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Issues of Data Aggregation Methods in Wireless Sensor Network: A Survey

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Abstract

In Wireless Sensor Networks (WSN) sensor nodes are deployed in a region to sense the information. These sensor nodes sense the similar information and sends it to sink node. This thing leads to redundancy at sink node. Sink node wastes most of its energy in processing redundant packets. To save the energy of node in order to prolong the network lifetime there is need to eliminate redundancy. Data aggregation is a process in which intermediate node receives multiple input packets performs aggregation and produce single output packet in the network. This process will reduce the number of redundant packets in the network. But redundancy sustains reliability. Therefore there is need to maintain redundancy but it should be up to an adequate level. In this paper we have focused on different issues in data aggregation process such as delay, redundancy elimination, accuracy and traffic load and mentioned various methods to solve those issues and then we compared some data aggregation techniques based on strategy, delay, redundancy, average energy consumption and traffic load. Further we have proposed a model based on our study which performs data aggregation at multiple levels and not only maintains the tradeoff between energy conservation and reliability but also addresses all the issues in data aggregation technique.

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1. Introduction

Wireless Sensor Networks (WSN) contains large number of small sensor nodes. These nodes communicate with each other wirelessly within their radio range. Due to limited power of sensor nodes it has become necessary to reduce energy consumption at each sensor node to enhance the overall life time of wireless sensor network. This can

be achieved by eliminating redundancy from WSN. Because nodes waste their power in processing redundant data. Therefore redundancy removal has become solution for improving WSN's life time. Data Aggregation is the technique which gather and aggregate data in an energy efficient manner and reduces redundancy so that network lifetime is enhanced.

Though redundancy removal improves the lifetime of the WSN, redundancy is important to get accurate results in WSN. So there is a need to make balance in between these two, reliability and energy conservation. This paper focuses on data aggregation issues like redundancy, delay, accuracy and traffic load also we have mentioned some mechanisms to solve these issues. Further we have done comparative study of various data aggregation techniques based on Strategy, Delay, Redundancy, Average Energy consumption and Bandwidth-overhead and proposed a new model of data aggregation which solves all these issues.

The rest of the paper is organized as follows. Section 2 contains Background of data aggregation, section 3 is related work. Section 4 discusses issues in the Data aggregation techniques and methods to solve these issues. Section 5 comes out with the comparative study of all techniques. Section 6 contains our proposed model to address all the issues in data aggregation and section 7 is conclusion of our work.

2. Background of Data Aggregation

The sensors deployed in the closer region sense the same phenomena which leads to produce lot of duplicate data. This duplication of data consumes more bandwidth and energy of sensor network. In data aggregation, sensor data collected by sensor nodes are aggregated by using some data aggregation algorithms and then aggregated data is forwarded towards base station. There are different strategies for data aggregation described as follows.

2.1. Data Aggregation Strategies

There are four strategies for aggregation some of them are listed below:
Centralized Approach, In-Network Aggregation, Tree-Based Approach, Cluster-Based Approach [1].

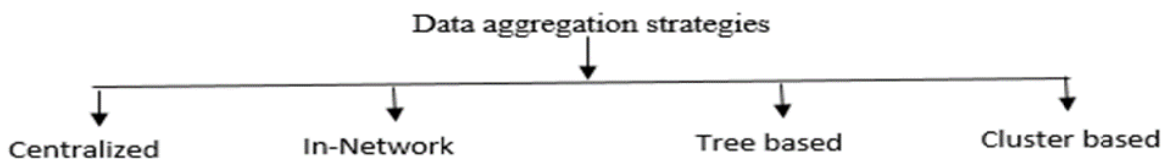


Figure 1: Data aggregation strategies

Centralized Approach: In this approach each node sends data to a central node via the shortest possible route. All the sensor nodes simply send the data packets to a node, which is the powerful among all other nodes. This node is called as header node. This header node performs aggregation of data coming from all nodes and result of this aggregation process will be a single packet.

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