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CLUSTER HEAD ELECTION USING WIRELESS SENSOR NETWORK

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Abstract: **Wireless sensor networks are equipped to handle more complex functions. In a network processing may require these battery powered sensor to judiciously use their constrained energy to prolong the effective network life time especially in a heterogeneous settings. Nodes are organized into clusters and in each cluster all non-cluster nodes transmit their data only to the cluster-head. Because of energy limitation in sensor nodes are energy reduction in each data transmission; appropriate cluster-head election can significantly reduce energy consumption and enhance the life of the network. Clustered techniques have since been employed to optimize energy consumption in this energy constrained wireless sensor networks. In this paper, we consider LEACH protocol in which most nodes transmit to cluster heads and explore how to elect the cluster heads with mobility as its parameter. Efficient distributed algorithms for cluster-head election in terms of energy are provided. Mobility based communication can prolong the life time of WSNs and increases the connectivity of cluster head. The experiment results show that our cluster-head election algorithms used in LEACH with the help of other two parameters (Euclidean distance and Mobility) can make the node live longer.**

Keywords: **Wireless sensor networks, Cluster head, LEACH Protocol, Cluster Head Probability, Mobility.**

I. INTRODUCTION

In this paper we have are using own set of different which increases the efficiency of node. Low-Energy Adaptive Clustering Hierarchy (LEACH) is a classical clustering routing in wireless sensor networks [1]. However the cluster-head selection in LEACH protocol is lack of balancing the whole network energy consumption, with the result that low energy nodes run out of energy prematurely and decline the network life. All clusters are self-organized, each cluster contains a cluster head-head and several nodes, cluster head nodes consume more energy than non cluster-head nodes. With the purpose of balancing network energy consumption and prolonging the network life cycle, it selects cluster head randomly and each node has an equal chance to be cluster-head [2]. The objective of cluster maintenance is to preserve as much as of the existing clustering structure as possible. The nodes movement in network results in frequent link failure or link establishment between the nodes.

In this paper the main analyses is to elect final cluster head which adapt low energy and increases node stability which maintains stable clusters. Weighted Clustering Algorithm lacks in knowing weights of all the nodes before starting the clustering process to solve this we use mobility as parameter which maximize network lifetime.

II. LEACH (Low Energy Adaptive Clustering Hierarchy)

The current interest in wireless sensor network has led to emergence of many application oriented protocols of which LEACH is most aspiring and widely used protocol [3]. LEACH can be described as a cluster-based routing protocol for WSNs. The term cluster-based can be explained by the fact that sensors using the LEACH protocol functions are based on cluster heads and cluster members. Multi-hop routing is used for inter-cluster communication with cluster heads and base stations. Simulation results shown in [4] that multi-hop routing consumes less energy when compared to direct transmission.

We have stated that wireless sensor sense data, aggregate them and then send data to the base station Data which is collected by the sensor is sent to the base station. LEACH is well suited to reduce the data aggregation an issue using a

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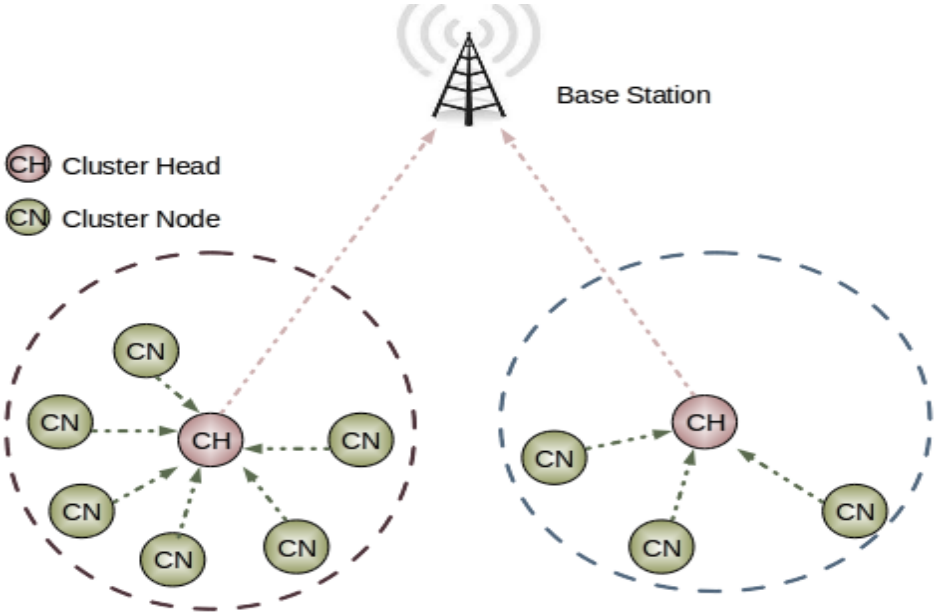
local data fusion which performs a compression of the amount of data is collected by the cluster head before it sends it to the base stations. All sensors form a self-organized network by sharing the role of a cluster head at least once. Cluster head is majorly responsible for sending the data that is collected by the sensors. It tries to balance the energy dissipation within the network and enhances the network's life time by improving the life time of the sensors [5].



Operation of LEACH

The operation of LEACH is divided into two phases , the set-up phase and the steady-state phase.

Setup Phase where cluster-heads are chosen in WCA the goal is to minimize the value of the sum of all cluster-heads weighted cost. Here a node is selected as cluster head when it minimize a function of four criteria such as degree(number of direct link to its neighbours), sum of distance between cluster head and other nodes, mobility of nodes and battery power of the nodes. When a new node arrives WCA calls the clustering algorithm to determine the weight of the new node for the possibility of being a cluster head. This maximizes overhead in WCA, weight of the node should be known prior to the clustering setup. To achieve this node's weight is calculated using the parameters independent of the clustering setup.this ensures that there are no collisions among data messages and also allows the components of each non cluster-head node to be turned off during transmit time, thus minimizing the energy dissipated by the individual[6].

Algorithm for Setup Phase

1. Let x be the random no. between 0 and 1, n is the given node, P is the cluster-head probability, r is the current round, G is the set of nodes that were not cluster-heads the previous rounds.
2. If x as: $T(n) = \begin{cases} \frac{P}{1-P*(rm\,0d\frac{1}{P})} & if\ n \in G \\ 0 \end{cases}$
3. Nodes that are cluster-heads in round 0 can't be again next 1/P rounds; after 1/P-1, the threshold value will be T(n)=1
4. In 1/P rounds, all nodes are eligible again to become cluster-heads.
5. After the election of cluster head, each nodes will broadcast and advertisement message to the rest of the nodes.

The algorithm is designed so that each node becomes a cluster-head at least once.

Steady-state Phase (The cluster-head is maintained when data is transmitted between nodes)

This phase allows transmission of data sensed by the nodes to the CHs or to the base station whichever is near. The information is transmitted, received and aggregated. The energy of nodes is dissipated in this phase only. The duration of the steady phase is longer than that of the setup phase to minimize overhead. Base station is assumed to have infinitesimal energy and hence, no energy is dissipated when BS receives data from the wireless nodes.

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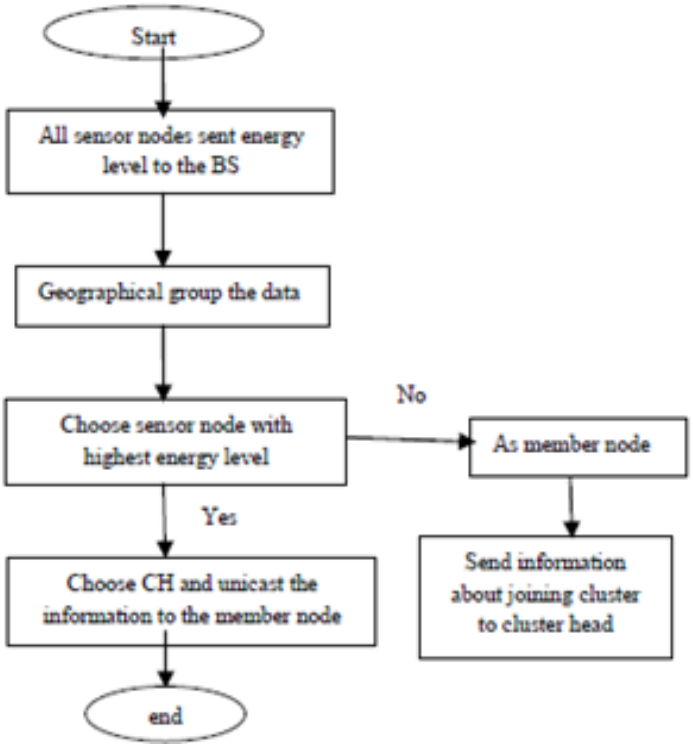
Algorithm for steady phase

1. Begin sensing and transmitting data to the cluster-heads.
2. Then, the cluster-head node, receive all the data, aggregates it before sending it to the base station.
3. After a certain time, which is determined a priori, the network goes back into the setup phase.

Flowchart for cluster head election process



III. MOBILITY

Mobility is an important factor in deciding the cluster heads . In order to avoid frequent cluster head changes, it is desirable to elect a cluster head that does not move very quickly. When the cluster head moves fast, the nodes may be detached from the cluster head and as a result, a reaffiliation occurs. Re affiliation takes place when one of the ordinary nodes moves out of a cluster and joins another existing cluster. in this case , the amount of information exchange between the node and the corresponding cluster head is local and relatively small . the information update in the event of a change in the dominant set is much more than a reaffiliation. A Cluster head is able to communicate better with its neighbours having closer distances from it within the transmission range. As the nodes move away from the cluster head , the communication may become difficult due mainly to signal attenuation with increasing distance. Most of the protocols proposed so far only consider residual energy for cluster-head selection but there are other metrics like distance to aggregation point, node reliability , mobility etc that are crucial in order to maximize network lifetime. In this paper nodes have typically low mobility and are limited in capabilities, energy and bandwidth. The sensor network should perform for as long as possible. In this way aggregation and fusion of sensor node at the cluster heads cause a significant reduction in the amount of data sent to the base station.

IV. Cluster-Head Probability

Cluster-head probability of a node determines the probability of a node for being a cluster-head. If a newly arrived node has higher probability than the existing cluster head of a cluster to which it wishes to join, then the newly arrived node becomes the cluster-head for that cluster without disrupting the entire topology which increases the stability of the network. If the newly arrived node has lower probability than the existing cluster-head of the cluster to which it wishes to join then it becomes the member of that cluster-head.

It is calculated as:

CHprob = Cprob*(Eresidual/Emax)+Tr(2)

1. Eresidual = the estimated current residual energy in the node.
2. Emax is a reference maximum energy (corresponding to a fully charged battery), which is typically identical for all nodes.
3. Tr = Transmission range.

IV. CONCLUSION

The energy is the most important factor in designing the protocol for WSN. LEACH is one of the most famous clustering mechanisms; it elects a cluster head based on probability model. In this paper Cluster Head can be enhanced by taking into consideration metrics related to QoS (Quality of service) and time constraints. The different parameters used in this paper considered the type of a request to give the suitable co-ordinator selection. For a request that needs almost all of the nodes that are alive the mobility factor is the good choice. The co-ordination selection is based on a node having energy information through which we can elect final cluster head which adapt low energy that makes the nodes live longer thus the complexity of the network and its energy consumption is much reduced. In this paper we have taken our own set of parameters to reduce the number of clusters and finally elect the cluster head. In future , we will try to select cluster heads on the basis of density of nodes in the region nearby to the cluster using other parameters so that we will be able to reduce a larger deviation, for more reliable communication quality.

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