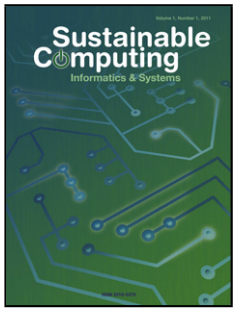
Accepted Manuscript



Title: Reliable and Energy-Efficient Multi-Hop LEACH-Based Clustering Protocol for Wireless Sensor Networks

Authors: Sara Al-Sodairi, Ridha Ouni

PII: S2210-5379(16)30037-3
DOI: https://doi.org/10.1016/j.suscom.2018.08.007
Reference: SUSCOM 275

To appear in:

Received date: 8-3-2016
Revised date: 11-8-2018
Accepted date: 22-8-2018

Please cite this article as: Al-Sodairi S, Ouni R, Reliable and Energy-Efficient Multi-Hop LEACH-Based Clustering Protocol for Wireless Sensor Networks, *Sustainable Computing: Informatics and Systems* (2018), https://doi.org/10.1016/j.suscom.2018.08.007

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final 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

Reliable and Energy-Efficient Multi-Hop LEACH-Based Clustering Protocol for Wireless Sensor Networks

Sara Al-Sodairi[a,b], Ridha Ouni[a]

[a] College of Computer and Information Sciences
King Saud University, KSA
rouni@ksu.edu.sa

[b] College of Computer and Information Sciences
Princess Nourah bint AbdulRahman University, KSA
Saalsodairi@pnu.edu.sa

Highlights

- Analyze the effectiveness of LEACH-based protocols in order to provide more reliability and extend the lifetime for energy-constrained WSNs.
- EM-LEACH is an enhanced LEACH clustering protocol:
  - Reduce and balance the energy consumption,
  - Introduce more reliability for packet delivery.
  - Increase lifetime of WSNs,
- EM-LEACH supports new rules for cluster-head selection and round time computing based on the remaining energy.
- EM-LEACH introduces multi-hop communication model based on two operating processes: leveling and generic multi-hop routing.

ABSTRACT

Wireless sensor networks (WSNs) are attracting research attention because of their important applications in critical environmental monitoring and target tracking in both civilian and military fields. The large-scale deployment of energy-constrained WSNs and the need for multi-hop data aggregation requires efficient organization of network topology to simplify the routing task, balance the load, and prolong the network lifetime. Clustering has proven to be an effective approach for organizing the network into a connected hierarchy. In this study, we analyze the effectiveness of low-energy adaptive clustering hierarchy (LEACH) and LEACH-based protocols in extending the lifetime for energy-constrained WSNs. An improved LEACH clustering protocol called enhanced multi-hop LEACH is proposed to reduce and balance energy consumption in order to allow increased packet delivery and network lifetime in WSNs. Additionally, this paper presents the weaknesses of the LEACH protocol. First, we introduce new rules for cluster-head selection and round time computing based on the remaining energy. Second, a multi-hop communication model is integrated in the WSN using two operating processes: leveling and generic multi-hop routing.

Keywords: *Wireless sensor networks, reliability, energy consumption, multi-hop, clustering, LEACH.*

1. Introduction

Wireless Sensor Networks (WSNs) have been widely considered to be one of the most important technologies of the twenty-first century [1]. It has a wide range of ever-increasing important applications. The sensor nodes are tiny and cheap; they are battery-powered devices that are deployed in a physical area to collect useful information and transmit it through wireless links to sink nodes. These sensors can communicate either among each other or directly to the sink. However, nodes have limited energy resources that represent the biggest challenge for WSNs. The energy efficiency, robust self-organization, clustering, and routing protocols are very important aspects of conserving energy and prolonging network lifetime, while ensuring proper operations of the network. Moreover, WSNs present some weaknesses because of their limited buffering features and computational resources.

The main problem in WSNs is controlling energy consumption across the whole network. The limitation of energy resources is a major issue in every wireless device. This issue is particularly amplified in WSNs for the following reasons [2].

Download English Version:

https://daneshyari.com/en/article/11023937

Download Persian Version:

https://daneshyari.com/article/11023937

Daneshyari.com