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Meliorated Outcomeinwsn Using Better CH Selection by Weighted Parameters

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Abstract
In recent era, the research for improving the performance of the WSN is done in the 'speed of light'. LEACH is the protocol which has changed the scenario of using WSN for any application like monitoring physical parameters, measuring parameters surveillance etc. Also LEACH-C can be used for the same with some modifications in LEACH like deciding CH centrally in fixed amount. But there is a con of LEACH; it decides the CH based on random generation value. Therefore, in proposed scheme, threshold is calculated using weighted parameter of residual energy and distance from the base station.
Keywords: WSN-Wireless sensor network, LEACH, NS2, residual energy

I. Introduction

For the applications like measuring and monitoring the physical parameters and surveillance, WSN is used. The research in this area is growing day by day. LEACH, very well known for WSN, uses clustering method for WSN. By clustering, the lifetime of energy can be increased compare to MTE [1]. LEACH-C is the expansion of LEACH which uses clustering done by BS centrally. But in both protocols we find cons like LEACH decides CH based on threshold value which has one value randomly generated. While LEACH-C has advantage over LEACH that it uses fixed amount of CH. But LEACH-C has same disadvantage like it uses central information after each round and it has same threshold value equation. So we proposed new scheme in which the no. of CH remains constant and it finds better CH using weighted threshold value calculated by residual energy and distance from the base station. Hence, CH is far more comparable with previous two protocols i.e. LEACH and LEACH-C.

In proposed scheme, the CH is decided by residual energy consideration so as to make this decision better. Residual energy is the energy which can be defined as the ratio of current energy to the initial energy. Also CH is having important weight of distance of node to distance from the base station.

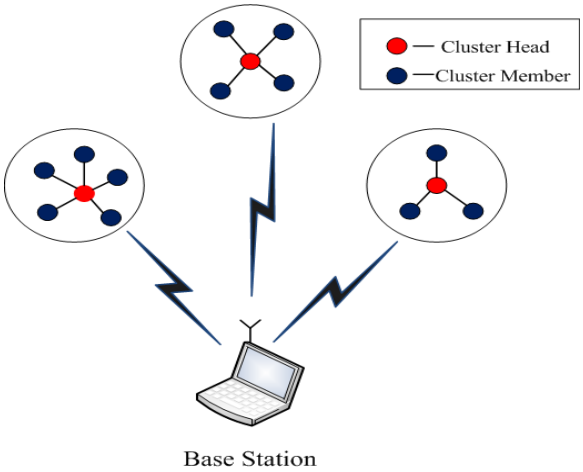

Fig. 1 Clustered architecture of WSN

The paper includes in following section related work on LEACH and LEACH-C. Section 3 has brief description about proposed scheme and section 4 and 5 includes Simulation results and result analysis.

II. Related Work

A. LEACH

LEACH is protocol in which the clustering is done among all the sensor nodes as shown in figure 1. LEACH protocol works in two phases 1. Set up phase and 2. Steady state phase.

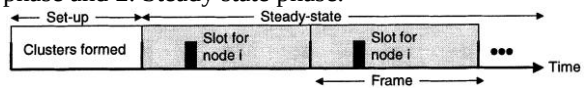

Fig. 2: working of LEACH in two phases

1. Set up phase:

In set up phase, the clustering process among all the nodes is being done. The sensor nodes first calculate the threshold value and depending on this threshold value it advertises its CH status. The

threshold value can be calculated by following equation

$$T(n) = \begin{cases} \dfrac{p}{1 - r \bmod \frac{1}{p}} & p \in G \\ 0 & else \end{cases}$$

Where T(n) is threshold value for n^{th} node for particular round. P is probability of node to be CH and r is random no. generated by the node. G is se tof possible CH which were not CH in previous round.

The nodes with highest threshold value will advertise their CH status. Remaining node will receive this status and it will respond the tentative CH taking into consideration the distance of that node from own. In response to this CH advertisement it will send Join request to corresponding CH node. Hence the cluster will be formed. Now, duty of CH is to create TDMA schedule for all the cluster members and give them a particular time slot.

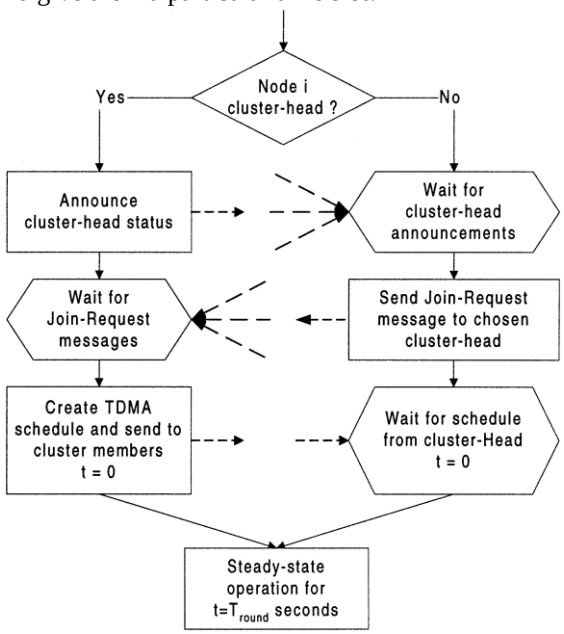

Fig 3: Flow chart of Set up phase in LEACH

2. Steady State Phase:

In steady state phase all the cluster members will send their data to their CHs. CHs will receive the data and aggregate this data. After aggregation it will send these data bytes to BS.

B. LEACH-C

LEACH-C has same working like LEACH. In LEACH-C the clustering is done centrally. CHs are decided by BS based on the distance of the node from BS. BS can decide the distance of the node by GPS receiver. So here set up phase of LEACH-C will change remaining procedure is same as LEACH.

III. Proposed Scheme

The proposed scheme work in two phases set up phase and steady state phase. The steady state phase of the proposed is same as LEACH and LEACH-C.

There is some variation in set up phase for selection procedure of CH for each round. Before, network initialization it is assumed that each node knows its distance from the BS. For this either BS can broadcast one packet having vectors of distance from the BS from all nodes or each node may have GPS system built in.

In proposed scheme, the CH is decided on the bases of threshold value which will be calculated on the weighted value of residual energy and distance of the node from the BS.

So the equation becomes

$$T(n) = \begin{cases} \dfrac{p}{1 - r' \bmod \frac{1}{p}} & p \in G \\ 0 & else \end{cases}$$

Where r' will be calculated as below

$$r' = w_1 * E_{ressidual} + w_2 * Distance\_From\_BS$$

Here w_1 and $w_2$are the weight factors. For the proposed scheme, we have taken the values of w_1 and w_2 equal and half i.e. 0.5

$E_{ressidual}$ can be calculated by taking the ratio of current energy of the node to the initial energy of that node.

So the calculated value of threshold will be improved value.

Threshold value includes the probability of node to be cluster head for n^{th} round and if it belongs to set G which denotes the set of nodes which were not CHs in last node.

IV. Simulation Results

Fig. 4 shows the graph for Time V/s No. of nodes alive for particular simulation time. It helps to decide lifetime of the network. From this, we can observe that, life time of network is higher for LEACH compare to LEACH-C. Here, proposed scheme gives improved lifetime of 15-20%compare to LEACH. So the network can work for more time.

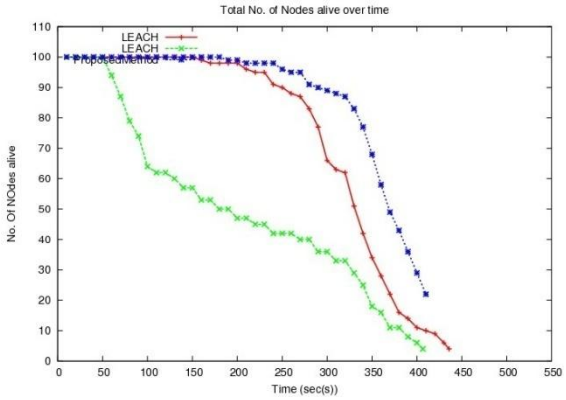

Figure 4 Plot for Time V/s No. of nodes alive

Fig. 5 shows the graph of Time V/s Data Bytes received at BS. LEACH-C has advantage over LEACH that amount of data transferred will be high in case of LEACH-C. As we can see the proposed scheme, it has almost same or more than LEACH-C amount of data bytes transferred to the BS.

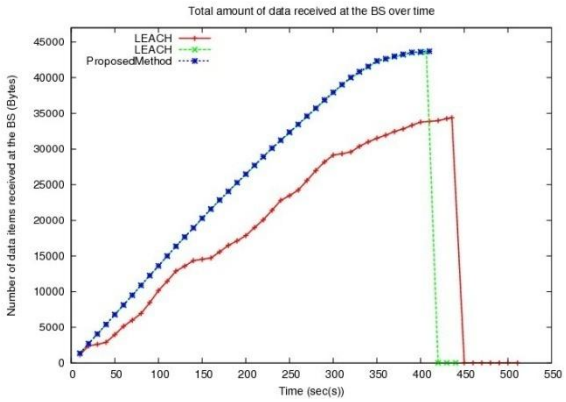

Figure 5 Plot of Time V/s Data Bytes received at BS

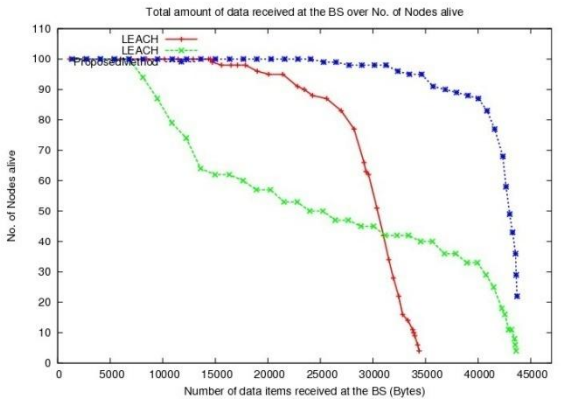

Figure 6 Plot of amount of data transfer v/s No. of nodes alive

Fig. 6 shows the amount of data transferred to BS V/s No. of nodes alive. As we can see from the graph the proposed scheme has more average no. of data bytes received per node.

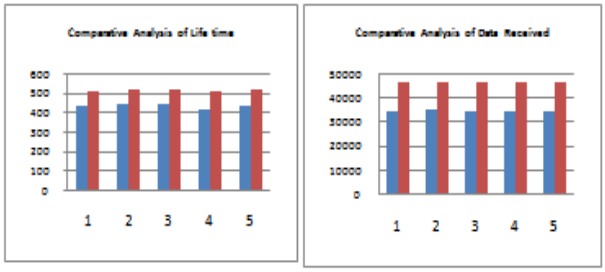

Figure 7 Comparative Analysis of LEACH and Proposed Method

Fig. 7 shows the comparative analysis of LEACH, LEACH-C and proposed scheme. The results have been generated for 5 different times simulation runs. In each simulation we can see the amount of data received and lifetime of the network is increased for proposed scheme. And we are gaining the advantage of the LEACH-C in energy dissipation. The energy dissipation in proposed scheme is less than LEACH and LEACH-C.

V. Conclusion

Because of better selection of CH, the lifetime of the network is increased, number of nodes alive over time is increased and energy consumption is reduced. From simulation, it can be observed that lifetime of the network is increased by 20-25 percentage. Also with use of better CH selection, we can receive more number of data bytes at BS. The data received at BS for proposed is increased by 10 percent as compared to traditional protocol. Also, as time increased, the no. of data received at BS will more compare to LEACH and LEACH-C.

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