Abstract ID: AIMC-2018-EBM-001

Design of a Fully Wireless Indoor Smart Energy Saving and Monitoring System

Li Woon Koay*[a], Yasir Hashim [b]

Faculty of Technology, Universiti Malaysia Pahang, Gambang 26300, Malaysia
*liwoon2@gmail.com

Abstract

The wireless indoor smart technology has changed rapidly and improved daily living. Humans will continue to enjoy comfortable and convenient lives with the support of the latest technology. The proposed Smart Energy Saving and Monitoring System (SESMS) was designed and developed to control the operations of indoor electrical appliances, especially in offices. SESMS is wireless and fully automated, and it reduces power consumption, particularly in high power consuming sectors, such as commercial and industrial areas. SESMS includes a monitoring system that can analyze the data collected from various conditions, thereby avoiding electricity wastage. The interface of the Monitoring Control System was designed to collect data easily and to show the information clearly to users. The collected data will display clearly and automatically in Microsoft Excel. The interface of the monitoring system indicates the status of every office according to the data collected.

Keywords: Fully Automated; Monitoring System; Smart Energy Saving System; Wireless.

1 Introduction

Technology has given way to useful inventions and has brought comfort and fulfilled the demands of daily living (Ford, Pritoni, Sanguinetti, & Karlin, 2017; Sorrell, 2015). However, these advancements have increased power consumption. To address this issue, technology plays an important role in generating the power needs of domestic and commercial users. Strong correlation is shown between increased wealth and increased energy consumption. Hence, to achieve the target, intention, or policy of reducing energy demand, measures are conducted at a global level(Sorrell, 2015). Increasing power usage has given way to labor intensive activities to reduce energy, but such activities will be effective in the long term.

Greenhouse effect has showed a big impact of destroying atmosphere slowly due to consume high energy consumption imprudently. One of the reasons of power consumption is to enhance life by raising the quality of living through using facilities more than necessary. Technologies providing opportunities for home energy management have been on the rise in recent years(Ford et al., 2017). A number of researchers and engineers have developed ubiquitous indoor network models. The ubiquitous indoor network models bring out the potential of smart home technology to deliver the benefits such as comfortable, convenience and even cost-saving in bills. Therefore, a smart energy saving system is proposed to address this issue. The proposed system is a reliable wireless indoor Smart Energy Saving and Monitoring System (SESMS) that solves the problem permanently. The smart energy saving system is fully wireless and automated, and it functions well without any remote control. Moreover, the system includes a monitoring system to show how much power has been used and to analyze how much power has been saved daily. This system is designed for the office area. Using a simple concept, the proposed system focuses on saving energy in every electrical appliance in the entire office area and is a better option for reliability than using a smart home system designed for homes and not offices.

2 Literature Review

The demand for smart home technology has been raised by users and motivated researchers to develop this technology. Ford and his colleagues(Ford et al., 2017) identified opportunities for energy savings (both behavioral and operational) as well as load shifting across most product categories, however, in many instances other potential benefits related to convenience, comfort, or security may limit the realization of savings. This is due to lack of information related to energy being collected and presented to users, as well as lack of understanding of how users may interact with the additional information and control provided. Ford et al.(Ford et al., 2017) recommends that users should be educated on ways to interact with technology at home and in the grid in a fully integrated smart home environment. Meanwhile, other related research stated that proper management of energy is necessary to address and manage issues of energy supply, demand, and pricing needs to support the economy(Azhar Fakharuddin, March, 2012). The management should be capable of monitoring electrical peak load effectively by using metering, display and communication layers with the utility. Nojeong et al.(Nojeong & Varshney, 2005) proposed an algorithm of distributed energy-efficient deployment is proposed through an algorithm for mobile sensors and intelligent devices to form an Ambient intelligent network. Their algorithm is evaluated in terms of several parameters to exhibit performance. These algorithms employ a synergistic combination of cluster structuring and a peer-to-peer deployment scheme. An energy-efficient deployment algorithm based on Voronoi diagrams is also proposed(Nojeong & Varshney, 2005). Performance of these algorithms is evaluated in terms of coverage, uniformity, and time and distance traveled until the algorithm converges. Our algorithms are shown to exhibit excellent performance(Nojeong & Varshney, 2005).

A smart energy saving system in the housing area or Home Automation System (HAS) enables power consumption management. According to Pandya(Bhavik Pandya, Mar, 2016), the smartphone interacts with the Arduino BT board to operate appliances in the housing area by running an Android application using a BT module to transfer signals. Users could then give a command via voice command sensing. Anitha(T.Anitha, Jan 2016) stated that a user-friendly interface, scalability and cost effectively could be achieved by the HAS when using an Android device with Wi-Fi as communication protocol and