

Optimum Partition for Distant Charging 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. An interesting issue is the effective partitioning of the network for more than one charging machine to patrol over. In this work, we aim to design and analyse three network partition methods, namely the tier-based partition, the sector-based partition, and the mixed partition, for charging scheduling with mobile charging machines so that the resulting sub-networks exhibits approximately the same total energy consumption rate. To the best of our knowledge, no optimal partition method has been proposed before. Moreover, we show that the largest diameter of the partitioned areas from the mixed partition is shorter than those from the tier-based partition and the sector-based partition. This indicates that the delay time can be reduced when a mobile charging machine runs for a dying sensor using the mixed partition method.

Keyword : wireless charging; wireless power transmission; wireless sensor networks