

TOPOLOGY CONTROL IN WIRELESS SENSOR NETWORKS

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ABSTRACT

Ad hoc networks are considered to be a very promising technology. Despite the importance and the variety of possible applications, they still suffer from some basic problems. One of the most important issues of wireless sensor networks is their restricted amount of energy resources, and therefore their restricted autonomy. This paper tries to reduce that problem by introducing topology control into the Wireless Sensor Networks (WSN). Many studies have been performed on topology control. This paper gives an overview of the most important algorithms for topology control. The performance of the different algorithms will be compared and their practicability will be discussed. Most of the literature about the topic of topology control stays focuses only on the theoretical part. This paper goes further and discusses an implementation of an algorithm for topology control on a real sensor network.

INTRODUCTION

A Wireless Sensor Network (see figure 1) is a special kind of ad hoc network. An ad hoc network is formed by a group of mobile clients communicating, using wireless connections. Wireless sensor networks are in most cases composed by a huge number of clients sending measurement results to a central node, called the sink. These networks possess some specific characteristics. In most cases they are dense, the network topology can change, the nodes only have a restricted view on the entire network, the energy resources are often batteries and therefore limited in lifetime. In order to improve those networks, an answer has to be found to the problem of the restricted power supply.



Figure 1. Wireless Sensor Network

In the paper we will first introduce topology control and explain how topology control can reduce the energy consumption while sending messages. In the literature many topology control algorithms are discussed. In this paper, some of those algorithms will be presented and classified according to their practicability. The topology control algorithms are implemented in Matlab in order to study and compare their ability to reduce the overall power consumption when all nodes in the network are sending messages to a sink. The purpose of this study was to pinpoint the most promising topology control algorithm to be implemented on a real sensor network. In the last part of the paper we will focus on the implementation of that algorithm on a real sensor network, using Tmote Sky modules as sensor nodes and Contiki as operating system on those nodes. The paper will conclude with some important remarks and recommendations for future studies.

Topology Control In Wireless Sensor Networks

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