Design and Implementation of IoT-Based Automation System for Smart Home

Waheb A. Jabbar*, Mohammed Hayyan Alsibai, Nur Syaira S. Amran, and Samiah K. Mahayadin
Faculty of Engineering Technology,
Universiti Malaysia Pahang, 26300 Gambang,
Kuantan, Pahang, Malaysia
*waheb@ump.edu.my

Abstract—Home Automation System (HAS) gains popularity due to communication technology advancement. Smart home is one of the Internet of Things (IoT) applications that facilitates the control of home appliances over the Internet using automation system. This paper proposes a low-cost Wi-Fi based automation system for Smart Home (SH) in order to monitor and control home appliances remotely using Android-based application. An Arduino Mega microcontroller provided with Wi-Fi module is utilized to build the automation system. In addition, several sensors are used to monitor the temperature, humidity and motion in home. A relay board is exploited to connect the HAS with home under controlled appliances. The proposed automation system, can easily and efficiently control the electrical appliances via Wi-Fi and Virtuino mobile application.

Keywords—HAS; Smart Home; IoT; Arduino; Virtuino

I. INTRODUCTION

Nowadays, the large diffusion of smart devices with embedded sensors and wireless interfaces have enabled the rapid advancement of Internet of Things (IoT). The IoT plays a remarkable role in improving the quality of life and growing the world’s economy. It facilitates global connectivity over the world-wide physical objects (e.g., sensors, RFID, smartphones, vehicles, appliances) to serve people in a collaborative manner automatically and intelligently. The vision for the IoT states that various “things” are going to be connected and will be controlled across the Internet. Application domains of IoT cover smart home, smart healthcare, smart grid, smart transportation, smart city, industrial automation and surveillance. Among various IoT applications, the design of Smart Home (SH) has drawn great attentions from both academic and industrial because it is more related to people’s lives [1-4].

A smart home can be defined in many ways. One definition is a home with an automated system that comprises sensors and device controllers to provide a comfortable, intelligence and secure system to improve the quality of life and control home appliances easily, in particular for elderly and disabled people. The SH automation system as shown in Fig. 1 may provide an interface between smart phone or personal computer and home appliances, via a wireless communication interface Bluetooth and Wi-Fi [5].

![Fig. 1 An example of smart home architecture](image)

There are many of the Home Automation Systems (HAS) that are commercially available and it can be categorized into two main categories: locally controlled and remotely controlled systems [6]. In the first category, users can control their home appliance using an in-home controller with a stationary or wireless communication technology (Bluetooth, Zigbee and GSM) for achieving home automation. In the second category, users can remotely control their homes over Internet connection using their mobile devices or personal computers. However, there are several issues involved when designing such automation system and it should be considered [7].

Home automation system should provide a user-friendly interface to allow setup, monitoring and controlling home appliance easily and efficiently. In addition, the automation system should be fast enough and provide reliable connection with acceptable data rate and communication range to realize the true power of wireless technology [8]. Finally, the system...