Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 34 (2014) 79 – 86

Procedia Computer Science

The 9th International Conference on Future Networks and Communications (FNC-2014)

Enhancement of energy conservation technologies in wireless sensor network

Vijey Thayananthan* and Ahmed Alzranhi

Department of Computer Science, FCIT, KAU, Jeddah 21589, KSA

Abstract

In the last few years, wireless sensor networks (WSNs) have been widely used for many applications in both profitable and non-profitable organizations. As sensor nodes used in most of the applications are generally battery-powered devices, the challenges focus on how to increase the lifetime of each sensor node and how to reduce the energy consumption of each node, so that the network energy efficiency (EE) can be maintained to deliver the data for a reasonable time. In this paper, we analyze to enhance the energy conservation approach which reduces the energy consumption, cost and complexity. In this research, combination of routing and solar power is analyzed as enhancement of energy conservation technology (EECT) which increases the lifetime of the sensor node as well as the battery. Even though, solar power concept is not new for the WSN, EECT can be used for where some selected applications such as monitoring air condition in large organizations are directly involved with the sun light and heat.

Selection and peer-review under responsibility of Conference Program Chairs

Keywords: wireless sensor network; solar power; energy efficiency; EECT

* Vijey Thayananthan. Tel.:+0966 6952000; fax:+0966 6952000.
E-mail address: vthayanathan@kau.edu.sa

Selection and peer-review under responsibility of Conference Program Chairs
doi:10.1016/j.procs.2014.07.052

1. Introduction

The necessity and trends of EECT can be obtained from many sources which are direct heat from the Sun, waste heat from human, factories and vehicles, etc. Utilizing waste heat energy from human can be used for WSN where sensor nodes are in micro or nano scale which consumes and uses very little energy. These tiny sensors may be used for human monitoring with low-cost and finding symptoms of some diseases without any side effects. Waste heat from factories was investigated to generate the electrical energy through EECT but it could be used for charging batteries employed in WSN. Direct heat from the Sun is wasted in hot countries where maximum energy can be saved for many applications including WSN. According to[25], solar energy and its advantages and energy-aware routing concept which includes routing algorithms for WSN are considered with practical approaches.

1.1. Our contributions

In this paper, we discuss some procedures based on EECT that help us to maintain the WSN with low-cost and energy efficient algorithms. Here, we analyze how much heat is wasted in each second and how we can use these opportunities to transfer the WSN through EECT. In this study, saving energy in large scale is considered with theoretical analysis, which provides us to implement a real system.

Heat is wasted in many ways and it destroys the natural environments with high pollutions. When WSN is systematically applied, following advantages may be useful to environment they are energy saving with low-cost, increasing EE in WSN, maintaining pollution free zone, etc.

Heat energy in hot countries can be transferred to different energy that is useful for necessary systems used in our real life. It will not only generate the energy but it also provides a clean environment around the residential area.

1.2. Taxonomy of EECT based routing protocols in WSN

In WSN, taxonomies of routing protocols are identified for many cases that may be categorized according to the applications and environmental conditions[1,2]. For instance, energy saving procedure of data driven approaches is mentioned as shown in Fig. 1.

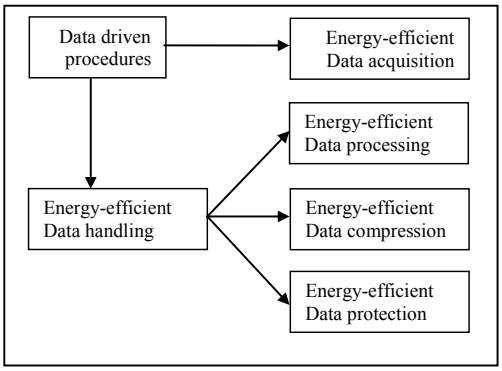

Fig. 1. Taxonomy of data driven procedure (Example of EECT)

To analyze the basis of EECT developed for routing protocols, EECT based routing protocols in WSN can be classified into many categories[3]. They are ant colony optimization (ACO) based routing protocols, Equalized Cluster Head Election Routing Protocol (ECHERP), Low-Energy Adaptive Clustering Hierarchy (LEACH) etc. To maintain the EECT, energy efficient and load balancing routing concept[7] is used in WSNs. These protocols and their design concepts are different because they are developed for different applications where we can consider EECT. Geographic Routing with Environmental Energy Supply (GREES)[14] is an algorithm that functions according to the