogeneous Based energy efficient routing protocol for WSN: The proposed model
Smart re-clustered reliable energy efficient routing protocol HEER is deployed upon reliable aggregation Of data and energy efficient technique which overcomes the drawbacks of LEACH on the following facts:

1. There is requirement for operating energy resources for a long period of time. HEER provides this feature. For scheduling of proper transmission of sensor nodes need of efficient energy is required. Improper transmission may cause to overhearing and idle listening causing energy loss. HEER provides reliable transmission.

2. Reliable data transport is required for event detection in terms of when the transmission of Packet from the sensor nodes to sink and then to all its nearby nodes (neighbor nodes). HEER provides this facility over LEACH.

3. By aggregating the data there is better quantity of data composed in a one message which required the change in consistency. HEER provides this feature. All the features discussed above overpower HEER over the basic LEACH protocol. Data of each cluster is send to its own cluster head and then to base stations directly how far the base station is situated. And the problem arises due to this far location of base station because packets may be lost in between the path. And moreover measure defeat ratio at the BS or sink will cause high amount of delay.

3.1 Purposed Algorithm Detail
In this paper, we proposed a novel scheme that is optimal aggregation of data. That is bases of new Invented model named as HEER which is smart re-clustered reliable energy efficient. Initially we create a cluster and choose a cluster head that is depends upon the value of cost. Which will be further described. Every node has to maintain ANIT (adjoining node info table). Every cluster has to select supervisor node in a network. These nodes that are supervisor have to close by the cluster and its working is to invigilate working of nodes and direct them for some particular operations. Every cluster head collect the data from all nodes and send it to supervisor node.

- For m 1 to P
- Calculate mean position of node-distribution
- For n 1 to s_m /* s_m=Number. of nodes in cluster m */compute distance of node$j$
- End for loop
- Select TCH_m (Temporary Cluster Head) arbitrarily for cluster$_m$
- Create Time Division Multiple Access schedule for the all nodes of cluster$_m$
- For n 1 to s_m
- Send (TCH_m, $TDMA_m$, $dmean^n_m$) data to node$_n$
- /*control information to every node in every*/ cluster.
- End For loop
- End For loop
- /* End of Setup Phase */
- for w 1 to round
- /* round Total number of rounds */
- /* Selection of Responsible Node Phase */
- For m 1 to p
- or Alive_node 1 to s_m
- End For
- Responsible_Node_Selection ( )
- BEGIN
- for m 1 to P Weight= [ ]
- for n 1 to s_m
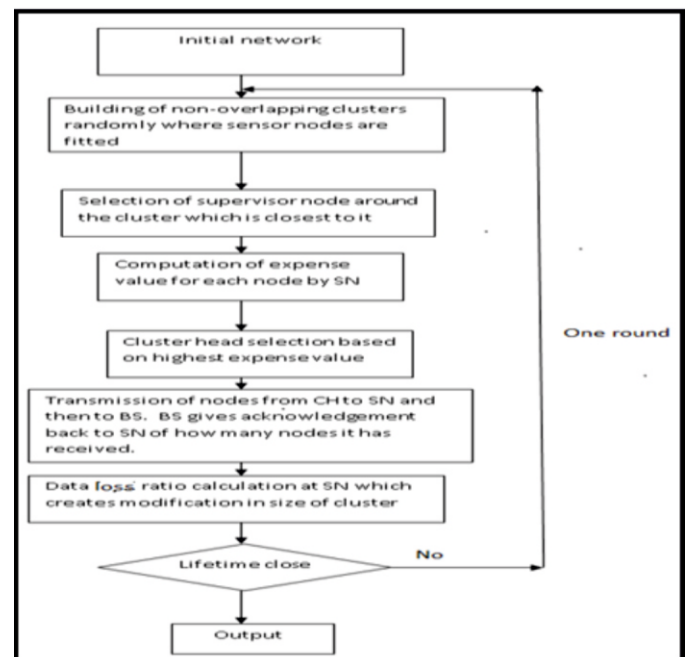- Weight = [weight, Eresidualnm /dmeannm]
- End for loop

Fig 3.1 Flowchart of HEER

4. SIMULATION RESULT

The performance analysis of HEER is done by using MATLAB. Evaluation of HEER is done by analyzing the packet delivery ratio in terms of rate. Rate vs energy and rate vs delay. Packet delivery ratio in terms of rate defines ratio of amount of packets send and received effectively at the base station with no defeat.

Table 1: Parameters used in Simulations

Parameter	Value
Size of Network	100m x 100m
Node Initial energy of node	0.5J
Eelec	50*0.000000001
Emp	0.0013*0.000000000001
EDA	5*0.000000001
Rounds	600
Packet size	4000 bits

4.1 Rate vs delay graph for proposed protocol

In the figure 4.1 average end-to-end delay of our novel invented protocol is shown which is proven smaller than existing LEACH protocol. We are comparing rate and delay ratio in terms of packet delivery. Congestion occurs due to the reason that the sending rate will be greater than from 100 to 250kb it result increased in traffic. Due to congestion there will be an increased amount of packet drops which will lead to increase in delay. But our proposed protocol delay is comparatively less because we are using cluster based approach having a supervisor node around the cluster which will lesser the delay of data transmission from sensor nodes to BS or sink. The end-to-end-delay of network is averaged over total number of surviving data packets from the sources to the destinations. Surviving data packets are those data packets which are received by sink with no failure. Graph for average end to end delay is shown in figure 4.1
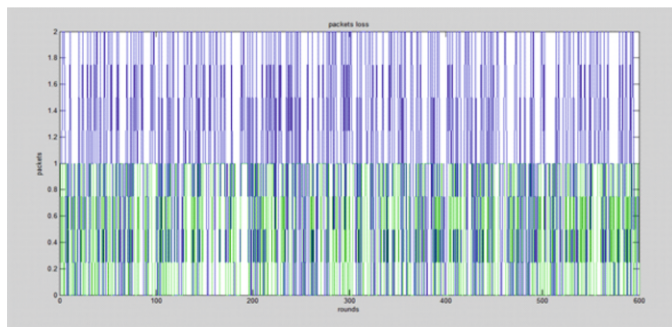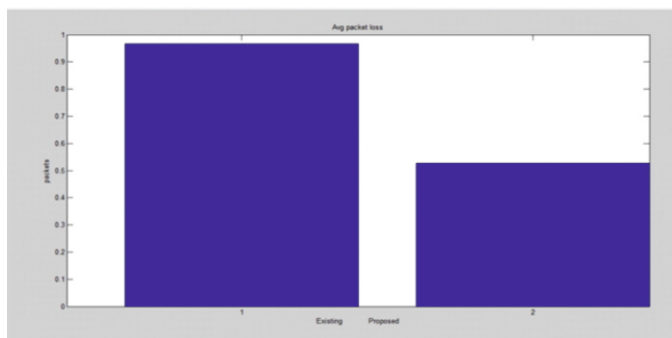

Fig 4.1 Delay according to rate

Fig 4.2 Avg Packet Loss

4.2 Performance evaluation in terms of energy consumption

In the figure 4.3 we can see that with the increased rate in node, it consumes more amount of energy which increasing the network congestion and also increase in traffic which causing packet drop and resending of the packet which is causing wastage of energy. Proposed protocol is more efficient in terms of energy consumption because in this protocol we are selecting CHs based upon levels of energy where LEACH take higher amount of energy compared to invented protocol.
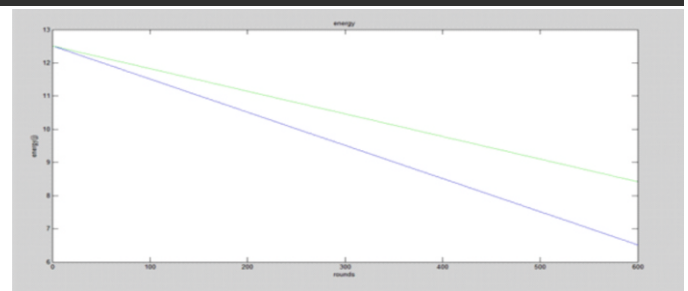

Fig 4.3 Energy

5. CONCLUSION AND FUTURE WORK

LEACH algorithm can be compare with mainly three aspects of LEACH algorithm that is shape of cluster, cluster head choice and clustered approach. In this algorithm, during the establishment of clusters it will generate the cost. If we decrease the cost, then during data transmission it can take additional energy. The proposed algorithm use a fixed sub-cluster approach, in initial stage, after division of cluster, node within t cluster will no longer be altered. In order to build consumption of energy consistently spread across all nodes, it is require to change or rotate cluster head with in every cluster .Invented protocol present the improved performance in terms of consumption of energy, average delivery ratio of packets ,average end to end delay of packets.

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