UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND IMPLEMENTATION OF INTELLIGENT HOME AND ELECTRICAL APPLIANCES CONTROL USING ANDROID AND WIFI TECHNOLOGY

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Industrial Electronics) (Hons.)

by

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DESIGN AND IMPLEMENTATION OF INTELLIGENT HOME AND ELECTRICAL APPLIANCES CONTROL USING ANDROID AND WIFI TECHNOLOGY**

SESI PENGAJIAN: **2014/15 Semester 2**

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Industrial Electronics) (Hons.). The member of the supervisory is as follow:

…….

(Mr Mohd Fauzi Bin Ab Rahman)

ABSTRACT

Currently, the advancement in technology makes people like to be easier in managing their life. Nowadays they more rely on technology when doing anything such as finding information and make something that make their life easier, example voice starter car and others. This project focuses on the controlling of home appliances remotely when the user is away from the house. The system is Android based to revolutionize the standard of living. This project is divided into two sections: the hardware and the software sections. The hardware section consists of smart phones as the controlling device, the power supply module and the control module. By using the Wi-Fi module, which is allows an electronic device to exchange data or connects using microwaves radio. The transmitter of Wi-Fi transmits the data given by the application using radio waves technology. The Wi-Fi works on radio waves technology, as the data to be passed through Wi-Fi is converted into the electromagnetic signal which is then sent using the antenna. This signal is received and decoded by the router at the receiving end. This signal is passed to the controller and operates the received information and performs operations on the appliances, which are driven by the driver circuitry to operate any of the connected appliances, it forwards to the microcontroller, and the microcontroller decodes the message, switch on or switch off the appropriate appliance. Overall, the work employs software and the signals to produce this product. The overall project will be applied with a constructed work, tested working and perfectly functional.

ABSTRAK

Pada masa ini, kemajuan teknologi membuat manusia lebih mudah dalam menguruskan kehidupan mereka. Pada masa kini mereka lebih bergantung kepada teknologi ketika melakukan apa-apa seperti mencari maklumat dan membuat sesuatu yang menjadikan kehidupan mereka lebih mudah. Projek ini memberi tumpuan dalam mengawal peralatan rumah secara kawalan jauh apabila pengguna berada jauh dari rumah. Sistem ini berasaskan system aplikasi Android untuk merevolusikan taraf hidup. Projek ini dibahagikan kepada dua bahagian: perkakasan dan bahagian-bahagian perisian. Bahagian perkakasan terdiri daripada telefon pintar yang bertindak sebagai peranti kawalan, modul bekalan kuasa dan modul kawalan. Dengan menggunakan modul Wi-Fi yang membolehkan peranti elektronik untuk menukar data atau menghubungkan dengan menggunakan gelombang mikro . Pemancar Wi-Fi menghantar data yang diberikan oleh aplikasi telefon pintar menggunakan teknologi gelombang radio. Wi-Fi berfungsi sebagai penghantar gelombang radio di mana data yang dihantar akan melalui isyarat kawalam ditukarkan kepada isyarat elektromagnet yang kemudiannya dihantar menggunakan antena. Isyarat ini diterima dan dinyahkod oleh router di bahagian hujung modul. Isyarat ini dialirkan kepada pengawal dan mengendalikan maklumat yang diterima dan melaksanakan operasi pada alat yang dipacu oleh litar pemandu untuk mengendalikan mana-mana peralatan yang berkaitan, Ia menghantarnya kepada pengawal mikro dan pengawal mikro menyahkod mesej, suis pada atau matikan perkakas yang sesuai mengikut arahan yang diberikan. Secara keseluruhan, kerja-kerja yang menggunakan perisian dan isyarat untuk menghasilkan produk ini.

DEDICATIONS

To my beloved parents, family members and friends.

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In The Name Of Allah, the Most Beneficent and the Most Merciful. A deep sense of thankfulness to Allah SWT who has given me the full strength, ability and patience to complete this Bachelor Degree Project as it is today.

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IDE	=	Integreated Development Environment
SDK	=	Software Development Kit
UteM	=	Universiti Teknikal Malaysia Melaka

CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter is the project background, objectives, problem statement, and scope of the project, general flowchart and project outlines in order to give an overall view of the project.

1.1 Background

Nowadays home is outfitted with many electrical home appliances that need to be controlled by people. However this may not be controlled by all the time because people may not be not at home all the time. We proposed a new technology so that the ordinary services of the mobile phones can be used to communicate with and control the home appliances. Here, the switch board of our regular use is replaced by Wi-Fi module which will communicate with microcontroller and the android based smart phone. The home appliances monitoring and controlling is done wirelessly through Android smart phone which user can monitor and can turns the ON/OFF the targeted electrical home appliances such as electrical fan and lamp remotely. The purpose of this project are for cost and energy saving.

1.2 Objective

The main objective of the project can be outlined as follows

- To design and fabricate a smart home system that is capable of monitoring and controlling the household appliances using Android application with the presence of Wi-Fi connection

- To evaluate and analyse the performance of the home controlling system and effective while using system.

1.3 Problem Statement

Nowadays, people are too busy in their daily routine and very often are away from home for working. Sometimes, they are forgotten to turn ON/OFF the appliances and as a result, the operation is put into operation for long hours. Thus, a project based on a microcontroller device using Android and Wi-Fi technology is developed. It can automatically control any electrical home appliances remotely using mobile phone. This project also can save cost and energy in daily life

1.4 Scope of Project

The main target of this project is to develop a system that can control and monitor the targeted home appliances by using Android and Wi-Fi technology. This project is focus on the users which have limited time and distance to control the home appliances when they are away from home since the users can control it by using mobile phone.

In order to build this project, the scope is developed within these areas:

1. Design and build the system which using microcontroller and the technology of Android and Wi-Fi.

2. Develop and analyse the controlling device.
3. Simulate the circuit and construct the circuit by using Proteus software.
4. Testing and troubleshooting.

1.5 General Flowchart

The appliances which are to be controlled are the interface with driver circuitry to microcontroller which is wirelessly connected to Wi-Fi that use Android based smart phone as controlling device. The appliances which are to be controlled is light on-off, controlling the speed of fan as well as on-off. The user can access the smart phone application and gives command to Wi-Fi module. The Wi-Fi module can processing router with help of electromagnetic signal which will processing microcontroller. The transmitter of Wi-Fi transmits the data given by the application using radio waves technology. The Wi-Fi works on radio waves technology, as the data to be passed through Wi-Fi is converted into the electromagnetic signal which is then sent using the antenna. This signal is received and decoded by the router at the receiving end. This signal is passed to the controller and operates the received information and performs operations on the appliances. The switching action can be take place with help of driver circuitry. The driver circuitry can control and manage the devices as per there required conditions. Devices can be on-off and senses by the driver circuitry.

The Figure 1.1 shows diagram which represents the activity diagram of system. It shows the process of flow of activities. Initially there are two modes of operations one is user mode and second is automatic mode.

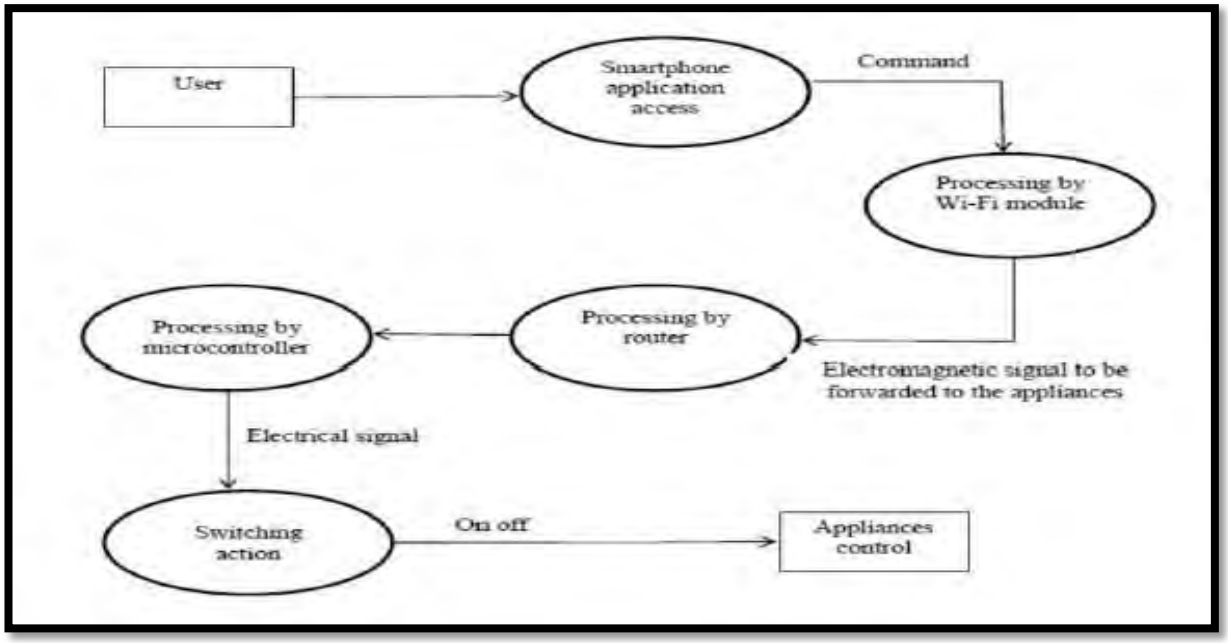

Figure 1.1: The Flowchart of The System

1.6 Report Outlines

The project is outlined as follows;

Chapter 1:

The first chapter is about the brief introduction and summary of idea of the project. It highlighted more on the overview of the project, the list of objectives, brief explanations on the problem statement, work scope and finally the project significant and expectations.

Chapter 2:

The background of the project is discussed in this chapter together with the methods, concepts, and related theory that were used in this project. The concept of the research and how it is the relationship between theories is also discussed in this chapter.

Chapter 3:

Chapter 3 is about the methodology section. In the methodology chapter, it illustrates the schedule or steps that needed to be completed in order to achieve the objective of the project. This chapter also explains the procedures taken in completing this project together with the project development are also explained in this chapter.

Chapter 4:

This chapter contains the result from the steps or procedure described in the methodology. The result that we have obtained will be analysing based on the objectives and problem statement.

Chapter 5:

Chapter five is described to the conclusion and the future recommendation associated with the achieved results. The result will be summarized in this section. All the simulation, data collection and analysis that were obtained from the project will be discussed in detail. The result was compared with the outlined objectives in order to state the hypothesis in obtaining the specific result and do the conclusion of the project.

1.7 Project Summary

This idea of this project started due to problem faced by people on wasting energy and cost to monitor the home and electrical appliances in turning ON or OFF the electrical appliances. From this project, the application created will become the user interface to help a person to control the fan and lamp switch remotely. Less movement required for them to perform this activity. This project will be implemented on basic electrical appliances such as lamp and fans in the house. In the

future, this project can also be installed widely in other places such as industrial building and hospital ward.

CHAPTER 2
THEORETICAL BACKGROUND

2.0 Introduction

In this chapter, the literature review which contains the information and ideas in completing the project is discussed. There are several sources that had been taken as a resource such as books, thesis, journal and website. It was included the operation of the circuit, the hardware and software which is useful in the project. Other than that, in this chapter also make a study about several projects that related to make some improvement or take some idea from the other project. It is useful to complete a project that has created.

2.1 Smart Home and Controlling System

The development of digital information has led the rapid change in human lifestyle. The use of electricity is very important as one of the main source of energy that is vital in today modern life. Some kinds of mechanism using available technology could be used to reduce wastage in electricity usage. Thus a prototype based on a microcontroller device using Android and Wi-Fi technology is developed. It can automatically control any electrical equipment at home remotely using mobile phone. Hence the electrical energy saving in daily life can be made more efficient and effective.

As the technology grows, Wi-Fi and Android technology has been widely accepted as a part of medium of communication (Akyildiz, Su, Sankarasubramaniam, & Cayirci, 2002). The purpose of using this technology is to provide widest coverage at minimal cost. Therefore the use of Android and Wi-Fi would facilitate in controlling the electrical device at home from long distance and low in maintenance

and independent from any physical geographical boundary. Thus this project is proposed to develop a system is to facilitate the home owner to optimize usage of electricity remotely using smart phone with the presence of internet connection.

Lights and other electrical appliances turned on continuously and it leads to energy waste. Thus this research is carried out to provide a mechanism through the development of a prototype to provide a service to the home owner to optimize the usage of electricity through remote control using Android services. The followings are the objectives of the research project to ensure it meets the aim. (J, Lathkar, & B, 2014)

2.2 Research from Previous Project

Research from other previous projects was needed to complete this project. It was useful to upgrade the system that has been demonstrated before. Other than that, some other technologies that has been used in this project can get help from others study in this field to know the function and to master on technology that used in this project.

One of the systems is wireless Bluetooth technology implemented on home automation system by (Lee, Chuah, & Chieng, 2013). The system was implemented by using Bluetooth module for controlling the home system. The next project is Ubiquitous home control and monitoring system by using Android and smart phone but using the technology of (IoT) and was proposed by (Kumar, 2014). This project is based on various wireless technologies that can support some form of remote data transfer, sensing and control such as Bluetooth, Wi-Fi, RFID, and cellular networks. The next research is the home system project that use the technology of Radio Frequency Identification (RFID) by (Darianian & Michael, 2008). The project introduces RFID reader system architecture for a home comprised of several readers in master slave architecture using network connectivity like WLAN RFID reader to read the identification information from the tags and exchange it with the back-end system for further processing.

Based on the mentioned literature review, there are a few flaws and disadvantages of these previous projects. For wireless Bluetooth implemented home automation system, there is limited range of connectivity since the effective area under control from a Bluetooth module is 100 meters in diameter (J et al., 2014). While for Ubiquitous home controlling system, which the system use the combination of a of Bluetooth and GSM technology, the disadvantages of these systems are twofold. Firstly, a high end personal computer has been utilized which not only increases the cost of installation but also increases the energy consumption. Secondly, development and hosting of web pages which also add to the cost. And the advantages of using GSM is users have to remember different AT commands to control the connected devices proposed mobile IP since that the users are not provided with a graphical user interface . The last disadvantage for project that use RFID is it is also limited as they work only with reading distances up to 5cm. But they are currently still too large, heavy and consume too much power compared to the mobile devices of today and are not very stylish for home environment and therefore not suitable for resilient long day usage. (Darianian & Michael, 2008).

2.3 Hardware and Software Review

This part is to review the hardware and software that will be used on this project. This part is very crucial as it explain some ctitical informations regarding parts and components for the hardware and some knowledge with the regards to the software.

2.3.1 Smart Phones as Controlling Device

A smartphone is a mobile phone with an advanced mobile operating system. They typically combine the features of a cell phone with those of other popular mobile devices, such as personal digital assistant (PDA), media player and GPS navigation unit. Most smartphones have a touchscreen user interface and can run third-party apps, and are camera phones. (Nusca, 2011). Smart phones gives the opportunity to the developers to create new applications for the advance smart phone usage (Hwang, 2012). According to a study made, smart phone