Wireless Charging Scheduling Algorithms in Wireless Sensor Networks

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Abstract

Wireless sensor nodes are commonly deployed in outdoor or hazardous environments. Due to limited resources and power consumption required to perform tasks, these nodes may experience power shortages and thus lead to the disconnection of the whole wireless sensor network. To prolong the lifetime of the network, new technologies are developed to wirelessly recharge the sensor nodes via mobile machines. Previous works have considered applying wireless charging to elevate the network lifetime without defining performance optimization. In addition, the effect of the speed of the mobile machines, the charging speed, and the possibility of more than one mobile machine to charge one sensor node is discussed. Another interesting issue is the effective utilization of the network once it is disconnected. This work is the first one which formally defines the wireless charging problem in wireless sensor networks by converting it into a job scheduling optimization problem and provides an algorithm for it using multiple mobile charging machines. Two more algorithms are further provided to locate the sensors whose failure can easily jeopardize network connectivity and to solve the charging machine scheduling problems by protecting these weak sensors first. From simulation results, our methods outperform previous methods in the sense of lifetime and number of received messages in sink.

Keyword：Wireless charging, Wireless power transmission, Wireless sensor networks, Graph theory, Job scheduling