



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Controlling Home Appliances By Using Bluetooth

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Computer Engineering Technology (Computer Systems) with Honours.

by

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BLUETOOTH**

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APPOROVAL

This report is submitted to the Faculty of Engineering Technology (FTK) of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the Bachelor Degree of Engineering Technology Computer Engineering Technology (Computer System) with Honours. The member of the supervisory is as follow:

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(DR Jamil Abedalrahim Jamil Alsayaydeh)

ABSTRACT

This report proposes the developing system with low cost that allows users to interact with appliances by controlling the home appliances using Bluetooth. Today's world without a smart phone is very complex. As a result, we have combined the Bluetooth module with the smart phones and provide simple user interface, rather than complex number of switches which we have seen in many areas of our houses. Controlling the appliances at home based on smart phone is more useful for the users to control home appliances including the fan and light switches at home. User can control home appliances easily by smart phone via Bluetooth connectivity because all smart phones come with the ability to communicate over the cellular networks, and built-in short-range communication capabilities, such as Bluetooth, that could allow them to communicate and control appliances in their surrounding environment. This paper combines the software and hardware of Android, Bluetooth module and smartphones which are three powerful technologies to develop a system that can access the control unit to turn ON and OFF the devices. This article describes in detail about the design and implementation of the control system.

ABSTRAK

Laporan ini mencadangkan sebuah sistem yang membangun dengan kos yang rendah dan membolehkan pengguna berinteraksi dengan menggunakan peralatan untuk mengawal peralatan rumah menggunakan Bluetooth. Dunia hari ini tanpa telefon pintar sangat kompleks. Oleh itu, kami telah menggabungkan modul Bluetooth dengan telefon pintar dan menyediakan antara muka pengguna yang mudah, dan bukannya bilangan suis yang kompleks yang kami lihat di banyak kawasan rumah kita. Mengawal peralatan di rumah berdasarkan telefon pintar lebih berguna bagi pengguna untuk mengawal peralatan di rumah, termasuklah kipas dan suis lampu apabila di rumah. Pengguna boleh mengawal peralatan rumah dengan mudah melalui telefon pintar melalui sambungan Bluetooth kerana semua telefon pintar mempunyai keupayaan untuk berkomunikasi melalui rangkaian selular, dan keupayaan komunikasi jarak jauh yang terbina dalam, seperti Bluetooth, yang membolehkan mereka untuk berkomunikasi dan mengawal peralatan di persekitaran mereka. Kertas ini menggabungkan perisian dan perkakasan Android, modul Bluetooth dan telefon pintar yang merupakan tiga teknologi yang kuat untuk membangunkan sistem yang boleh mengakses unit kawalan untuk menghidupkan dan mematikan peranti. Artikel ini akan menerangkan secara terperinci tentang reka bentuk dan pelaksanaan sistem kawalan.

DEDICATION

I would like to dedicate my thesis to my beloved parents, siblings and friends.

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LIST ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

PIR sensor	-	Passive infrared sensor
IR sensor	-	Infrared sensor
USB	-	Universal serial bus
DC	-	Direct current
FTDI	-	Future technology devices international
EEPROM	-	Electrically erasable programmable read-only memory
IDE	-	Integrated Development Environment
LED	-	Light emitting diode
OS	-	Operating System
PCB	-	Printed circuit board
PWM	-	Pulse Width Modulation
ICSP	-	In-circuit serial programming
CMOS	-	Complementary metal–oxide–semiconductor
RISC	-	Reduced instruction set computer
AVR	-	Automatic Voltage Regulator
SRAM	-	Static Random Access Memory
UART	-	Universal asynchronous receiver-transmitter

CHAPTER 1

INTRODUCTION

1.0 Introduction

The main concepts and development of the controlling home appliances by using Bluetooth are provided in this chapter. In this chapter, the explanation of the project background, problem statement, objectives and project scope will be made up into few parts. Moreover, explanation about this project system and how the system working will be explained in this chapter. Besides that, the very beginning of the preparation for this controlling home appliances using Bluetooth connectivity will be explained also in chapter one. This section is also important for the user because it will be the guidelines for the users. The developer also can achieve the desired goals based on the sections included in this chapter with the clearly specified statement stated.

1.1 Project Background

An electronic system is an electronic circuit and component are designed for completing either simple function or complex function for the home automation architecture. Telecommunication system, computer system and automation system are the examples of electronic systems. The automatic control is used in various control system that can help to minimize the involvement of human work and saving the energy consumption, because it uses the technique of self-moving processes to do the work.

Home automation is one of the first projects one thinks about when want to make the life easier, comfort and to save the energy at home because it involves the control and managing the home equipment such as lighting, home appliances and etc. Because nowadays, there is a continuous need for automatic appliances at home, so that home automation that also known as Domotics is develop for the home. This is because we press switches dozens of times a day, sometimes when our hands are full and we often forget to turn off the lights that will consumes more energy and effect the electric bill budget. The user can control the equipment connected to the system by using a smartphone, a tablet or a personal computer, through Bluetooth or Internet.

Furthermore, there are very few worldwide accepted industry standards and the smart home space that heavily fragmented when there are many competing vendors. Bluetooth is one of the popular communication protocols for the product that used in the home automation because it avoid new cable to used and the manufacturers often prevent independent implementations by withholding documentation and by litigation. Wired or wireless technologies can support the communications between the systems to working. An upgrade Bluetooth that is designed to reduce the power consumption and the comparison of the short-range wireless technology permitted to evaluate if the Bluetooth is a good alternative, due to its low power consumption, low cost and its general availability in tablets and smartphones, which can be easily used to control and monitor the all system.

This presents a project of controlling home appliances such as lamps and fans with the goals are to design a simple, low-cost system and widely use in future. The function of automation home appliances is to help the person to save the electric bill consumption to eliminate the situation of forgetting to switch OFF the lamps and fan if it remains ON unnoticed for long periods. This application system that plan to be implement will solves the problem of electricity wastage by switching ON and OFF the home appliances by using the Bluetooth if there no one at home, so that we can enhance the power efficiency and improve the quality of living. The system be able to control home appliances such as fans and lamps in their house. Using the android application that is installing to the smartphone, the users can switch ON or OFF the home appliances remotely. Some of these studies focused on predicting the probability that people will switch lights ON or OFF (Boyce et al., 2006, Lindelof and Morel, 2006).

Moreover, with the combination of software and hardware, we can control the home appliances such as lamps and fan that connect to Bluetooth module. The Arduino are a series of kits which combines of software and hardware which gives the ability to turn ON and OFF the home appliances. In this project, Bluetooth is used to control the home appliances and a series of programming will be applied to the Arduino boards that will make the lamps and fan to turn ON and OFF when there is nobody at home, The coded signals that are programmed to operate appliances and electronic devices are sent through the home wirings to switches ON and OFF in every part of the house.

1.2 Problem Statement

Problem today is the waste of energy resources in home. Energy is limited but most of us forget that energy is ready to use in great amount. In our lives, we count on energy for almost entirety in what we do. We desire to make our lives easy, comfortable and, productive. Unluckily, we have begun taking things for accepted and caused use the energy without thought begun unnecessarily, that because what we do not realize about the situation and just want the quality of our life to be maintained. We must use the energy resources wisely and always try to save the electrical power because the recourse is very important for us later. According to Gandhiji cited in Banerjee, (2015) “The earth provides enough to satisfy every man’s needs but not every man’s greed”. This is because one of the biggest motivators people have for conserving electricity in their homes is the accumulated savings in their energy bills at the end of the year. There are other reasons why conserving electricity is important beyond the impact on financial budget. We not only can cause to the depletion of natural energy that used to generate electricity, we also can make the electricity bills to increasing higher.

Human attitudes is one of the factor that contributing to the higher electric power consumption due to the wasting electricity become a habit which lead to the lack of awareness towards energy saving. Most of the people nowadays tend to forget to switch OFF the lamp and fan when leaves they house because it is already become a part of their behaviour. Based on what Ranjit et al, (2009) stated that, there are many cases where the consumers forgot to switched OFF the lamps when they come out from the washroom especially children and teenagers. The use of electricity continuously in the washroom without any occupant could lead to the energy wastage. According to Tzempelikos et al, (2010), Occupant switching behaviour is complicated and it depends, except for the individual personality, on the available daylight, time of the day, type of electric lighting, type of switch and location relative to the closest windows.

The light control system of the application can provide an applicable application for both home utilization and for commercial building purposes. The controlling home appliances such as lamps comes with the application where the light could be switched ON and OFF by using the Bluetooth connectivity. The benefits of using Bluetooth connectivity in our daily life can minimize the involvement of people to turn ON and FF the switch, besides of the location of the power switch at the certain places is different and sometimes hidden lead to the problem occurrence towards the visitors. The visitors does not need to find the switch when want to use the bathroom because the use of power switch is not consumable. In this digital word we need every possible thing around us to be automatic which reduces human efforts. To save the energy, the uses of Bluetooth connectivity will help to turn OFF the lamps and fan when the person leaves the houses. Recent studies have dealt with the problem of identifying occupant light switching preferences. By using this circuit there is an advantage of preventing unwanted electric power wastage and save the electricity when there is no occupant in the houses.

Regarding to the problem, a new application for controlling the home appliances is create to save the energy consumption. This new application for controlling home appliances is capable to manage electric power consumption, without worrying the electrical bills. The development of this application is to provide a user friendly application that capable to saves electric power consumption. Through the idea of controlling home appliances such as lamps and fans, it is hoped that the product will be a great way for people to save their electric power consumption. By involving the Arduino, it works as a microcontroller for this project and it needs specified code of programming to run it. The Arduino can resolve the problem of having complicated circuit and it is also more suitable device to be used for control system.

1.3 Objectives

The aim of this study is:

1. To prepare a circuit that suitable for the application of home automation.
2. To test and characterize the home automation using Bluetooth module.
3. To control home appliances such as lamp and fan by using Bluetooth connectivity.

1.4 Scope

Based on the objectives, the scopes of study are highlighted as follows:

1. To control home appliances system such as lamps and fan that using Bluetooth connectivity when a person that inside the house.
2. This system can be applied at the household because it can save the electrical power by using Bluetooth to switch ON and OFF the appliances systems inside the house.

CHAPTER 2

LITERATURE REVIEW

2.0 Area of Project Study

The developer have to study on several ideas of the development for this project in this chapter. First, the developer must studies about the controlling home appliances using Bluetooth that include the common idea of the android Bluetooth connectivity and the appliances systems, with its applications development tools. Besides that, the functionality of the hardware tools and the combination of the software application are needed to complete the project.

2.1 Home appliances

2.1.1 Manual home appliances

For the manual lighting control, the controller operates like a regular switch. In this manual mode, the occupants just simply press the main button to turn the lamps ON or OFF (Bath et al, 2009). Electrical appliances, such as lights are generally need to be installed as fixtures, with permanent connections rather than plugs and sockets. The lighting for lamps is depending on the occupants to control the switch whether to turn the lamps ON or OFF. The manual home appliances system can save energy by reducing the amount of time that the light is ON. Occupants must manually turn the light and fan ON and can turn it OFF manually as well. The occupants must turn ON the switch if want to enter the room. With the flexibility given, the occupants can control the lighting system according to their satisfaction. So the occupants can save the energy because the system allow the occupants to turn ON and OFF the light and fan when not required. If occupants forget to turn the lights and fan OFF, it will cause a waste of electricity and increase the electrical bills.

2.1.2 Automatic home appliances

Automation plays an increasingly important role in the world economy and in daily life. Automatic systems are being preferred over manual system (Sindhu et al, 2016). The energy consumption is inevitable for providing a comfort working environment to maintain the quality of the production activities. One solution to save energy without decrease comfort levels is lighting control. Lighting control systems are widely used on both indoor and outdoor lighting of commercial, industrial, and residential spaces. Lighting control systems serve to provide the right amount of light where and when it is needed. Lighting control systems also to maximize the energy savings and the occupants can have more comfort in their house by switching the lights automatically because the automatic system can minimise the manual work.

2.2 Classification of Android

For this project the developer has chosen the Android as progress stage. This is because Android being used by mostly community now presently as the operating system in their smartphone. Besides that, in 2007 Android was the first introduced by Google, based on the Linux Kernel. After the sugary treat, the Google Android OS give name for each major of the Android OS in alphabetical order. In September 2008, Android 1.0 the earliest Android version is that being released and version 1.1 in February 2009. After that, Android "Cupcake" release of Android 1.5 in April 2009 that being developed by Google. By the situation, Google start to name Android version follow a desert name that was in alphabetical order. Android 2.0 that known as Eclair was released due to rapid development in 2009. Then, the other version of Android are shown in Figure 2.4: Android version history.

Code name	Version number	Initial release date	API level	Security patches ^[1]
(No codename) ^[2]	1.0	September 23, 2008	1	Unsupported
(Internally known as "Petit Four") ^[2]	1.1	February 9, 2009	2	Unsupported
Cupcake	1.5	April 27, 2009	3	Unsupported
Donut ^[3]	1.6	September 15, 2009	4	Unsupported
Eclair ^[4]	2.0 – 2.1	October 26, 2009	5 – 7	Unsupported
Froyo ^[5]	2.2 – 2.2.3	May 20, 2010	8	Unsupported
Gingerbread ^[6]	2.3 – 2.3.7	December 6, 2010	9 – 10	Unsupported
Honeycomb ^[7]	3.0 – 3.2.6	February 22, 2011	11 – 13	Unsupported
Ice Cream Sandwich ^[8]	4.0 – 4.0.4	October 18, 2011	14 – 15	Unsupported
Jelly Bean ^[9]	4.1 – 4.3.1	July 9, 2012	16 – 18	Unsupported
KitKat ^[10]	4.4 – 4.4.4	October 31, 2013	19 – 20	Supported; ^[11] See clarification
Lollipop ^[12]	5.0 – 5.1.1	November 12, 2014	21 – 22	Supported
Marshmallow ^[13]	6.0 – 6.0.1	October 5, 2015	23	Supported
Nougat ^[14]	7.0 – 7.1.2	August 22, 2016	24 – 25	Supported
Oreo	8.0	August 21, 2017	26	Supported

Figure 2.1: The history of the Android version