

WIRELESS SWITCHING CONTROL FOR HOUSEHOLD APPLIANCES

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WIRELESS SWITCHING CONTROL FOR HOUSEHOLD APPLIANCES

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**A report submitted
in partial fulfilment of the requirements for the degree of
Bachelor of Electrical Engineering with Honours**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I declare that this thesis entitled “WIRELESS SWITCHING CONTROL FOR HOUSEHOLD APPLIANCES” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

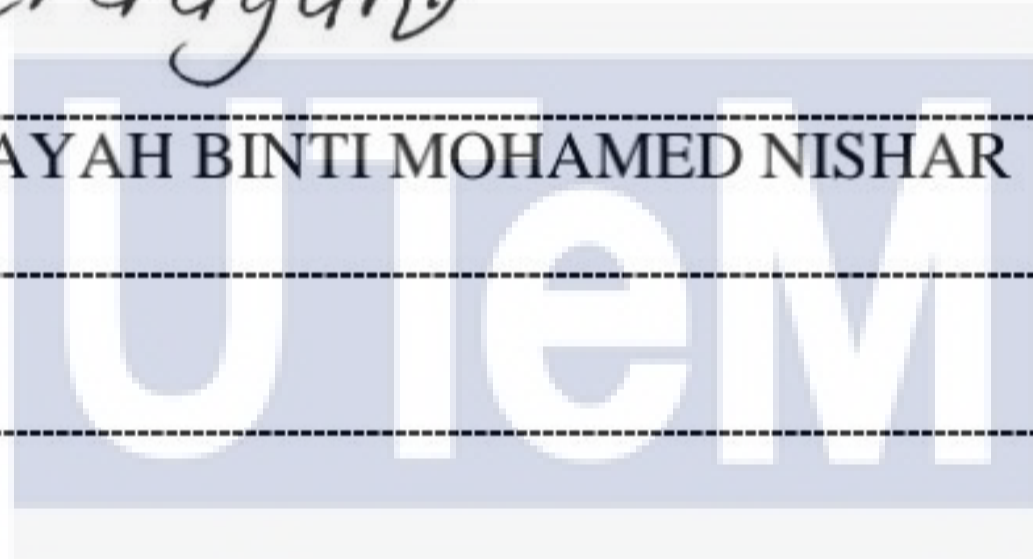
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APPROVAL

I hereby declare that I have checked this report entitled “WIRELESS SWITCHING CONTROL FOR HOUSEHOLD APPLIANCES” and in my opinion, this thesis it complies the partial fulfillment for awarding the award of the degree of Bachelor of Electrical Engineering with Honours

Signature



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4/7/2021

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DEDICATIONS

To my beloved mother and father.



ACKNOWLEDGEMENTS

In the name of Allah, the Most Gracious and Most Merciful. Alhamdulillah, all praises to Allah for the strength and His blessings for me to complete my final year project and report..

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ABSTRACT

In today's world, with the major progress of the social economy, more and more appliances have been introduced in our household. The growth of these appliances have brought limitations and fading of the full-time domestic maids and the desire to lessen the time-consuming activities in tracking of more useful time. Although, these appliances have been introduced in reducing time and energy, it is still a problem in managing and controlling these various appliances more efficiently and conveniently in order to accomplish more comfortable, relaxing and great space at home. This project is introduced to bring out answer for the above issue using the current technologies of internet of things (IOT). This project presents an application of an microcontroller based on IOT to produce a wireless switching control for household appliances to control and automate certain appliances at home. This system uses an arduino that is cheap, energy saving on a chip microcontroller, with intergrated Bluetooth (BT) and Wi-Fi connection known as ESP32 that connects to the relay to control the turning ON and OFF of the load appliances together with an Light Dependent (LDR) sensor module to control some switching appliances based on the sensor. Utilizing the wireless control system for household appliances leads to a more efficient, energy saving and a safe environment.

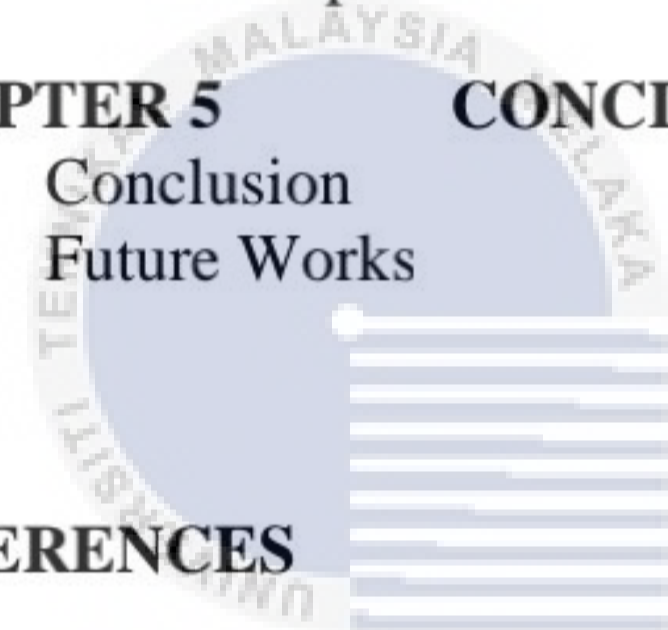
ABSTRAK

Di dunia hari ini, dengan kemajuan besar ekonomi sosial, semakin banyak perkakas elektronik diperkenalkan di rumah kita. Peningkatan peralatan ini telah membawa batasan dan pengurangan pembantu rumah sepenuh masa dan juga ia mengurangkan aktiviti yang memakan masa. Dengan masa tersebut, pelbagai aktiviti lain yang lebih berguna boleh dilakukan. Walaupun perkakas ini telah diperkenalkan untuk mengurangi waktu dan tenaga, ia masih menjadi satu isu dalam mengurus dan mengendalikan peralatan tersebut dengan lebih efisien and senang untuk mencapai suasana yang lebih nyaman, santai dan baik di rumah. Maka, projek ini diperkenalkan untuk mencadangkan penyelesaian untuk masalah di atas dengan menggunakan teknologi internet of things (IOT) terkini. Sistem ini menyajikan aplikasi mikrokontroler berdasarkan IOT untuk menghasilkan kawalan pensuisan tanpa wayar untuk perkakas rumah tangga dan mengautomasikan sesetengah peralatan di rumah . Sistem ini menggunakan arduino kos rendah, kuasa yang sangat rendah pada mikrokontroler cip, dengan Wi-Fi dan bluetooth mod dwi yang dikenali sebagai ESP32 yang menghubungkan ke relay untuk mengawal hidup dan mati beban perkakas bersama dengan modul sensor Light Dependent Resistant (LDR) untuk mengawal peralatan beralih berdasarkan sensor. Dengan menggunakan sistem kawalan tanpa wayar dan automasi sistem untuk peralatan rumah tangga, ia membawa kepada persekitaran yang lebih baik dengan penjimatan tenaga, selesa dan selamat.

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LIST OF SYMBOLS AND ABBREVIATIONS

COVID19	-	Corona Virus Disease 2019
FYP	-	Final Year project
UTeM	-	University Technical Malaysia Malacca
BT	-	Bluetooth
IoT	-	Internet of Things
WPAN	-	Wireless Personal-Area Network
WLAN	-	Wireless Local Area Network
WMAN	-	Wireless Metropolitan Area Network
WWAN	-	Wireless Wide Area Network
AC	-	Alternating Current
DC	-	Direct Current
MCU	-	Microcontroller Unit
MCB	-	Miniature Circuit Breaker
IDE	-	Integrated Development Environment
OLED	-	Organic Light-Emitting Diode
LDR	-	Light Dependent Resistor
DHT11	-	Digital Temperature and Humidity Sensor
CNN	-	Cable News Network
ARM	-	Advanced Risc Machines
GPIO	-	General Purpose Input/Output
PWM	-	Pulse Width Modulation
VCC	-	Voltage at the Common Collector
GND	-	Ground
LDR	-	Light Dependent Resistant (LDR) sensor module
NC	-	Normally Close
NO	-	Normally Open
COM	-	Common
USB	-	Universal Serial Bus
URL	-	Uniform Resource Locator

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CHAPTER 1

INTRODUCTION

1.1 Motivation

In modern times, one of the most life-changing technology trends over the past decade is the accessibility and expanded expectation of ubiquitous connectivity. It can be in many ways from making a conversation to someone, using the maps, browsing the internet, turning on switches wirelessly and many more in which we can now do it wirelessly regardless of location, time and other circumstances [4].

In a general way wireless network are networks connected without the use of cables. There are several types of wireless switching network already been introduced in today's technology and it can be used in various function depending on it's motive of usage. Some of the wireless network includes wireless personal-area networks (WPAN) which is used in a range to reach a person. Example of this network is Bluetooth. Secondly, wireless local area network (WLAN) is used within a building or campus and the example of this network is Wi-Fi. Thirdly, wireless metropolitan area network (WMAN), linked within a city and the example of this network is WiMAX. Finally, it is the wireless wide area network (WWAN) which carries the range of worldwide and provide connectivity over a wide geographical area. The example for this network is (Cellular- UMTS, LTE, etc.)

The motivation of this project is to design and create using the available networks to create a switching control wirelessly at home. Wireless switching control for household appliances is a convenient home control in which devices and appliances

can be automatically controlled remotely from anywhere as long there is an internet connection where the WLAN network is used in developing this system. Besides, the WPAN network which is by using the Bluetooth system can also be installed in the house control system as an additional feature in the control system itself.

The idea of this project is to allow the occupier of the house to control appliances remotely just by using a smartphone or a tablet with internet connection. Figure below shows some examples of home appliances where the switching control can be controlled wirelessly by using the current advanced network. Figure 1.0 shows some examples of home appliances such as an AC power socket, a fluorescent lamp and an iron box.



Figure 1.0: Example of home appliances.

Besides appliances from figure 1.0, many other house appliances and devices can be controlled wirelessly through this project. In general, control system is used to maximize the productivity of an appliance and boost the performance of a device. The

use of automatic equipment in a manufacturing that is known as automation is important to achieve high-quality products and raise productivity.

Wireless entry control reduces the extra expenses related with the installation of the device and extra wiring. It also reduces the need for continued care and maintenance. In terms of comparison of the hardware based system, wireless control is much easier and requires less hardware for adequate coverage.

1.2 Problem Statement

There are lots of drawbacks with the old switching control in which switches are controlled manually. Although in a way controlling house switching system manually may seem not an issue, but it will somehow be an issue one day when we are facing reality problem in which everyone wished the control system at home was wireless and automatic. Manual system connection simply can put on pressure on people on controlling their house switching system during emergencies. At home it is all easy to accidentally switch appliances ON or even forgetting in OFFING appliances which will simply lead to the transparent waste of electron juice, the consequent rise on electric bill, and definitely leave the home in risk of fire.

Manual switching system does takes an extra effort and physical movement to turn ON or OFF the switching systems. Besides accidental issues, the manual switching control can be a hustle for old aged people to turn ON their appliances whenever they need. Some old aged people who do not have anyone by their side, might find it a big troublesome in turning ON or OFF their switching appliances at home on their own. To those people who takes care old aged people at home will

slightly feel disturbed in controlling the switches for them as they might to control all the time for them.

In order to overcome this issue, the wireless and automated switching control is introduced. This switching control is the ability to control house switch remotely. The power of being able to control house functions from distance should never be underestimated. There are so many things can be controlled away from home with this wireless switching control. For example, during hot days, it is possible to control our house air conditioner by turning it ON earlier to become cooler in just perfect time before we reach home from work. Besides, the most important role of this system is to be able to check to see if we left any of our home appliances on when we are away from home, with this we are able to turn it OFF using the wireless switching control system. Other than that, when we are in hurry to get a meal done, we are able to preheat the oven earlier and proceed our cooking as fast as possible.

This project, wireless switching control for household appliances, makes us so convenient by just managing all of our house devices from one place. Being skilled to keep all of technology in our house connected through one interface is a huge progress for technology and home management. Theoretically, all we have to do is just learn how to use that one single application on our smartphones or tablets, and we can easily control multiple function of home appliances from one place.

Next, the problem in nowadays people are they easily forget to do things. Many of them are noticed to even forget to turn OFF what they have turned ON or even due to laziness, they leave it as it is. When a person enters a room, he or she might remember to ON the light but not the fan. This is because the output of fan is air and

it is something lately only to be noticed compared to seeing or hearing something. Same goes to turning OFF of the fans in a room, people might easily forget to turn it OFF. Thus, this project is created to turn ON and OFF fan automatically based on the light sensor. In this way, energy and money is saved a lot in a household.

Finally, this system benefits every consumer in a way, and it also brings peace of mind anytime and anywhere they are. As technology development continues to enlarge, so will the possibilities for consumer home wireless switching control to make life more convenient and pleasurable.

1.3 Objectives

The objectives of this project are:

- 1.) To design a smart control system for house appliances in the easiest way that can be used to remotely switch ON and OFF using Blynk application from any devices and automatically switch ON and OFF basic appliance at home based on the light intensity from anywhere and anytime in conjunction with the smart home system.
- 2.) To be able to gain understanding in the programming coding, and use it on the software called Arduino IDE to run the hardware of the system on the microcontroller board.
- 3.) To be able to read and control appliances based on the light intensity condition using the Light Dependent Resistant (LDR) sensor in

order to control appliances such as fan or curtains or any other applications.

- 4.) To analyze the Light intensity detected by the LDR sensor module in order to ON and OFF appliances automatically such as Fan, Curtain and others.

1.4 Scope of Project

Firstly, this project is designed as a prototype model. The main reason why this project is constructed as a prototype model is because since it is a wireless switching control for household appliances, it requires house wirings in order to achieve this system. Thus, this project will be demonstrated as a proto-type model. Besides, prototyping ensures a close communication between the product design and the desired results. With proto-typing, design faults can be spotted and detected at the early stage in the development process of this project. Creating prototyping model is a great plus point in the project as a few implementations and benchmark can be conducted on project. It is easier to notice and analyze project performance and make a wise decision.

Secondly, this project will be focusing on controlling household appliances remotely and automatically on selected electrical house appliances such as lights, fan, automatic curtain

Next, the number of loads of this project is limited to the number of relays introduced in this project. Relay modules are used in this project because it has a small input relay in which it is suitable to be connected to the Arduino board, esp32.

1.5 Thesis Outline

This report has a total number of 5 chapters. The first chapter of this entire report is the introduction to my project that consists of Motivation, Problem Statement, Objectives and the Scope of my project. This chapter briefly explains about the background of the idea of this project and what are the factors that lead to the creation of this project. The next chapter is called Literature Review. This chapter is created in order to gain some ideas on what is the project is going to be about and have some reference and little guidelines throughout conducting the project. The third Chapter of this paper is, Methodology. This Chapter discusses on the steps and methods carried out in order to create this project. Besides flow chart of work as well as a Gantt chart created in table form for the project planning will be illustrated in this report. The fourth chapter is the results and discussion chapter. This chapter presents the final result and the discussion related to the results obtained for this project. The final chapter of this report for this project is the Conclusion. Some future works related to this project are also recommended at the end of the report.

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CHAPTER 2

LITERATURE REVIEW

2.0 Literature Review

This chapter focuses on the reviews of previous researches done on the topic of Wireless Switching Control for Household Appliances.

2.1 Introduction on Wireless Switching System using IOT

Wireless switching control system is a system that is controlled by a far-off system in conjunction with the home automation system (HAS). In order to permit and operate various way of communication of the house appliances remotely, a mechanism for the desired system has to be created. Appliances such as toast machine, lights, fan, oven, charger and many others can be controlled remotely through this mechanism with ease. The control method of these appliances is through a wireless application management protocol installed in any smart gadgets in this world such as handphones, tablets, laptop, and many others. User will demand their desired command and the house appliances receives and perform the command [1].

There are many examples on how suitable and convenient on how life can lead through this mechanism. One of the examples is, most of the people on earth tend to charge their phones, tablets or even laptop at night in which it is the proper time to do so because it is not in use. Charging may take hours and people do not wish to stand near the charge point in order to switch it off once it is done charging as charging excessively may lead to overcharge of the device. In addition, most people tend to charge their