

Chapter 21

Event Based Data Gathering in Wireless Sensor Networks

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ABSTRACT

Wireless sensor networks (WSANs) are increasingly being used and deployed to monitor the surrounding physical environments and detect events of interest. In wireless sensor networks, energy is one of the primary issues and requires the conservation of energy of the sensor nodes, so that network lifetime can be maximized. It is not recommended as a way to transmit or store all data of the sensor nodes for analysis to the end user. The purpose of this “Event Based Detection” Model is to simulate the results in terms of energy savings during field activities like a fire detection system in a remote area or habitat monitoring, and it is also used in security concerned issues. The model is designed to detect events (when occurring) of significant changes and save the data for further processing and transmission. In this way, the amount of transmitted data is reduced, and the network lifetime is increased. The main goal of this model is to meet the needs of critical condition monitoring applications and increase the network lifetime by saving more energy. This is useful where the size of the network increases. Matlab software is used for simulation.

INTRODUCTION

A Wireless sensor network (WSN) is composed of a large number of tiny low powered sensor nodes and one or more multiple base stations (sinks). These tiny sensor nodes consist of sensing, data

processing and communication components. The sensor nodes sense, measure and collect ambient environmental conditions, use their processing abilities to carry out simple computations and send partially processed sensed data to a base station either directly or through a gateway. The gateway can perform fusion of the sensed data in

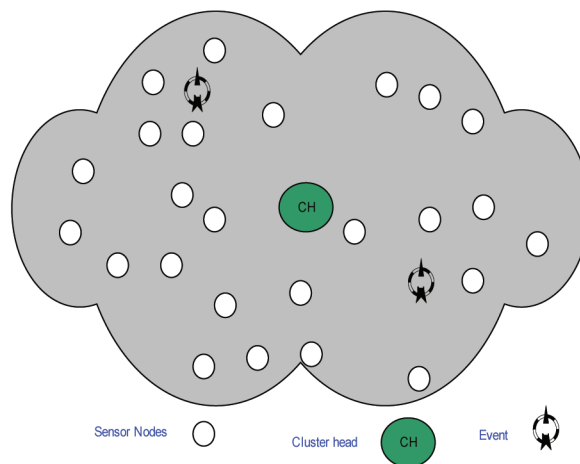
DOI: 10.4018/978-1-4666-0101-7.ch021

order to filter out erroneous data and anomalies and to draw conclusions from the reported data over a period of time. A comprehensive overview of wireless sensor networks and their broad range of applications can be found in (Akyildiz et al. 2002; Younis et al. 2004). The sensor nodes in a wireless sensor network (WSN) are resource constrained, i.e., have limited energy and computation power (processor and memory), a short communication range and low bandwidth. A sensor node operates on limited battery power and it is very difficult or even impossible to recharge or replace it. When it is depleted of energy, it will die and disconnect from the network, which significantly affects network performance. The life of a sensor node determines the lifetime of the network. Maximizing the lifetime of the network involves energy conservation and harvesting. Energy is conserved through optimizing communication and minimizing energy usage (Akyildiz et al. 2002) (Younis et al. 2004). A sensor network is deployed with the objective of gathering information with the initial battery energy. It is desired that the network works continuously and transmits information for as long as possible. This is referred to as the maximum life time problem in sensor networks. In

data gathering, nodes spend a part of their energy on transmitting, receiving and relaying packets. Hence, designing routing algorithms that maximize the lifetime until the first battery expires is an important consideration. One of the major tasks of a WSN is to detect events occurring in the sensing field as shown in Figure 1. In wireless sensor networks, whenever the event of interest occur the nodes should be aware and respond quickly without any delay. Delay is to be considered an important metric when detecting an event in real time applications such as surveillance (Biswas and Phoha 2006) (Tseng et al. 2005) or object tracking (Gui and Mohapatra 2004) (Wensheng and Guohong 2004).

Energy conservation in wireless sensor networks has been the primary objective; however, this constraint is not the only consideration for efficient working of wireless sensor networks. There are other objectives like scalable architecture, routing and latency. In most of the applications of wireless sensor networks, it is envisioned that they handle critical scenarios where data retrieval time is critical, i.e., delivering sensed information from each individual node to the base station as fast as possible becomes an im-

Figure 1. General event based scenario



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