Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 104 (2017) 385 – 392

Procedia Computer Science

ICTE 2016, December 2016, Riga, Latvia

Sensor Network Information Flow Control Method with Static Coordinator Within Internet of Things in Smart House Environment

Aleksejs Jurenoks[a,]*, Dejan Jokić[b]

[a]*Riga Technical university, Setas street 1 – 527, Riga, Latvia*
[b]*Univerzitet u Istočnom Sarajevu, Bosnia and Herzegovina*

Abstract

Nowadays the technical solutions related to energy resource management are being rapidly developed and integrated into the daily lives of people. The energy resource management systems use sensor networks for receiving and processing information during the realia time. Despite the large number of research related to increasing the life expectancy of a network, node positioning, network clustering as well as the optimization of the data-processing model, issues related to the data flow management and classification of the information become more and more topical; they allow to reduce the amount of transmitted information within the network. The network load of the unstructured information flow is the most important aspect that impacts the service quality of the network as well as the life expectancy of a node; as a result, the methods of network performance optimization and increase in life expectancy in the networks with a high information transmission rate become ineffective. Nowadays the amount of transmitted information in the Internet of Things networks is increased and becomes chaotic which results in the reduction of the overall network efficiency and life expectancy. The article discusses the management method of the network data flow that can respond to a data flow programming task whilst taking into account the balancing of the node energy in the network.

Peer-review under responsibility of organizing committee of the scientific committee of the international conference; ICTE 2016

Keywords: Sensor Network; Life expectancy; Data processing; Smart house

* Corresponding author. Tel.: +371 29606250.
E-mail address: aleksejs.jurenoks@rtu.lv

Peer-review under responsibility of organizing committee of the scientific committee of the international conference; ICTE 2016
doi:10.1016/j.procs.2017.01.150

1. Introduction

The system Smart house is a topical and modern solution which increases the energy efficiency of a building and provides energy resources individually and also provides other automated solutions that facilitate the daily lives of people[1, 2, 3].

Most processes of the Smart house systems are pre-programmed and are provided in the automatic mode, however, depending on the system specifications there is a set of values that can be controlled by the user. Thanks to its structure and the module system, the Smart house solution allows individual subsystem modification and customization for every user which in turn allows reserving a lot of resources[4].

Nowadays the technical solutions related to energy resource management are being rapidly developed and integrated into the daily lives of people. The energy resource management systems use sensor networks for receiving and processing information during the realia time. Despite the large number of research related to increasing the life expectancy of a network[5, 6, 7], node positioning, network clustering as well as the optimization of the data-processing model, issues related to the self-organisation of the system and the issues of topology creation allowing the increase of the overall life expectancy of a network. Excessive exchange frequency of the network topology is the most important factor that impacts the network service quality and the life expectancy of the node; as a result, the methods of network performance optimization and increasing life expectancy of the self-organizing networks with a high network topology exchange rate become ineffective. Nowadays the amount of transmitted information in the Internet of Things networks is increased and the network elements are programmed to perform both the roles of a terminal and a router; as a result, the network activity becomes chaotic and the total network efficiency and the life expectancy are reduced. The article describes the use of dynamic coordinator node in the wireless sensor networks which allows structuring the information transmitted through the network and reducing the need for network topology change which results in the increase of the overall system life expectancy.

2. Overview of current situation

Recently, the number of studies related to the wireless sensor network implementation issues has increased. For example, the paper[8] is focused on the issues related to wireless sensor network design, energy resource shortage within the network and the overload of the network router. It is pointed out in the paper that the data flow of a wireless sensor network is imbalanced and the issues associated with data flow management in the network are becoming topical. Dawadi[9] in his research reviews issues related to the data flow modeling and optimization. It should be emphasized here that within the transmission of the WSN flow is dependent on the network usage and the network operation scenario. There are systems in which the frequency and size of the information transmitted are strictly determined and there is no possibility for network optimization and, as a result, a large amount of useless information appears in the network.

Recently, there has been an increasing amount of studies related to the improvement of wireless sensor network technical properties for increasing its life expectancy. The main drawback of a wireless sensor network is a low power battery which significantly limits the life expectancy of the network. Currently, there are a number of methods that allow solving this problem[10, 11, 12]. These include the individual choice of battery capacity, node placement density, transmitter power adjustment, the use of energy-efficient data transmission protocol, network node positioning and other methods that are related to additional costs of network introduction.

In turn, it is demonstrated in the article[7] that the methods of increasing the life expectancy in networks with a large unstructured data flow are ineffective because the network operates through a single network topology and the nodes are not in sleep mode and the function of the router is fulfilled inefficiently whilst transmitting service information within the network.

Several WSN operational scenarios require that the research object will contain a sufficient number of sensors for collecting information from the network[13]. This means that artificial redundancy has been created in the network.

There are situations where it is not possible to introduce redundancy and the network uses the smallest possible number of sensors. It stipulates that a limited number of nodes create a variety of problems in the network: