

PERFORMANCE ENHANCEMENT OF LEACH PROTOCOL FOR WIRELESS SENSOR NETWORK

Pradyumansinhji C. Thakur
Department of Elec. & Comm Engg.
V.V.P. Engineering College
Rajkot, India
pradyuman.thakur5@gmail.com

Jignesh H. Joshi
Department of Elec. & Comm Engg.
V.V.P. Engineering College
Rajkot, India
jhjoshi@gmail.com

Abstract- Wireless sensor network is so many application like military and civil .Wireless sensor network is made by thousand of tiny and low cost sensor node. Sensor node work on the battery power and battery power is limited that why our main aim is the reduce battery power. Leach is the one of the hierarchy routing protocol for the energy saving for wireless sensor network. In this paper proposed work new approach. This approach save the energy of the network and reduce the consumed energy of the node. Using this three parameter: energy parameter, vicinity and adding a vice-cluster head to each and cluster for the back-up mode condition.

Keywords- WSN, LEACH protocol, vicinity, vice cluster head, Network life time.

I. INTRODUCTION

Wireless sensor network made by the tiny and low cost sensor node. So many facility are available in sensor node like a sensing, calculation and transmitting and receiving data. Sensor have main three subsystem: Sensing subsystem with wireless sensors, processing subsystem with microcontroller, memory unit and communication subsystem form transmitting the data and receiving data between other sensor node. WSN of distribute in the separately sensor for the individual task like monitor physical or environmental condition. And sensor node are sensing capability to sense temperature, sound, pressure etc. and helpfully pass data through the network to main location [4]` In this time network are very intelligent or modern that are bi-directional and also enabling control of sensor activity. WSN development by the military application like a battle field surveillance but in those day WSN is use in the industrial and machine health monitoring and so many area. The WSN made by tiny and low cost sensor node, where each node is connected to one or sometimes a number of sensors .Each such sensor network node work on the battery power, sensor node has own antenna , its capable to send and receiving data.

The applications of WSNs are so many in toward day. For example, WSNs developed by military application. In military and civil application WSN are use for the target field imaging, interruption detection, observation to atmosphere condition.

Routing in WSN's is so difficult task that differentiated these to other network like mobile ad-hoc network, cellular network. Routing in wireless sensor network is so complicated that why so many challenges occur in routing. Dynamic nature of WSN, battery power is limited, addressing scheme is not conventional, self-organization and less transmission range of sensor node [6]. Basically routing is divided on three type: flat routing, hierarchical routing and location base routing.

In flat routing, route from source to destination only determine the hop count and remaining energy of the near by node. In the location base routing, the all space is divided in the quadrants. Each node knows it's position in space (like GPS) in the location base routing mainly focus on the physical coordinate for the transmitting and receiving data of sensor node in a WSN. In the hierarchical routing, creating a group of cluster in the one cluster, one node become the cluster head and other node is the intermediated node. Node are sense the data and send to the cluster head than cluster head aggregated all data in base on TDMA schedule than data send to the base station. Advantages of the hierarchical routing is the, such as more scalability, data aggregation/fusion, less load, less energy consumption, more robustness.

II. LEACH

Low Energy Adaptive Clustering Hierarchy (LEACH) [7]. is the first hierarchical routing protocol it's a cluster based routing protocol for wireless sensor network. LEACH operation work in the round form. In the LEACH protocol operation divided in to two phase: set up phase and steady stage phase. In the set up phase cluster organized and cluster head selection. And in the steady stage phase data transfer node to cluster head and cluster head to base station (B.S) or vice versa. Data transmission base on the TDMA schedule.

In wireless sensor networks Low-Energy Adaptive Clustering Hierarchy (LEACH) is one of the most effective cluster-based routing protocols.

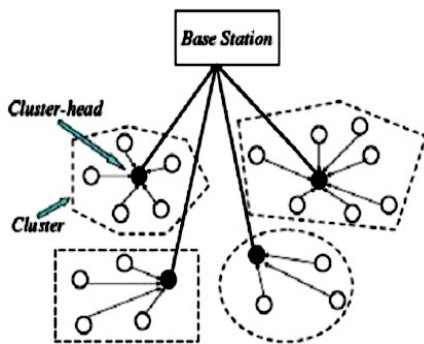


Fig1: LEACH protocol

SET UP PHASE:

In this phase, all nodes are equally probable to develop a cluster head. Initially, nodes become cluster heads and broadcast their decision packets. In the set-up phase, cluster head selection priority depends on each node's energy. Nodes generate a random number between 0 and 1. This random number is compared with a threshold. If the random number is less than the threshold, that node becomes a cluster head.

$$T(n) = \begin{cases} \frac{P}{1 - P * (r \bmod \frac{1}{P})} & \text{if } n \in G \\ 0 & \text{if } n \notin G \end{cases}$$

Where P = equals probability of the node in the Percentage form (0.05)

R = current round

G = set of nodes that have not become a cluster head in the last $1/P$ round

All nodes are once again eligible to become cluster-heads.

Once the cluster head has been selected, the cluster head broadcasts advertisement messages to the rest (intermediated) of the nodes using CSMA MAC protocol. All rest (intermediated) nodes receive their advertisement message from all cluster heads. After this phase, each node decides which cluster to join based on signal strength. If a node receives two different advertisement messages from cluster heads, cluster head selection is based on high signal strength. If willing to become a member of the cluster, the cluster head receives and transmits information by each regular node using a CSMA MAC protocol. In the last, the cluster head receives all the messages from nodes that would

like to join the cluster. The cluster head broadcasts the TDMA schedule in all directions.

STEADY STATE:

After the clusters are created and based on a fixed TDMA schedule, data transmission starts. According to the allocated transmission time to each regular node, it will send data based on the TDMA schedule. The intermediate node senses the data and sends it to the cluster head, which then sends all data

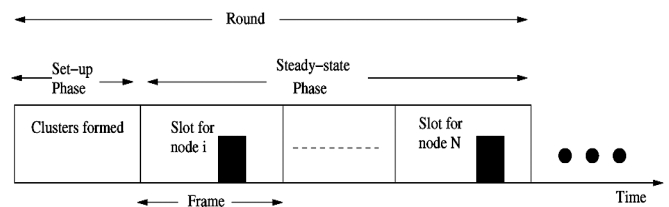


Fig 2: steady state

Cluster heads receive all the data received from all intermediate nodes. All data has been received by the cluster head, and the cluster head compresses all the data into a single signal. For this purpose, it performs data fusion functions. Then the composite signal is sent to the BS by the cluster head. This is a high energy transmission because the base station is far away.

This is the steady state operation of the LEACH network. At the end of the steady state operation, one round is complete.

Some drawbacks of the LEACH protocol:

- CH selection is random, that does not take into account energy consumption. Large area coverage isn't possible here.
- CHs are randomly distributed; where CHs can also be located at the edges of the cluster.
- The selection of the cluster-head is based on a probability model, so consideration of node energy is null.
- The lifetime span of the network is not as extended as the randomly chosen cluster heads.
- Ultimate location distribution of cluster heads has no certainty; hence, there is a possibility that nodes can't cover some parts of the network.
- Also, one-time data not sent to a given TDMA schedule; that time data is discarded, no backup plan.

III. Proposed algorithm

Instead of random cluster head selection, the node which has more than 50% residual energy is eligible for the cluster head selection process. Then find the vicinity to every node (how many nodes are peripheral to each and every node). All nodes will be in the range of the 447.2 radius, and it will find or count the peripheral nodes under it. After that, arrange in descending order. The top five highest vicinity nodes are selected as cluster heads, and for the back-up, the vice-cluster head is available to each and every cluster.

Step 1:

- At the very first step check every nodes energy if it is more than 50% then it will be eligible for C.H.

Step 2:

- Each node find participate node base on its radius.
- More participate node become the cluster head for particular round.
- First five participate node become the cluster head.

Step 3:

- Add the vice-cluster head to each and every cluster
- When main cluster head is die that time vice cluster become a cluster head
- So, using this PROPOSED algorithm I can enhance lifetime of network and residual energy of each node, and also I can design cluster based on VICINITY.

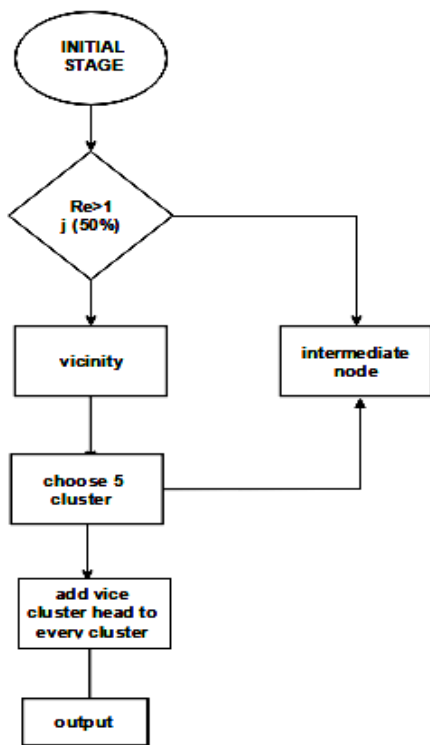


Fig.3 propose algorithm

IV.RESULT

In this paper , change in traditional method of cluster head selection. In this, proposed work is to apply new approach for culster head selection, Considering three parametere: check energy parameter, vicinity and add to vice-clustre head to each and every clustre for back up plan. Than

result is compare with the LEACH protocol. From the comparison we can say that increase network life time, reduce the consume enrgy and send the mode no of data packet.

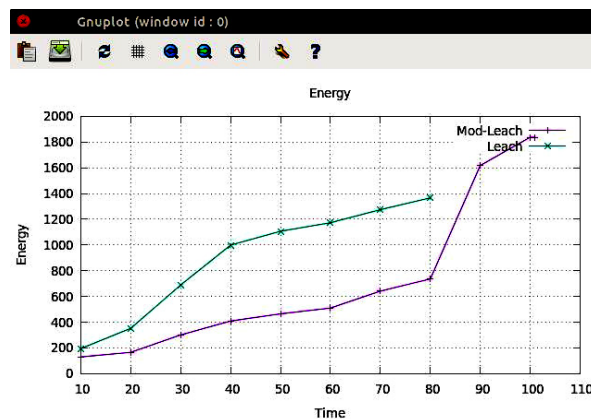


Fig4: enrgy vs time (LEACH vs mod-LEACH)

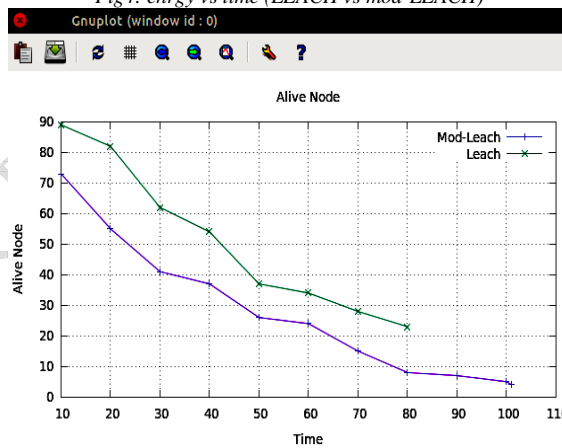


Fig5: alive node vs time (LEACH vs mod-LEACH)

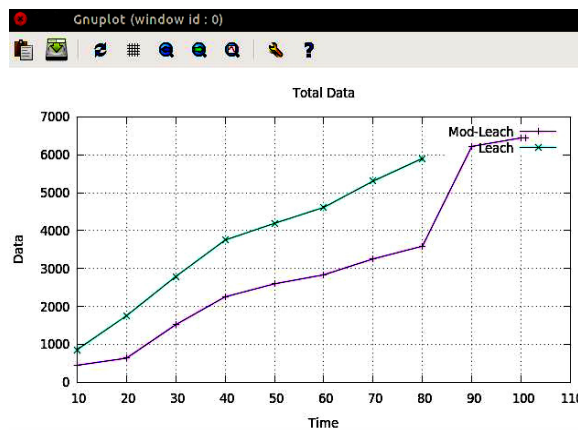


Fig6: data vs time (LEACH vs mod-LEACH)

Show the above graph between LEACH and propose LEACH protocol, network life time is increase with the help of proposed algorithm.

V. SIMULATON SCENARIO

| Parameter | Value |
|---------------------------|-----------------|
| Ns version | 2.27 |
| Channel type | Wireless |
| Routing protocol | LEACH |
| Total number of nodes | 100 |
| Area | 1000*1000 |
| Initial energy | 2 J |
| Base station | Infinite energy |
| Desired number of cluster | 5 |

VI. CONCLUSION

Study and simulate Cluster based Routing algorithm i.e.-LOW ENERGY ADAPTIVE CLUSTERING HEIRARCHY in Network simulator. As per my proposed algorithm, Instead of random CH selection process as in LEACH, here by considering the residual energy parameter and vicinity parameter with add vice-cluster head to select the CH in mod-LEACH, the Network lifetime is expanded, Network send more no of data packets and the No of alive nodes are higher in proposed work.

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