**UTeM**

اونيۏرسيتي تيكنيکل مليسيا ملاك

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

# Faculty of Electrical and Electronic Engineering Technology

## DEVELOPMENT OF AN IOT BASED VOICE COMMAND FOR HOME CONTROL SYSTEM USING ANDROID APPLICATION
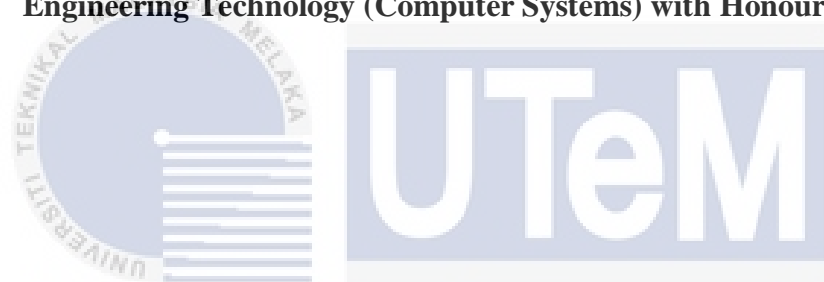
**MOHD NASHRUL IKRAM BIN AHMAD GHAZALI**

**Bachelor of Computer Engineering Technology (Computer Systems) with Honours**

**2022**

# DEVELOPMENT OF AN IOT BASED VOICE COMMAND FOR HOME CONTROL SYSTEM USING ANDROID APPLICATION

## MOHD NASHRUL IKRAM BIN AHMAD GHAZALI

**A project report submitted**
in partial fulfillment of the requirements for the degree of **Bachelor of Computer Engineering Technology (Computer Systems) with Honours**

**Faculty of Electrical and Electronic Engineering Technology**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**2022**

**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**
FAKULTI TEKNOLOGI KEJUTERAAN ELEKTRIK DAN ELEKTRONIK

**BORANG PENGESAHAN STATUS LAPORAN**
**PROJEK SARJANA MUDA II**

Tajuk Projek    : DEVELOPMENT OF AN IOT BASED VOICE COMMAND FOR HOME CONTROLSYSTEM USING ANDROID APPLICATION

Sesi Pengajian : 2022/2023

Saya MOHD NASHRUL IKRAM BIN AHMAD GHAZALI mengaku membenarkan laporan Projek Sarjana

Muda ini disimpan di Perpustakaan  dengan syarat-syarat kegunaan seperti berikut:
1.  Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2.  Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
    3.  Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4.  Sila tandakan (✓):

☐  **SULIT***

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)

☐

(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

☐  **TIDAK TERHAD**

Disahkan oleh:

_Nashrul_

_____
(TANDATANGAN PENULIS)
Alamat Tetap: Seremban, Negeri Sembilan

_____
(COP DAN TANDATANGAN PENYELIA)

NURLIYANA BINTI ABD MUTALIB
PENSYARAH
Jabatan Teknologi Kejuruteraan Elektronik Dan Komputer
Fakulti Teknologi Kejuruteraan Elektrik Dan Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh:

Tarikh: 22 FEBRUARI 2023

*CATATAN: Jika laporan ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali tempoh laporan ini perlu dikelaskan sebagai SULIT atau TERHAD.

**DECLARATION**

I declare that this project report entitled "DEVELOPMENT OF AN IOT BASED VOICE COMMAND FOR HOME CONTROL SYSTEM USING ANDROID APPLICATION" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

| | | |
|---|---|---|
| Signature | : | Nashrul |
| Student Name | : | MOHD NASHRUL IKRAM B AHMAD GHAZALI |
| Date | : | 27 JANUARI 2023 |
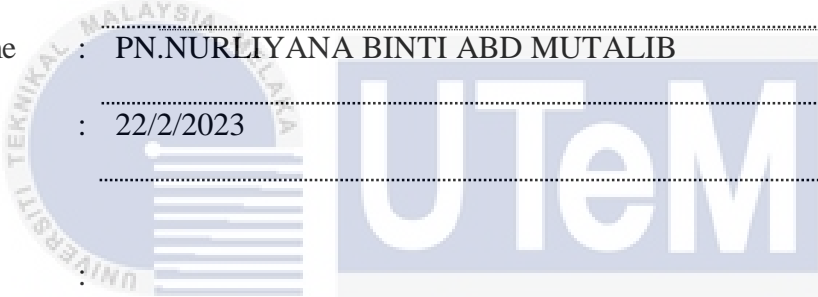
# APPROVAL

I hereby declare that I have checked this project report  and in my opinion, this  project report

is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer

Engineering Technology (Computer Systems) with Honours

Signature                :

Supervisor Name  :   PN.NURLIYANA BINTI ABD MUTALIB

Date                 :   22/2/2023

Signature                :

Co-Supervisor      :

Name  (if any)

Date                 :

# ABSTRACT

Since technology advances on a daily basis, voice recognition systems have become a popular trend in home automation in today's culture. A voice recognition system for home automation can be cheap and simple to set up. A voice recognition system is a physical device that recognises the speaker's voice and can control itself. This voice recognition system's main goal is to make it easier for normal, disabled, and elderly people to handle and operate household equipment. Furthermore, it was designed for customers seeking luxury and sophisticated home automation. The goal of IoT Based Voice Command for Home Control System Using Android Application is to assist people with disabilities like vision impairment, physical disability, and blindness who are unable to perform daily tasks like turning on and off electrical devices without assistance. This system is also ideal for businesses, factories, offices, and institutes with a large amount of equipment, such as fans, air conditioners, lights, door locks, and windows. It would be difficult to operate all of the appliances, especially if there are many of them, so having a system that allows you to run any item simply by saying a command is beneficial. Non-technical users will find the device easy to transport, install, configure, run, and maintain. The process of connecting various electrical equipment in a home is referred to as "home automation." This article discusses how the system controls the electrical appliances of the house by using a user interface device and speech recognition technology by using a microcontroller device via a Bluetooth module to control the on/off of devices such as lights, fans, and door lock.

### *ABSTRAK*

Sejak teknologi berkembang setiap hari, sistem pengecaman suara telah menjadi trend popular dalam automasi rumah dalam budaya hari ini. Sistem pengecaman suara untuk automasi rumah boleh menjadi murah dan mudah untuk disediakan. Sistem pengecaman suara ialah peranti fizikal yang mengecam suara pembesar suara dan boleh mengawal dirinya sendiri. Matlamat utama sistem pengecaman suara ini adalah untuk memudahkan orang normal, orang kurang upaya dan warga emas mengendalikan dan mengendalikan peralatan rumah. Tambahan pula, ia direka untuk pelanggan yang mencari kemewahan dan automasi rumah yang canggih. Matlamat Perintah Suara Berasaskan IoT untuk Sistem Kawalan Rumah Menggunakan Aplikasi Android adalah untuk membantu orang kurang upaya seperti cacat penglihatan, kecacatan fizikal dan buta yang tidak dapat melakukan tugas harian seperti menghidupkan dan mematikan peranti elektrik tanpa bantuan. Sistem ini juga sesuai untuk perniagaan, kilang, pejabat dan institut yang mempunyai sejumlah besar peralatan, seperti kipas, penghawa dingin, lampu, kunci pintu dan tingkap. Sukar untuk mengendalikan semua peralatan, terutamanya jika terdapat banyak daripadanya, jadi mempunyai sistem yang membolehkan anda menjalankan sebarang item hanya dengan mengatakan arahan adalah berfaedah. Pengguna bukan teknikal akan mendapati peranti mudah untuk diangkut, dipasang, dikonfigurasikan, dijalankan dan diselenggara. Proses penyambungan pelbagai peralatan elektrik di rumah dirujuk sebagai "automasi rumah." Artikel ini membincangkan cara sistem mengawal peralatan elektrik rumah dengan menggunakan peranti antara muka pengguna dan teknologi pengecaman pertuturan dengan menggunakan peranti mikropengawal melalui modul Bluetooth untuk mengawal hidup/mati peranti seperti lampu, kipas dan kunci pintu.

# TABLE OF CONTENTS

# LIST OF TABLES

# LIST OF FIGURES

# CHAPTER 1

# INTRODUCTION

## 1.1    Background

Nowadays communication technology is advancing. It's now very simple to use voice recognition to input text, verify spelling, and dictate messages. The microphone icon on most on-screen keyboards allows users to easily switch from typing to voice recognition.

Speech recognition are used to control electrical appliances in the voice controlled smart home automation system. The system employs a Bluetooth module to communicate data in order to manage the operation of electrical loads. Any device with Bluetooth capability, such as a smartphone, can send an input signal to Bluetooth. Smart home automation is very advantageous to persons who are disabled or elderly. To operate the appliance or electrical loads, the user only needs to issue a voice command; the system eliminates the problem of switching on/off electrical appliances. The system is designed so that the user can control all of the appliances simultaneously or individually. Some software is developed for operating the system built-in microphone implemented in a device such as Android phone are used to send the user's voice command. The Arduino Uno receives input from the user devices and sends the signal to the appropriate relay to turn on and off electrical appliances connected to the system, such as lighting, fans, and air door lock units.

The benefits of using voice as a communication channel are numerous. To begin with, we would eliminate or greatly reduce the need for operating technology training. Second, service simplification would result in a greater acceptance of current technology, allowing persons with a variety of disabilities to use the technology. Android app was chose as the user front end partly because the app allows us to integrate advanced technology and because of its extensive usage in the mobile sector.

## 1.2    Problem Statement

The aim of this project is for people with various disabilities such as vision impairment, physical handicap and blindness who are unable to move excessively and to do daily activities such as turning on and off electrical device without the assistance of another person. Besides, this system is ideal for industries, factories, offices, and institutes with a significant number of equipment, such as fans, air conditioners, lights, door locks, and windows. It would be tough to operate all of the appliances, especially if they are numerous, thus a system that allows you to run any item simply by speaking a command is beneficial. So, keeping the situation in mind, we decided to create an intelligent system to assist these disabled people. After the project is completed, the purpose is to provide specific assistance to disabled people.

## 1.3    Project Objective

The main focus of this project is to design and construct a voice recognition system for turning electrical devices on and off. The project's objective are as follows:

- To study and understand the properties of voice recognition

- To develop an iot based voice command for home control system using android application

## 1.4 Scope of Project

The scope of this project focuses mainly on using microcontroller and Arduino to communicate with Bluetooth module and smartphone application which is AMR_Voice application to get the user voice and command. The presence of Bluetooth module is to connect the smartphone application with the microcontroller and Arduino to get the voice from user. The electrical device such as light, fan and door lock will turn on and off based on the user command. Moreover, the range between user voice command and the electrical devices has limitation. Last but not least, this project is dedicated for people with various disabilities such as vision impairment, physical handicap and blindness. The performance of the project is analyzed by observing between the function of the voice command and the electrical devices.

# CHAPTER 2

## LITERATURE REVIEW

### 2.1 Introduction

This chapter discusses the crucial features and information discovered by various studies and research from prior project. As a result, the topic starts with an exploration of voice recognition concepts. It is critical to conduct study on these ideas because they are the project's main objective. Furthermore, because this project involves voice technologies as well as microcontrollers and Arduino, it is important to understand the underlying ideas in order to have a comprehensive understanding of the scope. In conclusion, this section ends with a comparison of prior relevant projects and the type of implementation that will be suitable for the project.

### 2.2 Voice Commands and Arduino Based Automatic Home Control

Automatic Control Based on Voice Commands and Arduino is an integrated system provides the easiest home automation system that can be controlled using voice recognition system [1]. For controlling appliances, toys, tools, computers, and robotics, speech recognition is becoming the preferred way. Voice-controlled equipment, such as computers, televisions, lighting systems, and security systems, become easier to operate, improving the efficiency and effectiveness of working with them, because of the rapid advancement of technology, it is now possible to control electronic equipment using a number of control methods, including controlling electronic devices automatically via sensors or remotely. This technological innovation, users of electronic gadgets no longer have to struggle with controlling their equipment. Sound-

based control is a commonly utilized method of control nowadays. Operating a smart house, such as turning off or on lights, opening or closing doors, and manipulating the robot, is similar to controlling a smartphone to run software put on it. Its offers a security system that uses an individual's characteristic pattern, voice control is in high demand.

Table 2.1: Fundamental Technologies of Automatic Control Based on Voice Commands and Arduino

| Technology | Type of Fundamental | Function of Fundamental |
|---|---|---|
| Internet of Things (IoT) | Microcontroller | A microcomputer that is compressed into a single integrated circuit. It has been improved in order to control electronic gadgets. On a single printed circuit board, this compact gadget contains memory, input-output pins, and a microcontroller. This device is typically employed in industrial settings, where it is integrated with other devices to give control and interface. Microcontrollers such as the Raspberry Pi and Arduino are examples. |
| | Microsensor | A little instrument that can measure a variety of things. As a result, several of these gadgets work at the nanoscale. For example, sensors that detect heart rate and output data in digital format. Data that was |

| | | |
|---|---|---|
| | | previous inaccessible, such as blood oxygen levels, can now be measured and evaluated. |
| | Easy VR | EasyVR 3 Plus is a multi-purpose speech recognition module that may be used in practically any application to add diverse, powerful, and cost-effective speech recognition features. The EasyVR 3 Plus module works with any host that has a 3.3V–5V UART interface, such as PIC and Arduino boards. |
| | Voice Recognition | Voice Recognition is an interdisciplinary branch of computer science and computational linguistics that develops approaches and technologies that allow computers to recognise and translate spoken language into text, with the main advantage being searchability. |
| | Arduino | Arduino is a corporation, initiative, and user community that designs and manufactures single- |

| | | board microcontrollers and microcontroller kits for making digital devices using open-source hardware and software. |
|---|---|---|
| | | |

## 2.3    Method of Automatic Control Based on Voice Commands and Arduino

The study was a literature review based on the findings of published works, such as research findings. In library research, literature searches were used not only as the initial stage in constructing a research framework (research design), but also to gather research data from library sources [1]. The data was gathered through a review of books and publications on controlling with voice commands and Arduino. The data analysis technique utilised was to summarise data and information in simple phrases in order to find answers to the difficulties investigated, which were related to numerous research on controlling using voice commands and Arduino.

There were three steps involved in doing literature research. The initial step was to decide on the research's title, the literature sources to be used, the amount of literature to be employed, and so on. Furthermore, the literature search was done in accordance with the topic under consideration. Finally, a content analysis of easyvr 3.0 is performed.

Easyvr 3.0 is a voice module that is simple to use and works with nearly all programmes. At a voltage of 3.3v- 5v, Easy vr 3.0 can be used with any uart (universal asynchronous receiver-transmitter).

For low impedance sound, this module audio output interface can be connected to an 8ohm speaker or to an external amplifier. Furthermore, it can be connected to high impedance loads such as headphones, given that the power output is in accordance with the literature that has been obtained and how the relationship between the literature obtained was carried out. Figure 1 shows a block schematic of the procedures involved in conducting literature research.
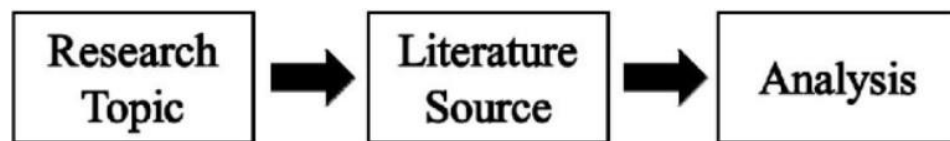


Figure 2.1 Block Diagram of Literature Research Steps [1]

This study's literature review was carried out by examining 25 journals published between 2014 and 2020 that discussed Using Arduino and voice commands to control [1]. Journal Assessments are made by paying attention to the details. Based on the similarities and differences in each journal using vocal commands to control an electrical gadget to be commanded, a verbal command in the form of the hardware for voice recognition or speech recognition used, the tests conducted, the results of the tests, and the system functioning and the factors that are influenced by the system [1].

## 2.4    Concept of Voice Recognition

The ability of a machine or program to receive and interpret dictation or to recognize and execute spoken commands is known as voice or speaker recognition. With the advent of AI and smart assistants like Amazon's Alexa, Apple's Series and Microsoft's Cortana, voice recognition has gained popularity and usage [2].

The voice recognition system allows users to interact with the technology simply by talking to it, enabling hands -free requests, reminders and other simple tasks.

8

### 2.4.1 How Voice Recogniti Work

Audio of must be transform to digital signals by voice recognition software on the computer, that is what we called process of analog to digital conversion [2]. Computers should have a digital database of syllables, as well as a rapid way to contrast this data to signals or parse signals. When app is started, the speech ornamentation is delivered on the hard disk and filled into memory. Recorded ornamentation comparator with A/D encoder output, the process called pattern recognition.

In operation, the amount of effectual vocabulary of a voice recognition program is exactly in proportion to the RAM space of a computer. When contrast to observant a hard drive for multiple matches, voice recognition programs manage many times quick if a absolute vocabulary can be put into RAM. Processing speed is also dominant because it consequence how fast a computer finds a RAM match [3].
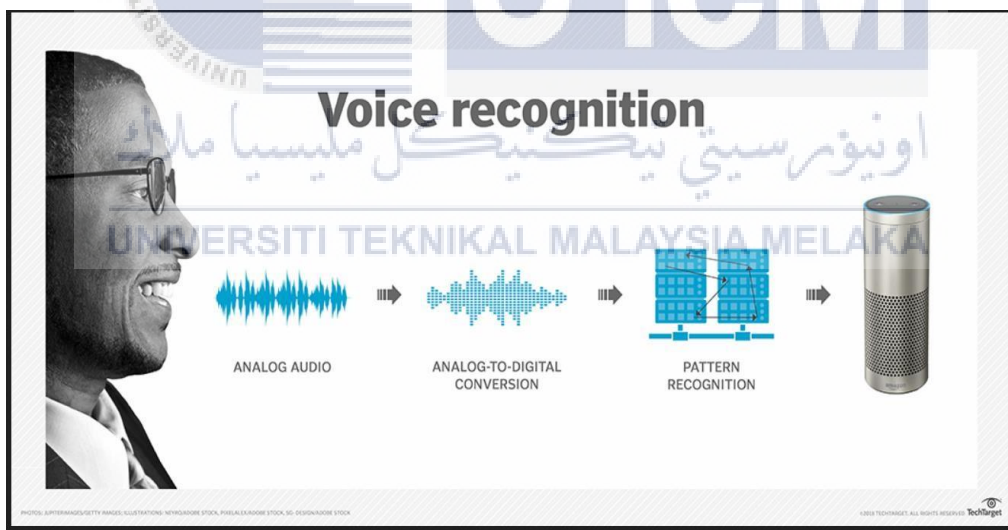


Figure 2.2: How voice recognition work [3].

Even speech recognition system began on PCs, it has open out to smartphone and maid products in both the business and end user sectors. The admiration of smartphones allows voice recognition technology to be intermix into users 'pockets, while home appliances like Google Home pushing the voice system space into the

bedroom and master living room. Many end user devices that previously did not have any smart potential have gained a layer of technology thanks to voice recognition and an ever -expanding number of internet sensors [3].

### 2.4.2    Voice Recognition Advantages and Disadvantages

By using voice directly to Google Home, Amazon Alexa or their other voice recognition system, end-users can carry-out a variety of piece of work. Voice recognition system can quickly change your speech work to written text using expert systems and advanced algorithms [3].

While the precision of the voice recognition system and program ameliorate, it all made inaccuracy. Untrue inputs can be fabricated by background noise, which can be bypass by using the system in a quiet room. There is also the problem of near words sounding unalike and having different meanings, such as red and read. This problem may one day be resolve by storing contextual data [3]. However, the increase of RAM and a the faster of processor can be accessed now in personal computers will be needed.

### 2.5    Internet of Things (IoT)

According to Big Data Insight, Kevin Ashton, a member of the team that identified RFID tags to use as a communication channel to connect objects to the Internet [4], coined the term Internet of Things. The word was first introduced in 1999 [5], and it has since grown fast in a variety of industries all around the world. Kevin Ashton has also stated that, in comparison to what the Internet has accomplished for the world, the Internet of Things has the potential to achieve even greater advancements [5]. In addition, characterize IoT as a network made up of physical, technological, and wide socioeconomic settings. The structures are listed in table 2.2 below.

10

Table 2.2: Structures of IOT [6]

| Characterize of IoT | Structure of IoT | Explanation |
|---|---|---|
| Physical | Environment | The environment is a place where humans and other entities interact. For example, in hotel rooms, RFID readers are embedded in the lights and fans. |
| | Person/Individual | The Internet of Things can be accessed by anybody with a wireless device or who can handle and operate a wireless object, such as a smartphone or laptop (IoT). |
| | Device/Object | Cars and packages are real objects that can connect to |

| | | the internet via any wireless device. |
|---|---|---|
| Technological | Networking | Wireless networks are widely used to connect devices and share information |
| | Hardware | Home automation, cellphones, and RFID tags are examples of wireless devices that connect humans and objects to the Internet of Things for communication across a wireless medium. |
| | Software | End-user IoT applications that are designed to help people. |