AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Department of Electronics and Electrical Communications

"Performance Enhancement of Wireless Sensor Networks Cluster-based Routing Protocol"

A thesis submitted in partial fulfillment of the requirement of the M.Sc. in Electrical Engineering

By

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B.Sc. in Computer Engineering, 2008

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STATEMENT

This thesis is submitted as partial fulfillment of M.Sc. degree in Electrical Engineering, Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or qualification at any other scientific entity.

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Summary of the Chapters

The thesis consists of six chapters that are concluded as follows:

Chapter 1 Introduction

In this chapter, the thesis is introduced in addition to why is the thesis important including the main problem and its solution.

Chapter 2 Wireless Sensor Networks: an Overview

This chapter provides a WSNs overview in terms of its applications, hardware & software components, Mac layers protocols, cross-layer design, and different types of the used simulations.

Chapter 3 Routing Protocols in WSNs

Many WSNs routing protocols have been introduced with different ideas to meet the application requirements. In order to design an energy efficient routing protocol, some routing challenges and design issue would appear. These challenges and issues are mentioned in this chapter in addition to different common types of WSNs routing protocols and their classifications.

Chapter 4 Cluster-Based Routing Protocols in WSNs

This chapter provides more details about some of the common cluster-based routing protocols, how they operate, their advantages, and disadvantages.

Chapter 5 PR-LEACH: Approach for Balancing Energy Dissipation of LEACH Protocol for Wireless Sensor Networks

This chapter presents more details about the proposed routing protocol, PR-LEACH, and the radio model used. In addition, the simulation results and analysis for PR-LEACH

compared to LEACH and BEC are provided. Results show that PR-LEACH outperforms the two other protocols in all simulation scenarios using either random or grid deployment methods.

Chapter 6 Conclusions and Future Work

This chapter contains the conclusions of the thesis in addition to the future work that is intended to be done.

Abstract

A Wireless sensor network (**WSN)** consists of a huge number of deployed sensor nodes that have many capabilities such as sensing, computation, and wireless communication among each other or with a faraway Base-Station (**BS)**. Wireless communication is the most power dissipation operation in WSNs; therefore energy conservation is an essential issue in the design of the routing protocol. Many proposed routing protocols were published in this area to achieve minimum energy dissipation for WSNs nodes.

In this thesis a Cluster-Based (CB) routing protocol, namely Percentage LEACH (PR-LEACH), which is an enhanced image of the common routing protocol Low Energy Adaptive Clustering Hierarchy (LEACH) is proposed. LEACH selects the cluster-heads (CHs) based on random probability that leads to bad energy distribution among all nodes of the network, while PR-LEACH considers the residual energy at each sensor node while selecting the CHs in order to balance energy dissipation among all of the nodes, extend the network lifetime as one unit, and to minimize the Dead-Spots (DSs). MATLAB simulation shows that the proposed energy consideration protocol, PR-LEACH, provides better performance compared to LEACH protocol.

Key Words:

Wireless sensor network, routing protocol, energy dissipation, LEACH, PR-LEACH.

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