UNIVERSITI TEKNIKAL MALAYSIA MELAKA

THE DEVELOPMENT OF AUTOMATIC SWITCH USING MICROCONTROLLER

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

by

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FACULTY OF ENGINEERING TECHNOLOGY
2017

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **The Development of Automatic Switch Using Microcontroller**

SESI PENGAJIAN: **2017/18 Semester 1**

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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 Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

……

(Mohd Firdaus Bin Mohd Ab. Halim)

ABSTRAK

Automatic Switch (AS) adalah sebuah sistem yang menggabungkan rangkaian komunikasi yang menghubungkan peralatan elektrik dan perkhidmatan yang membolehkan system ini dikendalikan dan dipantau dari jarak tertentu di berbagai tempat. AS adalah pendekatan yang berbeza untuk mencapai pelbagai objektif untuk membantu pengguna menguruskan bil elektrik mereka. Dalam masalah ini, AS terdiri daripada dua sistem iaitu *Wireless Switch* (WS) di mana ia dikawal dengan telefon bimbit yang mempunyai sistem Android dan *Mechanical Switch* (MS) dikawal dengan alat kawalan televisyen. Reka bentuk system adalah berdasarkan kepada perisian Arduino, perisian Proteus untuk simulasi, pelbagai pasif dan komponen aktif dan juga perkhidmatan internet yang digunakan dalam system ini. Masalah ini membentangkan pelaksanaan perkakasan bagi system kawalan multiplatform untuk automasi rumah dan menggabungkan kedua-dua teknologi perkakasan dan perisian. Keputusan sistem menunjukkan bahawa ia boleh diklasifikasikan bertindak sebagai peranti palam dan mainan, sistem yang selesa, selamat, swasta, ekonomi dan selamat selain fleksibiliti dan kebolehpercayaan yang besar.

ABSTRACT

Auto Switch (AS) is a system incorporating a communication network that connects the electrical appliances and services allowing them to be controlled and monitored from a certain distance at various places. AS is a different approach to achieve multiple objectives range in order to help users to manage their electricity bills. In this paper, AS consist by two systems which is Wireless Switch (WS) where it controlled with Android phone and Mechanical Switch (MS) is controlled with remote. The system design is based on the Arduino software, Proteus software for simulation, multiple passive and active components and also a wireless internet services which is used in different monitoring and control processes. This project presents the hardware implementation of a multiplatform control system for house automation and combines both hardware and software technologies. The system results shows that it can be classified act as a plug and play devices, comfortable, secure, private, economic and safe system in addition to its great flexibility and reliability.

DEDICATION

To my beloved parents

Mr.Rosmi and Mrs.Azizah

Who was raised me

Love you both

ACKNOWLEDGEMENT

I would like to express my appreciation for those who help me to accomplish my project especially to my supervisor Mr Mohd Firdaus bin Mohd Ab. Halim for guiding me through the whole process of this project and thanks for those who are contributed in giving me ideas, encouragement and helped to coordinate my project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

AS	-	Automatic Switch
App	-	Apparatus
AC	-	Alternating Current
GND	-	Ground
Hz	-	Hertz
IR	-	Infrared
LED	-	Light-emitting diode
MIT	-	Massachusetts Institute of Technology
MS	-	Mechanical Switch
PIR	-	Passive infrared sensor
TV	-	Television
USB	-	Universal Serial Bus
V	-	Voltage
WS	-	Wireless Switch

CHAPTER 1
INTRODUCTION

1.0 Introduction

The advances in the technologies related to wireless communication has led to the emergence of several engineering designs to aid the human requirements. Nowadays the vital part in our daily life is modern technology. Modern technology has made the requirement for information flow to be quick and effective. Day by day people are become more reliant on science and technology. Today, mobile phone is an element and useful devices of our daily life.

In this project, describe how to control and designing an Automatic Switch (AS) which act as plug and play device that control system which is based on microcontroller. AS consist of two parts which is first part Wireless Switch (WS) is about a system which can turn on and off a lamp wirelessly within shortage range by using mobile phone through Bluetooth device at range of 10 meter while the second part Mechanical Switch (MS) is about a system that can control electrical appliances with a certain type of switch remotely. AS can control every electronic and electrical devices of our home like light, fan, AC, door, water tank switch etc. It can apply this system in any big office, industry, shop or university, classroom and home.

WS came up with this idea of developing a simpler, multipurpose, cost effective design to control the on-off mechanism of various devices in the field via android. WS is the concept of controlling and automating the use of home appliances and other electrical equipment, such as light bulbs. It is a connector that connects the power supply of the socket outlet with the electrical appliance. WS is an automation

technology provides home owners flexible and practical solutions for their homes and even their offices. This system will allow any person who has a Bluetooth enabled Android mobile phone to connect with the server. With the help of this application, a user can control all the appliances in the house via Bluetooth receivers

Here comes the concept of MS. MS is an arrangement in such a way that manual switching can be replaced by remotely automated switching. This Mechanical Switch is used to control switching at a certain types of switch only. And in this project, parameter that has been used is light. It uses a servo motor in order to control switch of the light. For example, there is a huge space of a house. In this situation, the remote is the main devices that control the Mechanical Switch as the transmitter signal. The proposed system allows the clients to have access to all the appliances in the house including air conditioners, and lights, with a single press on a remote to turn it either on or off.

Automatic switches (AS) control even electrical appliances and other subsystems found in any home. Automatic Switch controls all the electrical appliances including lighting, fan and others under one device. The topic of Automatic Switch is nothing new. It replaces the manual switches with a wireless based control technology. This AS can save energy, help disabled and provide solution to minimize the number of remotes. Energy supply costs generally make up about 75% to 80% of an electricity bill and, therefore, are the primary focus for most energy manages. Thus there is a need for an automated and effective system that provides comfort, safety, convenience and cost efficiency.

There are several appliances running in our homes, offices and other institutions. For the functioning of these appliances electrical energy is required. But an electrical energy is the non-renewable form of energy, so an extra care of an electrical energy, needs to be taken. An electrical energy needs to be saved by system that can wirelessly control and remotely control all of the above appliances and it needs to save electricity. The primary motive of this project is to build up a system that helps user to manage their electricity bill with control the electrical appliances through android and remote. The most important consideration in the application is that it has to be user friendly and simple to operate.

1.1 Problem Statement

There are numerous reasons which respect to the creation of the Automatic Switch around the world. Most of the reason is to manage the electricity issues that frequently happened among user that forgot to switch off the electrical appliances. Typically the Automatic Switch are actualized in any big office, industry, shop or university classroom and home and even can be discovered any places without the user need to return back home or any places in order to make sure all the appliances are switch off in order to reduce cost of electricity bill.

1.2 Objectives

This research consists of several objectives in order to achieve at the end of this project as stated below:

i. To design an application for android that can control Wireless Switch wirelessly.
ii. To design and control Mechanical Switch with servo motor by remotely.
iii. To analyse power consumption and reliability of Wireless Switch and Mechanical Switch.

1.3 Scope

This project aims to create a concept for an Automatic Switch system with the use of existing technologies. Control of a huge area of existing devices should be taken into consideration however, as a limitation of the prototype only functionality to control power supply to existing devices will be implemented. In order for users to control the system, this project will develop on Wireless Switch which is this device can help everyone easy to control lamp through android especially at home. In this project is more focus on design an android application by using MIT inventor software. This application will connect with Bluetooth HC-05 where it is function to control the electrical appliances. Furthermore, Arduino UNO is used as the microcontroller where it functions to control the whole process in Wireless Switch while Arduino Nano is use in Mechanical Switch. In order to control the electrical appliances, ULN2003 is use in this project. Besides that, in this project also focus on designing a Mechanical Switch by using a servo motor where it can be mounted on the existing switch. This project can be control by using remotely. However, this project will attempt to implement simple automation functionality and act as plug and play that could be beneficial to the user.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

In this section, the review of technology used and applications pertaining to Intelligent Switch based on Android and Bluetooth for energy efficiency has been discussed.

2.1 Literature Survey

Ihedioha and Eneh introduced Home Automation using Global System for mobile Communication in order to control home appliances remotely using SMS where it indicates the automation of daily tasks with electrical devices used in home. It control of lights or more complex chores such as remote viewing of the house interiors for surveillances purpose. It also offers a comfortable, convenient and safe, and secure environment for occupants. The owner of home can control over their home by automating lighting system, dimming, and electrical appliances ultimately. Furthermore, the system includes an automatic load controlling, fire detection, temperature sensing and motion detection, lock system and etc. The main objective of this system is to design and a GSM-enabled distributed control application platform for industrial automation and also for home appliances. Ihedioha and Eneh implement this system by using Nexys2 circuit board which is a complete, ready-to-use circuit development platform based on a Xilinx Spartan 3E FPGA. (Ihedioha and Eneh, 2016)

In order to provide greater mobility, Piyare and Tazil purpose a Bluetooth based home Automation System using cell phone where this system is a low cost secure system in which the communication between mobile and home appliances is wireless. The appliances are connected to the Arduino BT board. Besides that, all the additional devices can be connected into the system by making a little modification. The cell phone script is written in python where it is portable and can run on any mobile using Symbian Operating System Platform. For this system the users are expected to acquire password for the Arduino BT and the cell phone to access the home appliances and this adds a protection from unauthorized users.(Piyare and Tazil, 2011)

The development Automatic lighting and control using Arduino for the efficient use of energy in classroom situation where the systems are divided the classroom into grids. The control lighting in particular area of classroom based on the attending of human with using relay control. By comparing to the one placed in ceiling which would which would switch on or off based on attending of human in room irrespective of position. This system provides mobility and remote command execution to system using Android mobile phone App via Bluetooth to control lighting based on voice command. There is one PIR sensor that placed at the entrance of classroom and the sensor can sense object to a limited range only. Mobile phone applications are provided in order to control the lighting based on voice input which it sent via Bluetooth.(Suresh, 2016)

Shah, Pathrabe and Patel are proposed wireless smart power saving system for home automation where in this work consist of an electronic door lock and power saving module. Only by enter the correct password in door lock the power saving module will switch on. And then it switches all the appliances in the room automatically based on the attendance of the person. So the power delivered to fan and light can control according to the temperature of room and the natural daylight intensity. This system is used low cost RF modules that are easy to use and easily available in order to provide a solution for preventing the wastage of power in a comfortable and cost effective way.(Shah, Pathrabe and Patel, 2012)

Studies in home automation using Bluetooth, Marimuthu has discussed about several of techniques that are involved in order to control the home appliances, the controller used and the number of devices controlled. He states that there are two types in order to implement home automation systems which are wired and wireless technology. For wired structure's existing electrical wiring and cable are used to connect all the devices. Power line systems is the signal that carried by the electrical wires. While the wireless type contain of three devices for facilities communication between two devices are Bluetooth module (range between 0-10 meters), XBEE modules (range between 0-100 km) and GSM (operating frequency range between 380.2-1989 MHz). (Marimuthu *et al.*, 2016)

Nupur, Payal and Kajal are purpose an automation system where all electrical appliances like TV, light, fans and so on can be controlled by an Android app over Bluegiga WT11 Bluetooth module. This system are cheap and flexible secure for mobile phone. It used Arduino BT board in order to connect all the electrical appliances. Between the mobile phone and all appliances, the wireless communications are established. The different home or office appliances were connected to the Arduino BT board via relays and it has been done in order to provide sufficiently high voltage and current compatibility. The commands were sent from an application in cell phone to switch on or off an electrical appliance. A feedback circuit has been designed and implemented in order to indicates the actual status of the appliances after it has received the command either on nor off from the gadgets. The feedback circuit detects the current to give an output signal after the command sending to a appliances on by turning on a led on the switching circuitry indicating that the appliance is switch on. (Nupur, Payal and Kajal, 2014)

The project in Bluetooth based home automation gives basic idea of how to control various home appliances and provide a security using Android mobile phone or tab. The main objective in this project is to assist a handicapped or an old aged people. The overall implementation cost is very cheap and it is affordable by a common person. This system need the user interact with the Android mobile phone and sent control signal to the Arduino UNO which in turn will control other embedded devices or sensors. (Anjale *et al.*, 2014)

Prasanna and Basha are purpose a Home automation based on Arduino where this system presents a microcontroller based on voice controlled home automation system using cell phones. This system enables users to have control over every electrical appliance in their home with voice. Furthermore the connection between the microcontroller and the cell phone is established via Bluetooth, a widespread wireless technology used for sharing data. So the user needs an Android mobile phone and a control unit. The control unit circuit consist of an Arduino Uno microcontroller, which process the user commands and controls the switching of electrical appliances. (Prasanna and Basha, 2016)

CHAPTER 3
METHODOLOGY

3.0 introduction

This chapter discuss about the methodology and approach used in this project. It is to ensure a well-planned project in order to be able to achieve all of the project objectives. The methodology is referred as a guideline before the final result can be successfully achieved. It will explain one by one step to complete the progress of the project. The steps and the procedures of running the experiment will briefly discussed in this chapter.

3.1 Wireless Switch (WS)

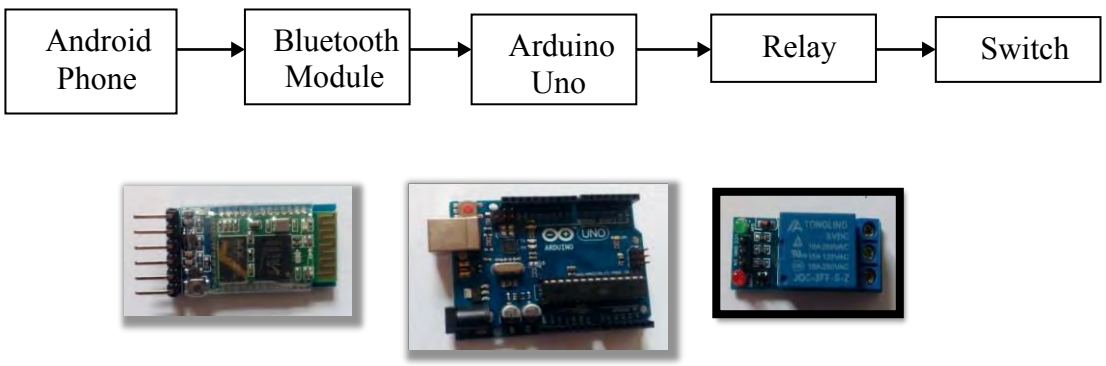

Figure 3.1: Flow Operation for WS

3.1.1 Operation for WS

Based on Figure 3.2 above shows that an Android phones send a signal to Bluetooth module. Then Bluetooth module transmits the signal to Arduino UNO in order to control the switch. The 5V of relay is used where the output is connected with socket outlet. Parameter that be used in this experiment is a lamp. From Android phone, it connects with Arduino UNO by using Bluetooth module. In order to control the switch, the 5V of relay is used. This WS is a connector that connect socket outlet with the load. The Bluetooth module, Arduino UNO and relay are the medium transition for this system.

3.2.2 Software Implementation

MIT inventor software is used in order to design an application for Android. The coding for create the system is shown below.

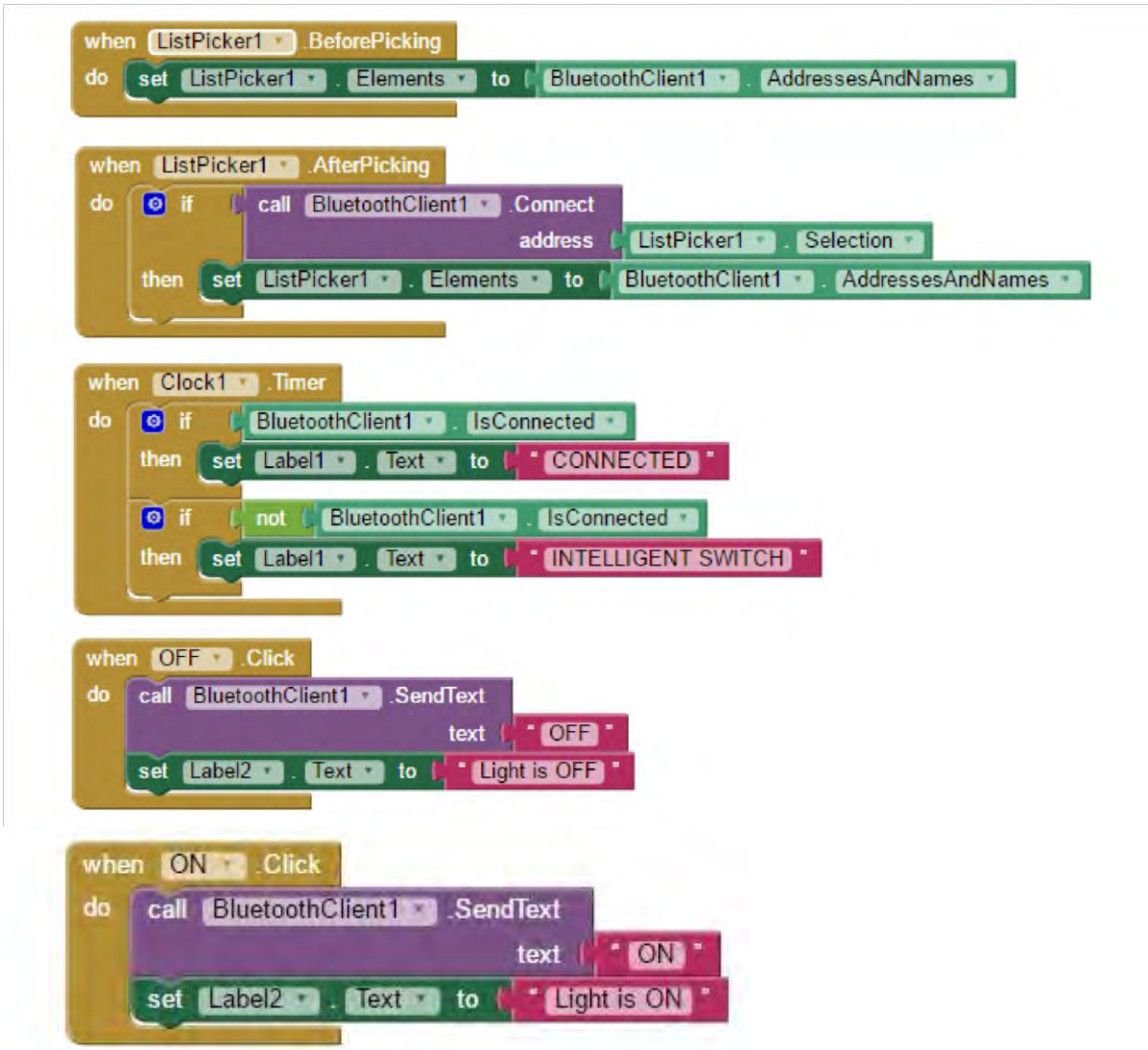

Figure 3.2: Coding of WS using MIT Inventor software system