

Path Selection Algorithm with Energy Efficiency for Wireless Sensor Networks

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Abstract

A sensor network consists of a large number of sensor nodes that are spread densely to observe the phenomenon. The lifetime of sensor nodes in sensor network affects a whole network. If one node dies, it could lead to a separation of a sensor network. Thus all sensor nodes should fairly live long to extend the lifetime of sensor network.

In this paper, we propose a path selection algorithm with energy efficiency for wireless sensor networks. Nodes' energy in the network is concerned to find the best path for a source's request. Simulations can be carried out to test its performance. In conclusion, we discover that our protocol is more efficient than the other protocols that consider only minimum energy.

I. Introduction

Recent advances in technologies such as low cost, low power, and small size made sensor networks more efficient because they are the main factors of the sensor networks. A sensor network consists of thousands of sensor nodes that are spread densely either inside or close to the phenomenon but sensor nodes are easy to fail [3]. Sensor networks consider the power efficiency very important, and most of them are data-centric. The reason that the routing protocols are needed is that the source and the destination can not communicate directly if they are not in the same communication range. If they are in the same range, then the routing protocols are not essential to communicate.

There are many differences between sensor networks and ad hoc networks in terms of routing. First, sensor nodes have power-constraint and memory. Since neighbor sensor nodes send data after they aggregate the same data called "data fusion", energy can be saved. Second, sensor networks are data-centric. It means they ask for the certain attributes' information instead of requiring routing of data between nodes. Third, in sensor network, there is a large number of nodes and nodes are very aggregated densely. This will affect routing system as well.

There are many kinds of sensor network protocols in the energy point of view such as Low-Energy Adaptive Clustering Hierarchy (LEACH) [1], Energy-Aware Ad hoc Demand Distance Vector (AODV) [2], and minimum-transmission-energy routing protocol (MTE) [1].

LEACH is a cluster-based routing protocol that collects data from nodes. This process is called "data fusion" and nodes send aggregated data directly to the sink. It randomly chooses cluster-heads and this process leads to an energy efficient protocol. Energy-aware AODV increases the lifetime of a network where nodes work on battery power alone. This alters the routing protocol to have lower power. Additionally, it turns off the radio interfaces to save energy. In MTE, there are many possible nodes which can send messages. However, this protocol chooses the nearest node on the way to the base station to save energy.

In this paper, we propose a path selection algorithm with energy efficiency for wireless sensor networks. We have used AODV and we have evaluated its performance.

The rest of the paper is organized as follows. In the next section, we describe our routing protocol and we evaluate the performance in the following section. Finally, we conclude in the last section.

II. Energy-Efficient Routing Protocol

2.1 Path Selection Algorithm

Energy should be under consideration when a routing protocol is designed. The reason is that how much the network spends the energy has a relationship with how long the network can work. Therefore, to design a protocol, minimizing the energy consumption is an important factor. In this paper, we consider not only