



**Faculty of Electrical and Electronic Engineering Technology**



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**Bachelor of Electronics Engineering Technology (Industrial Electronics) with  
Honours**

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# DEVELOPMENT OF VOICE-CONTROLLED IoT HOME AUTOMATION

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in partial fulfillment of the requirements for the degree of  
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## DEDICATION

*To my beloved mother, Sakthi, and father, Paramasivam,*



## ABSTRACT

This report proposes a low-cost home monitoring system using Blynk which enables users to control their home appliances and smoke detector. The project is to build a home appliance monitoring system which was connected to the IoT platform, Blynk. Electricity is one of the essential of human life. The use of power in the world goes on to consider the ways in which we have no awareness of energy consumption. This is due to the cost of further managing, dividing, and isolating. Project development will use voice recognition to control electronic equipment in the home. The data will be communicated in the android application. Consumers will be notified whether home appliances are on / off. Not only that, with smoke detectors, if there was fire at home, users will be notified immediately via android. As the internet technology in Malaysia has been enhanced, the ESP8266 Wi-Fi module has been integrated to send data over Wi-Fi. To make life easier, all systems are now Wi-Fi enabled. This allows users to keep an eye on the system no matter where they are or what time it is. This system uses an Arduino Mega 2560 Rev3 as a microcontroller to control the framework. When a user forgets to turn off the electrical equipment switch, it sends a notification to the Android application, which the user can then operate using speech recognition. It can also assist those with disabilities in managing their affairs more easily.

## ***ABSTRAK***

Laporan ini mencadangkan sebuah sistem pemantauan rumah menggunakan Blynk yang membangun dengan kos yang rendah dan membolehkan pengguna mengawal peralatan elektronik rumah and sistem keselamatan iaitu pengesan asap. Projek ini adalah untuk membina sistem pemantauan peralatan elektronik rumah yang berkaitan dengan platform IoT, Blynk. Ini adalah sebab daripada kos melanjutkan mengurus, membahagi dan mengasingkan. Perkembangan projek akan digunakan pengecaman suara untuk mengawal peralatan elektronik di rumah. Data-data tersebut akan dimaklumkan dalam aplikasi android. Pengguna akan diberitahu bahawa peralatan elektronik di rumah dalam keadaan on / off. Bukan itu sahaja, dengan pengesan asap, jika berlaku apa-apa kebakaran di rumah, pengguna akan mendapat pemberitahuan dengan segera melalui android. Modul ESP8266 Wifi disepadukan untuk menghantar data melalui Wifi kerana teknologi internet telah dinaik taraf di Malaysia. Semua sistem masuk disepadukan dengan Wifi sekarang untuk menjadikan kehidupan lebih mudah. Ini membantu pengguna memantau sistem tidak kira di mana sahaja dan bila-bila masa. Arduino Mega 2560 Rev3 digunakan sebagai mikrokontroler dalam sistem ini untuk mengawal sistem. Apabila pengguna terlupa untuk tutup suis peralatan elektronik, ia akan menghantar pemberitahuan dalam aplikasi android serta ianya dapat mengawal melalui pengecaman suara. Ia juga dapat membantu orang kurang upaya (OKU) untuk memudahkan urusan mereka dengan mudah.



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## LIST OF ABBREVIATIONS

UTeM	-	Universiti Teknikal Malaysia Melaka
RF	-	Radio frequency remote control
RX	-	Receiver
TX	-	Transmitter



# CHAPTER 1

## INTRODUCTION

### 1.0 Introduction

The Internet of Things (IoT) refers to the ever-expanding network of physical objects with internet access IP addresses, as well as the connectivity between these objects and other internet-connected devices and systems. The term "IoT" has come to refer to a range of technologies and analytical disciplines that allow the Internet to expand into the real environment of physical objects. Consumers were motivated to build a smart home because of this. A smart home is one in which everyone can control anything without the need for a human being to be present.

When a person wants to turn on or off a light or a fan inside the house, they must go to the switchboard and push a button. For someone who appears to be physically fit, this is not a daunting job. However, for a physically handicapped person, the simple task of pressing a button to turn on or off a light or fan may be challenging. As a result, the disabled individual will have to rely on others to perform this menial task. It can also track and control programmable isolated devices such as smoke and fire alarms. If these functions could be performed via remote control, users' dependency on another person would be minimized, and they would benefit greatly. It can also handle these devices as people leave for work or other locations, reducing the burden of maintaining the home, office, or other locations.



## 1.1 Project Background

Home automation is becoming important in these busy lives today to simplify the daily tasks. Home automation provides a modern lifestyle in which consumers can use a smartphone or website to monitor and control the entire home, monitor electricity consumption, security system, etc. Home automation includes tracking and monitoring remote electronic devices based on the IoT principle. It also offers the ability to monitor and control programmable isolated devices like smoke / fire detectors. These services too usually provide connections to equipment / appliances such as electrical appliances and smart grids.

However, it can be expensive to acquire and implement these devices, revealing why home automation has not really gained much market interest and demand to date. Furthermore, these programs can be difficult to configure and customize. Therefore, it is essential that new solutions have cost effective, simple to customize strategies.

This research involves identifying solutions for some of the most important problems missing in the literature, which includes safety-monitoring, home-security, and energy management solutions. Most of the studies and products in the field of home automation systems have not addressed those areas, however, much have concentrated on monitoring electrical devices like the fan and lighting units upon user commands, leaving other essential home automation tasks unaddressed. For example, only a few of the previous studies concentrated on how to monitor energy consumption or could detect fire events. Attempting to help overcome these key issues in this study by creating a system that offers functionality for safety monitoring, home security, and energy management to support people and society.

## 1.2 Problem Statement

The IoT is becoming a rapidly growing topic of conversation both on and off around the world. However, conventional wall switches are in different parts of a house and require manual operations such as switching on or off. These switches control many appliances, making it nearly difficult to keep track of them and monitor their performance, which the IoT based Home Automation System helps to bridge. Several smart house commercial and research projects have been carried out. If it has a button or a full touch screen, many of the consumer products use remote control. Even, it takes some effort and physical touch to track and operate the appliances. It will also be a burden on disabled people particularly for people with disabilities and the elderly. Thus, this project aims to establish an IoT monitoring system, controlling device and security system in home. This system very helpful to control electrical appliances such as light, fan, refrigerator etc. Besides that, it also provides security framework smoke or fire detector by detecting alarm and notifications. Therefore, the development of smart home automation network technology using the IoT has allowed users to automatically manage the environment and control devices remotely.

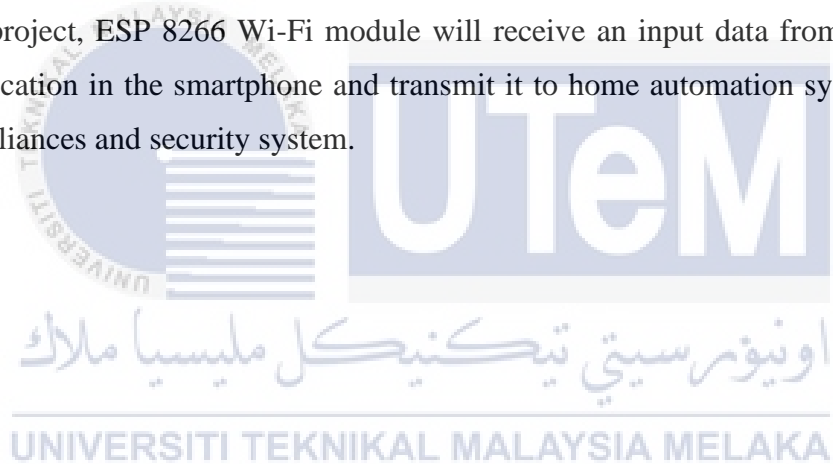
## 1.3 Objectives

The aims of this project are as follows:

- 1) To develop a home automation system that can be able to control electrical appliances and security.
- 2) To integrate between Blynk application software, voice recognition system and electrical appliances.
- 3) To improve an efficient energy management system for electrical system and security system.

## 1.4 Scope of the project

Based on the main objective of this project, its aim to track from anywhere all electrical equipment and security system. This project is about program light control, or whatever other home appliances. The user can connect via internet or Wi-Fi module with Arduino. This device is less costly, allowing for extra home appliances. IoT is a developing application that allows people to use the network to monitor hardware equipment and security system such as smoke or fire detector. Here the system suggests the use of IoT to monitor home appliances, thus automating modern home via the internet. This is around an exact conception of a device for speech recognition. Along with low-power wireless networking, sensors will be connecting to embedded systems to track and manage electrical appliances and security system remotely. The Android app can use the open-source web platform which known as Blynk to monitor domestic devices using every Android device. It can control any device from far apart with the help of IoT. In this project, ESP 8266 Wi-Fi module will receive an input data from WIFI module through application in the smartphone and transmit it to home automation system to control electrical appliances and security system.



## CHAPTER 2

### LITERATURE REVIEW

#### 2.0 Introduction

This chapter basically contains several articles, journals and conferences devoted to a summary and those related to the project to be undertaken. This study focuses on the Development of Voice Control IoT Home Automation.

The survey found that android-based phones or tablets running the Blynk application are used to control home computerization systems and gadgets. Computerizations are not available. Every module has its own set of journal highlights. A few organizations have been officially chosen and are attempting to improve house computerization structure features.

The flexible use of Home Automation in many locations with great precision, which saves time and money and plays a vital role in today's world. This technology is mostly used to manage household appliances such as lamps, fans, and refrigerators. This research paper offers detailed information on Arduino Home Automation and Security System and how to manage home devices using NodeMCU.

## 2.1 Overview of Voice Controlled Home Automation System

In this era technology, there was numerous advantages regarding home automation is becoming increasingly popular each day. Local networking, or remote control, may do this. Our mission is to build a package which can be used by Android phone to manage AC Loads. Home automation is embraced for simple, safe and energy efficient reasons. This entails monitoring and automating light, fan, refrigerator, etc., and protection, as well as home appliances such as smoke / fire detectors. Wi-Fi is often used for access and remote monitoring. Home devices are an important component of the Internet of Things, when managed and controlled remotely over the Internet.

## 2.2 Past Related Project Research

According to the several journals, the authors had presented their framework with successful demonstration in the thesis. In the region of development of voice control IoT home automation systems several similar studies and projects have been identified as follows:

### 2.2.1 “Implementation of Speech Recognition Home Control System using Arduino”

by Nurul Fadzilah Hasan, Mohd Ruzaimi Mat Rejab and Nurul Hidayah Sapar[1].

This paper has proposed to design a system for the identification and understanding of human voice commands as an input to wireless control of electrical appliances. This goal is accomplished by dividing the device into two different modules that are the transmitter module and the receiver module. The main purpose of the transmitter module is to accept human voice as the input and execute process of speech recognition to define the corresponding control of commands. The control signal then transmits to the receiver module wirelessly at 315 MHz. The fan and lamp controls are attached to the receiver board. The receiver module will first evaluate the signal after receiving the signal. Then, the fan and the lamp will be regulated accordingly. (Hasan et al., 2015)

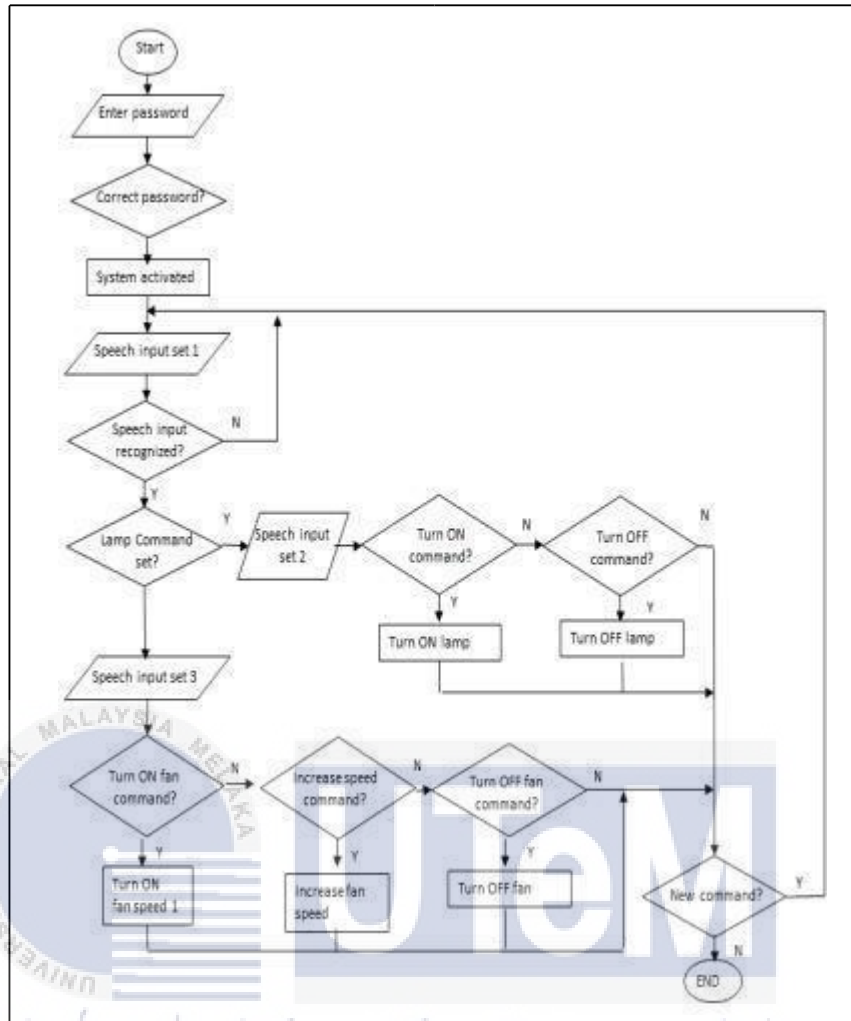


Figure 2.1: The flowchart of the whole system (Nurul Fadzilah Hasan, Mohd Ruzaimi Mat Rejab and Nurul Hidayah Sapar) [1]

The Transmitter Module is designed to work portably and with voice. As the microphone, Arduino Uno, and EasyVR 2.0 as speech recognition, are the major components of the transmitter. EasyVR functions as a slave board and uses UART to interact. The baud rate is 9600 and the frame is 8 data bits, No parity and one stop bit, respectively. Figure 2.2 shows the transmitter module circuit diagram. Use the user define Speaker Dependent (SD) trigger to activate the machine while using US English to run the output device using the built-in Speaker Independent (SI) commands. The device control was taught by the hidden Markov HMM model.

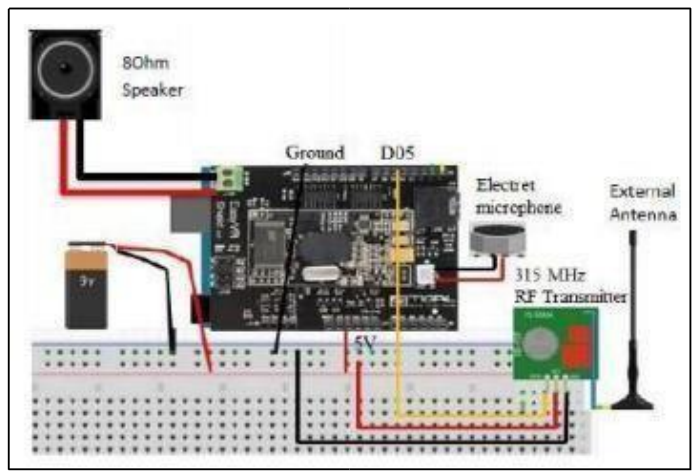


Figure 2.2: The circuit diagram of the Transmitter module (Nurul Fadzilah Hasan, Mohd Ruzaimi Mat Rejab and Nurul Hidayah Sapar) [1]

The RF Receiver has four pins which are source pin, ground pin, and two data pins that connected in Receiver Module. The source and ground pin connect to Arduino Pro Mini's Vin and Ground pin. Pin A03 is used on Arduino Pro Mini to connect the RF Receiver data pin. This connection is very important for proper functioning of the contact between these two devices as shown in Figure 2.3 Receiver Module.

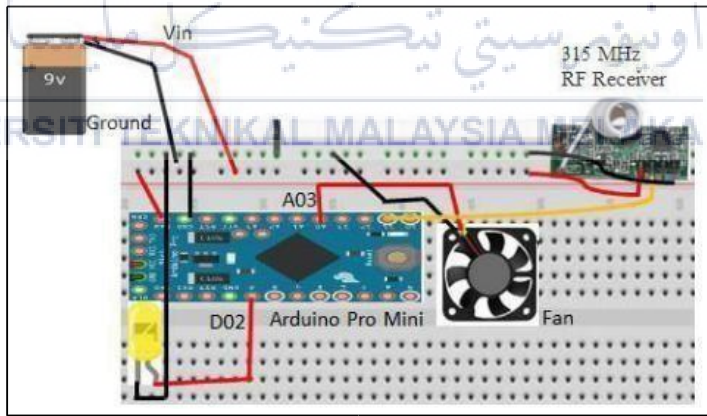


Figure 2.3: The circuit diagram of the Receiver module (Nurul Fadzilah Hasan, Mohd Ruzaimi Mat Rejab and Nurul Hidayah Sapar)[1]

In this journal, the voice command uses trigger and word set party. Table 2.1 shows all the voice command and the device output. The term "Device On" is learned in trigger orders. It is used to turn the system on. All three-word set category are used as command word for monitoring the output system for the use of Word set Command in this project.

Trigger /Word set group	Voice Command	Output
Trigger	System On	System is activated
Word set 1	Action	Trigger the lamp
	Turn	Trigger the fan
	Run	The lamp and fan are ON *The fan is ON with speed 1
	Stop	System is deactivated
Word set 2	Up	The lamp is ON
	Down	The lamp is OFF
Word set 3	Zero	The fan is OFF
	One	The fan is ON with speed 1
	Two	The fan is ON with speed 2
	Three	The fan is ON with speed 3

Table 2.1: Voice Command and Output of the system (Nurul Fadzilah Hasan, Mohd Ruzaimi Mat Rejab and Nurul Hidayah Sapar)[1]

