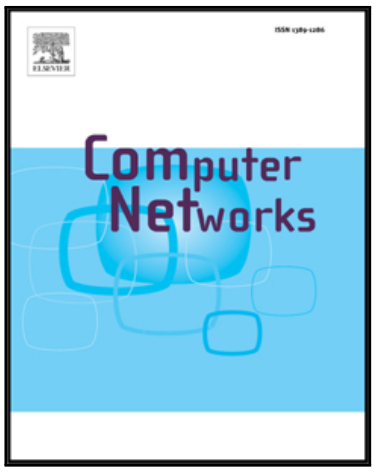

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PII: S1389-1286(18)30130-0
DOI: 10.1016/j.comnet.2018.03.016
Reference: COMPNW 6443

To appear in: *Computer Networks*

Received date: 3 August 2017
Revised date: 26 February 2018
Accepted date: 15 March 2018

Please cite this article as: Mahdi Zareei, Cesar Vargas-Rosales, Rafaela Villalpando-Hernandez, Leyre Azpilicueta, Mohammad Hossein Anisi, Mubashir Husain Rehmani, The Effects of an Adaptive and Distributed Transmission Power Control on the Performance of Energy Harvesting Sensor Networks, *Computer Networks* (2018), doi: 10.1016/j.comnet.2018.03.016

The Effects of an Adaptive and Distributed Transmission Power Control on the Performance of Energy Harvesting Sensor Networks

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Abstract

The design of routing protocols for wireless sensor networks (WSNs) has been traditionally tackled by assuming battery-powered sensors, in which minimizing the power consumption was the main objective. Advances in technology and the ability to harvest energy from the environment has enabled self-sustaining systems and thus diminish the significance of network lifetime considerations in the design of WSNs. Although WSNs operated by energy-harvesting sensors are not limited by network lifetime, they still pose new design challenges due to the unstable and uncertain amount of energy that can be harvested from the environment. In this paper, we propose a new protocol for energy-harvesting sensor networks that uses adaptive transmission power to maintain the network connectivity, and distributes the traffic load on the network. Based on local information, each node dynamically adjusts its transmission power in order to maximize the network's end-to-end performance. The simulation results indicate that the proposed protocol keeps the network connected at most of the times by using an efficient power management, outperforming greedy forwarding and dynamic duty cycle protocols in terms of packet delivery ratio, delay, and power management.

Keywords:
Energy harvesting, wireless sensor network, transmission power control, energy efficiency, green computing

1. Introduction

Ubiquitous sensing enabled by evolution of Wireless Sensor Network (WSN) technologies affects many areas of our daily lives. The ability of sensors to measure, infer, and understand environmental conditions let us think about the seamless integration and proliferation of sensors

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