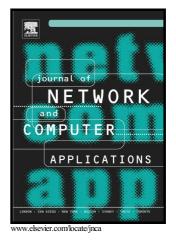
Author's Accepted Manuscript

A Self-Organizing Network Coordination Framework Enabling Collision-free and Congestion-less Wireless Sensor Networks

Akiya Kamimura, Kohji Tomita



 PII:
 S1084-8045(17)30221-7

 DOI:
 http://dx.doi.org/10.1016/j.jnca.2017.06.002

 Reference:
 YJNCA1929

To appear in: Journal of Network and Computer Applications

Received date: 14 February 2017 Revised date: 12 May 2017 Accepted date: 12 June 2017

Cite this article as: Akiya Kamimura and Kohji Tomita, A Self-Organizing Network Coordination Framework Enabling Collision-free and Congestion-les Wireless Sensor Networks, *Journal of Network and Computer Applications* http://dx.doi.org/10.1016/j.jnca.2017.06.002

This is a PDF file of an unedited manuscript that has been accepted fo publication. As a service to our customers we are providing this early version o the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain

ACCEPTED MANUSCRIPT

> REPLACE THIS LINE WITH YOUR PAPER IDENTIFICATION NUMBER (DOUBLE-CLICK HERE TO 1 EDIT) <

A Self-Organizing Network Coordination Framework Enabling Collision-free and Congestion-less Wireless Sensor Networks

Akiya KAMIMURA^{a*}, Kohji TOMITA^{b*}

^a National Institute of Advanced Industrial Science and Technology (AIST), 1-1-1 Umezono, Tsukuba, Ibaraki 305-8568, Japan,
 ^b National Institute of Advanced Industrial Science and Technology (AIST), 1-1-1 Umezono, Tsukuba, Ibaraki 305-8568, Japan,
 kamimura.a@aist.go.jp (A. Kamimura)

k.tomita@aist.go.jp (K. Tomita)

*Corresponding authors.

Abstract

In recent years, wireless sensor networks (WSNs) have been widely used for controlling remote devices and also for gathering sensor data of distributed WSN devices. The WSNs support current Internet of Things (IoT) technologies in the background. However, it is becoming a salient issue that frequent packet delivery losses occur during data gathering on WSNs along with the increasing number of nodes. Two fundamental difficulties exist for MAC and upper layers on IEEE 802.15.4 standard: transmission collisions among two-hop away nodes, known as the "Hidden node problem," and traffic congestion during data transfer that engenders buffer overflow at nodes. To resolve these difficulties, we propose a self-organizing network coordination framework for WSNs that realizes an adaptive time-division transmission by nodes and also traffic congestion handling in a decentralized manner. Specifically, the framework is based on a decentralized time division technique using a simplified pulse-coupled oscillator model. By coordinating the transmission timing adaptively, each node sends messages without collisions. "Hidden node problems" as well as "Exposed node problems" will be prevented, in principle, when using our method. Additionally, to reduce traffic congestion in a decentralized manner, time slots in the transmission cycle on each node are used efficiently by additional algorithms: an "empty time slots utilization algorithm" and a "takeover algorithm of neighboring nodes' transmission slots". These are introduced for efficient large data gathering applications. We simulated a 60-node data gathering application and evaluated its superiority to a conventional WSN method using CSMA/CA on IEEE 802.15.4 standard. We also conducted hardware experiments using nine developed WSN nodes and confirmed our framework's feasibility in real situations targeted at real-time landslide detection with distributed WSN nodes.

Download English Version:

https://daneshyari.com/en/article/4955874

Download Persian Version:

https://daneshyari.com/article/4955874

Daneshyari.com