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A SURVEY FOR LIFETIME ENHANCEMENT IN ENERGY EFFICIENT CLUSTER HEAD SELECTION METHOD USING GEOGRAPHIC ROUTING IN DUTY-CYCLED WIRELESS SENSOR NETWORKS

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ABSTRACT

Network lifetime is crucial in Wireless Sensor Network systems since recharging or exchanging the sensors is difficult and expensive. To maximizing the network lifetime, selection of paths for data transfer in such a way that the total energy consumed along the path is minimized. The objective of this paper is to present a state of the art survey on energy efficient cluster head selection algorithms using geographic routing in duty-cycling WSN. To support scalability, nodes are often grouped into disjoint clusters. Each cluster would have a leader, often referred as cluster head (CH). A CH is responsible for not only the general request but also assisting the general nodes to route the sensed data to the target nodes. Lifetime of a network can be maximized through clustering algorithms, where cluster is responsible for sending the data to the base station and not all the nodes are involved in data transmission .various clustering algorithms are deployed in past few years.

Key Words*: *Wireless Sensor Network, Clustering, Geographic routing, Duty-cycle

1. INTRODUCTION

Wireless Sensor Network is a network of independent sensors to guide Physical or environmental conditions like pressure, temperature and sound to send the data to the destination. Wireless sensor network is made up of many nodes with sensors and each sensor node has many parts like: - A radio transceiver, a micro-controller, a battery and an embedded form of power harvesting. It is small and infrastructure less basically wireless sensor network consist a number of sensor node, called tiny device and these are working together to detect a region to take data about the environment. Wireless sensor network has two types: structured and unstructured. The unstructured sensor is a collection of sensor nodes. And these deployed in ad hoc manner into a region. Once deployed, the network is absent unattended perform monitoring and reporting functions. In other structured wireless sensor network, the all sensor nodes are deployed in pre designed manner. A cluster is a group of sensor nodes where each cluster includes a leader named as cluster head and works the duty of mix and aggregation. The cluster head collects the information from most of the similar and lower nodes and deliver it to the base station. It is a two layered architecture in which the selected cluster heads forms the upper layer and the other sensor nodes forms the lower nodes.

The wireless sensor network is of two types:-

1. Proactive network- the nodes in this network continuously interact with the base station.
2. Reactive network- the nodes in this network communicate only when some particular event happens.

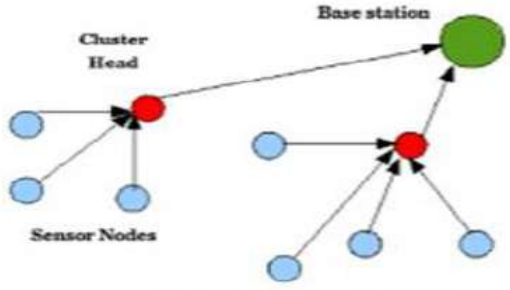

Figure 1: Basic cluster structure

2. CHALLENGES AND LIMITATION OF WIRELESS SENSOR NETWORKS

In WSN sensor nodes have limited processing power, communication bandwidth, and storage

space. This gives rise to new and unique challenges in data management and information processing. In-network data processing techniques, such as data aggregation, multicast and broadcast need to be developed. Network lifetime is the key characteristics used for evaluating the performance of any sensor network. A lifetime of the network is determined by residual energy of the system, hence main and most important challenge in WSN is the efficient use of energy resources. Literature shows the energy efficiency is introduced in WSNs using any of the following mechanisms: Energy conservation mechanism, Power conservation mechanism, Energy harvesting mechanism and Energy efficient routing.

3. CLUSTERING ALGORITHMS IN WSNS

3.1 Low-Energy Adaptive Clustering Hierarchy (LEACH)

LEACH protocol that is proposed by Hein Zelman et al is an elegant solution to solving power consumption problem, by forming enough number of clusters in a self organized manner. LEACH is suited for the applications which are involved in constant monitoring and periodic data reporting. LEACH protocol runs in many rounds. Each round contains two phases: cluster setup phase and steady phase.

In cluster setup phase, it performs organization of cluster and selection of cluster head. Selected cluster heads broadcast a message to all the other sensors in the network informing that they are the new cluster heads. All non cluster head nodes transmit their data to the cluster head, while the cluster head transmit the data to the remote station that is the base station (BS).Cluster head node is much more energy sensitive than being a non- cluster node. Head nodes would quickly use up their limited energy.

Limitations of LEACH

1. Not efficient for large-scale networks.
2. Fixed percentage of cluster-heads for any size network (5%).
3. The protocol may lead to concentration of cluster-heads in one area of the network.
4. It assumes that all nodes can communicate over one hop (directly) with the base station.

3.2 Hybrid energy-efficient distributed clustering (HEED)

Hybrid Energy-Efficient Distributed Clustering (or HEED) is a multi-hop clustering algorithm for wireless sensor networks, with a focus on efficient clustering by proper selection of cluster heads based on the physical distance between nodes. The main characteristics of HEED algorithm are to:

a. Distribute energy consumption to prolong network lifetime;
b. Minimize energy during the cluster head selection phase;
c. Minimize the control overhead of the network.

The selection of cluster head is basically depends upon the following two parameters:

The residual energy of each node is used to probabilistically choose the initial set of cluster heads. This parameter is very commonly used in many other clustering schemes also.

Intra-Cluster Communication Cost is used by nodes to determine which cluster they are going to join.

3.3 Energy Efficient Cluster Head Selection (EECHS)

There are various network models for WSNs. For the development of our method, some reasonable assumptions about the sensor nodes are made. These assumptions are similar to those incorporated in and are as follow:

(i) The base station is a high-energy node, located far away from the sensor nodes.

(ii) All the nodes can transmit with enough power to reach to the base station if needed.

(iii) Nodes always have data to send to the end user and nodes located close to each other, have correlated data.

4. PROPOSED CHANGES

4.1 Energy Efficient Cluster Head Selection using Geographic Routing in Duty-Cycle

To reducing energy consumption and optimizing the routing path by using the protocol called EECHS (Energy Efficient Cluster Head Selection). The goal of EECHS protocol is to lower the energy consumption required to create and maintain clusters and clusters head in order to improve the life time of a wireless sensor network. The complete path from source to destination will be selected prior to sending the data packet.

Then the nodes are grouped together to form a cluster to reduce the traffic in the network. Then the next step is load estimation, for each node the load is calculated using clustering algorithm and the nodes are arranged in ascending order in terms of low load, then with the same parameter delay time is calculated for each node.

The sensor nodes can be organized to clusters and each cluster is managed by a special node or leader, called cluster head (CH). The CH is responsible for coordinating the data transmission activities of all sensors in its cluster. Transmission to the base station is also performed by the CH.

For transmitting data to the base station**,** the cluster members will first transmit the data to respective cluster heads. The data transmission is the most energy consuming task in the operation of WSN. So if the number of transmissions is reduced, it saves a considerable amount of energy. The power saving is achieved using a sleep and active scheduling of the member nodes in each cluster. For this the randomly deployed node positions are considered. The sleep state is based on two conditions:

1. If more than one node is deployed such that they cover the same area, then only one such node is kept active and others are driven to sleep state.
2. The overlapping coverage for all nodes is calculated. The nodes with highest overlapping are made to sleep.

5. CONCLUSSION

Scalability and density of deployments, environmental uncertainties and constraints in energy, memory, bandwidth and computing resources pose serious challenges to the developers of WSNs. Issues of node deployment; localization, energy aware clustering and data aggregation are often formulated as optimization problems. The solution which maximizing lifetime and minimizing the traffic by means of energy efficient cluster head selection using geographic routing in duty-cycled wireless sensor networks.

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