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Improved Cluster Head Selection For Energy Efficient Data Aggregation In Sensor Networks

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Abstract
Wireless Sensor Networks (WSN) are a challenging emerging technology due to their scope, low processing power, and associated low energy. WSN routing differs from conventional routing in fixed networks. It lacks infrastructure, has unreliable wireless links, sensor nodes may fail and routing protocols have to meet tough energy saving requirements. Data aggregation in WSN effectively saves limited resources. The goal of data aggregation algorithms is gathering and aggregating data in an energy efficient manner so that network life is enhanced. Clustering is used to extend a sensor network life by reducing energy consumption. This work proposed a better cluster head selection in sensor networks for efficient data aggregation. The proposed algorithm is based on Local search and incorporated in Low Energy Adaptive Cluster Hierarchy protocol (LEACH).

Keywords: Wireless Sensor Networks (WSN), Low Energy Adaptive Cluster Hierarchy protocol (LEACH), Clustering, Cluster Head (CH) Selection.

Introduction

WSNs are node collections where every node has its own sensor, processor, transmitter, and receiver. Such sensors are low cost devices performing a specific sensing task. Being of low cost, they are deployed densely throughout an area to monitor specific events [1].Recent advances in Micro-Electro-Mechanical Systems (MEMS) technology, digital electronics, and wireless communications lead to the development of low-cost, low-power, multifunctional sensor nodes small in size and communicating untethered in short distances. Sensor networks are a major improvement over traditional sensors deployed in the following ways [2]:

- Sensors are positioned far from an actual phenomenon, i.e., something known by sense perception. So large sensors with complex techniques are required to distinguish targets from environmental noise.
- Sensors performing only sensing are deployed. Their positions and communications topology are carefully engineered. They transmit time series of a sensed phenomenon to central nodes. Here, computations are performed, and data fused.

The sensor nodes position is not pre-determined which ensures random deployment in inaccessible terrain and disaster relief operations. But, it also means that sensor network protocols and algorithms must have self-organizing abilities. Another unique sensor networks feature is the cooperative effort. They are fitted with an on-board processor. Instead of sending raw data to nodes for fusion, they use processing abilities to carry out simple computations and transmitting only required and partially processed data [3].
Data aggregation collects and aggregates useful data and is a fundamental processing procedure to save WSN energy. It is an effective way to save limited resources. The goal of data aggregation algorithm is gathering and aggregating data in an energy efficient manner to enhance network life. WSNs have limited computational power, memory, and battery power, so increased application develops complexity which results in applications closely coupled with network protocols [4].
Data aggregation solves data centric routing's implosion and overlap problems. Data from multiple sensor nodes is aggregated when they reach the same routing node enroute to the sink. Data aggregation is a WSN technique. Security issues, data confidentiality, and integrity become vital when a sensor network is in a hostile environment. Data aggregation aggregates a sensor data using aggregation approaches [5].

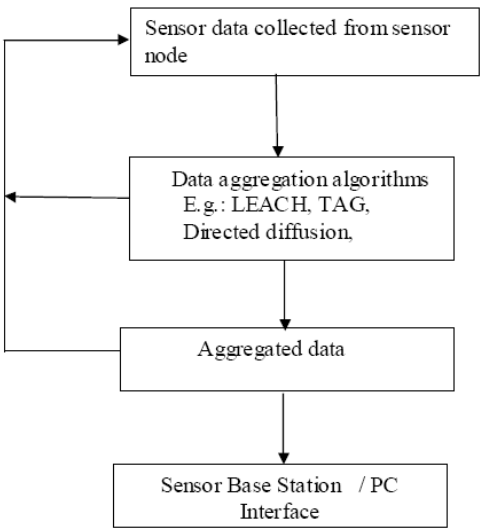

Figure 1: Architecture of data aggregation.