



**Faculty of Electrical and Electronic Engineering Technology**



**DEVELOPMENT OF VOICE COMMAND GROCERY SHOPPING LIST  
MAKER BASED ON ARDUINO PLATFORM**

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**NUR ELMIERA BINTI ISMAIL**

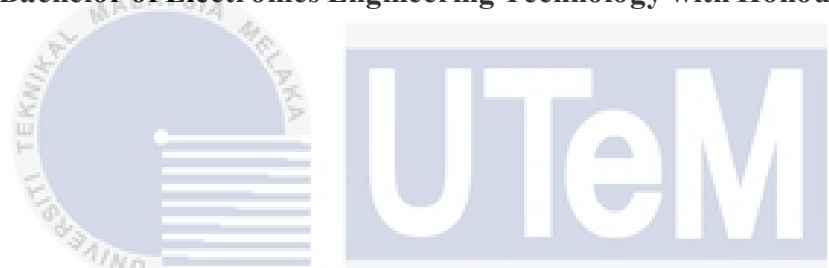
**Bachelor of Electronic Engineering Technology with Honours**

**2021**

**DEVELOPMENT OF VOICE COMMAND GROCERY SHOPPING LIST MAKER  
BASED ON ARDUINO PLATFORM**

**NUR ELMIERA BINTI ISMAIL**

**A project report submitted  
in partial fulfillment of the requirements for the degree of  
Bachelor of Electronics Engineering Technology with Honours**



**Faculty of Electrical and Electronic Engineering Technology**

اوتيمر سیتی تیکنیکل ملیسیا ملاک

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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

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Sesi Pengajian: 2020/2021

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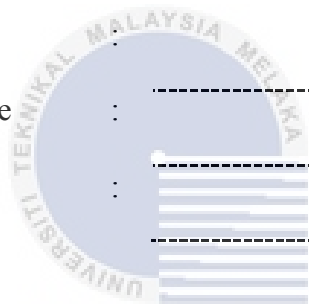
## DECLARATION

I declare that this project report entitled “Development of Voice Command Grocery Shopping List Maker based on Arduino Platform” 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.

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## 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 Electronics Engineering Technology with Honours.

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## DEDICATION

*To my beloved parents,*

*Ismail bin Omar and Julia bt Ismail who always there with me and instilled in me the virtues of perseverance and relentlessly encouraged me to strive for excellent in completing this report.*

*To my siblings that always generates and giving idea for me to complete this report, I would like to say thank you for always support and help me with their full of love that make me feel motivated and always in high spirits to finish my report.*

*To my great supervisor TS. DR. Mohd Syafiq bin Mispan, thank you for the guidance and encouragement for me to make sure my report and project is done well and always keep reminds me to complete my task and always motivate me with some brilliant idea and positive vibes also never lets any sadness dominate into my heart.*

## ABSTRACT

In today's modern world, due to a lack of time to manage household needs, people are always seeking a convenient and effective way of doing their daily jobs. One of the daily activities in people's lives that could be improved is going to the grocery store. It has become a habit for people to provide for their household needs in an orderly and complete manner. As a result, the goal of this project is to create a system that can use voice to list groceries and display them on a small I2C 16x2 LCD in the kitchen area. This application will help the user to list the groceries through voice recognition and takes a short time to list the items needed. The project that is used consists of the programmable voice recognition module, the small LCD display, and the microcontroller Arduino Uno board with ESP8266 (ESP-01). The list of groceries is linked to the grocery app (i.e., developed by the previous PSM students). Whenever the user enters new data into the list via the voice command system, the list in the Grocer App is updated. So, this mobile application is easy to use and shortens the time for the user. Moreover, the user can add, remove, or overwrite the list by using the grocery store's app.

## ***ABSTRAK***

Dalam dunia moden hari ini, kerana kekurangan masa untuk menguruskan hal rumah, orang selalu mencari cara yang mudah dan berkesan untuk melakukan pekerjaan harian. Salah satu perkara harian dalam kehidupan orang yang memerlukan penambahbaikan adalah ketika melakukan runcit. Sudah menjadi kebiasaan bagi orang untuk menyediakan barang runcit rumah dengan teratur dan lengkap. Oleh itu, objektif projek ini adalah untuk merancang sistem yang boleh menggunakan suara untuk menyenaraikan runcit dan paparan pada monitor I2C 16x2 LCD kecil di kawasan dapur. Aplikasi ini akan membantu pengguna menyenaraikan barang runcit melalui pengecaman suara dan mengambil masa yang singkat untuk menyenaraikan item yang diperlukan. Projek yang digunakan terdiri daripada modul pengecaman suara boleh atur cara, paparan LCD kecil I2C 16x2, dan papan mikropengawal Arduino Uno dengan ESP8266 (ESP-01). Senarai barang runcit telah berjaya dihubungkan ke Aplikasi Grocer (iaitu, yang dikembangkan oleh pelajar PSM sebelumnya). Setiap kali pengguna memasukkan data baru dalam senarai melalui sistem perintah suara, daftar di Aplikasi Grocer telah diperbaharui. Jadi, aplikasi mudah alih ini senang digunakan dan memendekkan masa untuk pengguna. Lebih-lebih lagi, pengguna dapat menambah, membuang atau menukar senarai dengan menggunakan Aplikasi Grocer.



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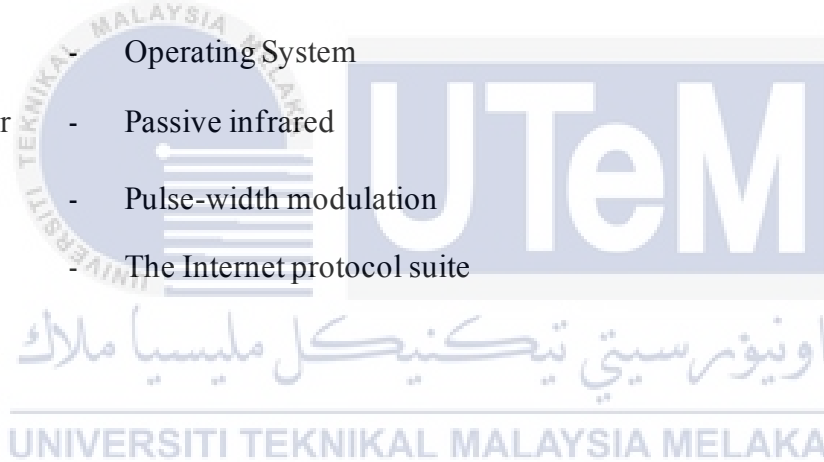
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## LIST OF ABBREVIATIONS

API	-	Application Programming Interface
GPIO	-	General Purpose Input/Output
HTML	-	Hypertext Markup Language
iOS	-	iPhone Operating System
IoT	-	Internet
JSON File	-	JavaScript Object Notation
LCD	-	Liquid-crystal display
OS	-	Operating System
PIR sensor	-	Passive infrared
PWM	-	Pulse-width modulation
TCP/IP	-	The Internet protocol suite



# CHAPTER 1

## INTRODUCTION

### 1.1 Background

In today's world, a portable computer, such as a smartphone, has become an essential part of our daily lives. Android is the operating system for these cellphones. Today, the three most widely used smartphone operating systems are Apple's iOS, Google's Android, and Microsoft's Windows. Each of these operating systems has a unique mix of advantages and disadvantages. iOS, Android, and Windows all have 1.4 million, 1.5 million, and 0.3 million applications installed, respectively, according to Statista. (Statista,2015). The cell phone has fundamentally altered people's lives. Nowadays, people interact less using SMS, preferring to interact using instant messaging services that need an Internet connection, such as WhatsApp or Telegram. Apart from that, cellphones have GPS, which enables users to navigate via navigation applications.

Today's internet businesses prioritise not just their websites, but also their mobile platforms. Mobile users have overtaken device users for the first time, according to Mobile Marketing Statistics 2015. Additionally, online analytics company Flurry reports that 80 percent of mobile advertising time is spent on apps rather than browsers. This is why internet firms must build mobile applications in order to remain competitive. Through push notifications, a client may get the most up-to-date information through a mobile application on their smartphone.



While grocery shopping might be intimidating, virtually everyone will have to do it at some time. Through the use of the current online retail buying mobile application, a new voice command capability for smartphones has been developed to aid customers with online grocery shopping and to quickly list the things required. Each suggested application comes with a unique set of disadvantages. In conclusion, this project will provide a new menu of voice command mobile applications that will make it simple to list grocery goods utilising the kitchen's voice command system.

## **1.2 Problem Statement**

Voice commands combined with technology are becoming more prevalent in everyday life. As a result of voice search's growth and interest among internet users, eCommerce enterprises must include voice search optimization in their marketing efforts. As an example, consider online grocery buying on the Android platform.

As a result, the current online retail purchasing mobile application must be enhanced to make it simpler for customers to shop for groceries online from the comfort of their homes. Voice commands should be integrated into the current online retail purchasing mobile application system to facilitate the listing of grocery goods. Additionally, by utilising the Grocer App's voice command, users may save time by avoiding the need to travel to the living room if they forget to bring their mobile device with them while listing grocery goods in the kitchen.

Additionally, there are certain complications when a customer must recall kitchen supplies that have run out and wants to purchase them impulsively at home. The answer to this issue is to design a mobile application that supports voice commands and is capable of taking orders for things in real time while also reducing the usage of paper for grocery lists. Hence, voice commands on the grocer's app may assist.

### 1.3 Project Objective

The objective of this project is to list the groceries through voice commands and take a short time to list the items needed. Specifically, the objectives are as follows:

- a) To design a system that uses voice commands to list groceries and display them on a small LCD.
- b) To execute the voice command to be displayed directly on the small LCD and Grocer apps at the same time.
- c) To evaluate the accuracy of the voice command of the system.

### 1.4 Scope of Project

The scope of this project are as follows:

- a) This system is used for voice command grocery shopping list makers, and it includes some new feature that make it easier to use and save the user time.
- b) This application will help the user to list the groceries through voice recognition and takes a short time to list the items needed.
- c) The voice recognition module is considered for any 7 voice commands in the library that could be imported into recognizer. It means 7 commands/words are effective at the same time.
- d) It requires a Wi-Fi connection to work.
- e) When a user adds new data by voice command, the Grocer App updates the list.
- f) All data collected by the Grocer App will be stored in the Firebase database.
- g) It is an application that is based on the Android platform

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

This chapter aims to explore the project's relation to other research in order to do better research and minimize the excessive recurrence of the study's issue areas. All information was gathered from credible sources such as journal papers, books, conference proceedings, and websites. A voice command shopping list maker application on a Arduino based platform is one that allows the user to list groceries using speech recognition and takes a little time to list the things required. This chapter's content contains an explanation of the function and a comparison of the components.

#### 2.2 Microcontroller

A microcontroller (MCU, abbreviation for microcontroller unit) is a kind of microcomputer that is based on a single metal-oxide-semiconductor (MOS) integrated circuit (IC). A microcontroller consists of one or more central processing units (CPUs), memory, and programmable input/output peripherals (Moskowitz, Sanford L, 2016). Additionally, on-chip programme memory in the form of ferroelectric RAM, NOR flash, or an OTP ROM is prevalent, providing a tiny amount of RAM.

In modern use, a microcontroller is similar to, but less complicated than, a system on a chip (SoC). A microcontroller may be one of the components of a system-on-chip (SoC), although it is commonly combined with advanced peripherals such as a graphics processing unit (GPU), a wireless module, or one or more coprocessors (Moskowitz, Sanford L, 2016).

For my project, I used the Arduino Uno microcontroller for research. As a result, the Methodology section discusses the usage of hardware and the kind of microcontroller in this project in more depth.



Figure 2.1 Example of Microcontroller

### 2.2.1 Comparison between Microcontroller

NodeMCU is an open source development board based on the ESP8266 microcontroller. The ESP-8266 module is a wireless microcontroller board that may be programmed. The ESP8266 Wi-Fi board is a system-on-chip (SOC) with an integrated TCP/IP protocol stack that can connect any secondary microcontroller to a Wi-Fi network. Because the ESP8266 board is capable of hosting an application or offloading all Wi-Fi networking tasks to another application processor, it is well suited for usage as a sensing node capable of sensing data from numerous wirelessly linked IoT sensor nodes and delivering it to a central server.



Figure 2.2 Example of NodeMCU ESP8266

While Arduino is an 8-bit microcontroller development board equipped with a USB programming port for connecting to a computer and other connections for interfacing to other devices such as sensors, motors, speakers, and diodes. It has both input and output pins, with the inputs being either digital (0–13) or analogue (A0–A5), while the output pins are all digital (0–13). The Arduino board design, as well as the integrated development environment that includes a cross-compiler, a debugger, and a serial monitor for controlling the inputs and outputs, is open source. Arduino may be powered through a USB cable connected to a computer, a 9V battery, or an external power source.



Figure 2.3 Example of Arduino Uno

Table 2.1: This is the comparison between NodeMCU ESP8266 and Arduino Uno.

	NodeMCU ESP8266	Arduino Uno
Advantages	<ul style="list-style-type: none"> <li>• NodeMCU is one of the easiest to use, since it already has the necessary processing capability to run its applications, and it still has a direct connection to Wi-Fi (D. Bento, 2018)</li> <li>• NodeMCU makes direct references to its libraries, eliminating the need for extra libraries; the method of connection and use is as simple as selecting the device type on the platform. (D. Bento, 2018)</li> </ul>	<ul style="list-style-type: none"> <li>• The Arduino Uno is an excellent learning platform for embedded programming but does not have an integrated Wi-Fi module. (Müller, Mohammed and Kimball, 2015)</li> <li>• It is easy to use, programme and integrate Arduino controllers into electrical applications. (Müller, Mohammed and Kimball, 2015)</li> </ul>
	<ul style="list-style-type: none"> <li>• During the research papers, detect a few references on the NodeMCU, due to the</li> </ul>	<ul style="list-style-type: none"> <li>• Has limited capabilities using the standard libraries. (Müller, Mohammed and Kimball, 2015)</li> </ul>

Disadvantages	<p>fact that it is a new product, recently debuted in the market. (D. Bento, 2018)</p> <ul style="list-style-type: none"> <li>• The number of pins on the NodeMCU ESP8266 is significantly less than the number of ports on the Arduino Uno. (D. Bento, 2018)</li> </ul>	<ul style="list-style-type: none"> <li>• It is based on an 8-bit microprocessor. The Arduino Uno seems to have little computer power. (Müller, Mohammed and Kimball, 2015)</li> </ul>
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### 2.3 Mobile Application

A mobile app is a computer programme or software application, commonly called a mobile application or an app, intended to operate on a mobile device, such as a phone, a tablet or a wristwatch. Although applications such as email, calendars, and contact databases were initially developed to aid in productivity, public demand for apps has resulted in rapid development in other areas, such as mobile gaming, factory automation, GPS and location-based services, order-taking, and ticket purchases, resulting in the availability of millions of applications. Mobile applications are an evolution of desktop programmes for use on desktop computers and web applications for use on mobile web browsers rather than directly on the mobile device. (R. Islam and M. Mazumder, 2010).

### 2.3.1 Mobile Application Development

There are several classification schemes for mobile apps. A frequent technique is to distinguish between native mobile applications, web-based applications, cross-platform applications, and hybrid applications. Native applications are those that are specifically created for a particular mobile platform. As a consequence, an Apple iPhone app will not run on an Android smartphone (Khandeparkar, Gupta and B.Sindhya, 2015). As a consequence, the vast majority of businesses develop apps for a variety of platforms. Professionals build native applications using best-in-class user interface components. This results in increased speed and stability, as well as a more favourable user experience (Khandeparkar, Gupta and B.Sindhya, 2015).

A web application is developed using standard web technologies such as HTML, CSS, and JavaScript. In contrast to offline use, an internet connection is often required for proper action or access to all the features. The cloud stores the vast majority, if not all, of user data (Delia et al., 2015). However, since online methods or apps employ client-server interaction, the response time is slower and the technique is less appealing than the native approach since it is not installed on the devices (Delia et al., 2015).

The hybrid pattern is similar to the web approach in that it makes use of web technologies such as HTML, JavaScript, and CSS but is not browser-based. They instead run in the web container of the device, which enables increased access to device-specific data capabilities given through application programming interfaces (Delia et al., 2015). Finally, it leverages a procedure known as cross-compilation for cross-platform approaches. The source code will be transformed into native binaries, and the cross-compiler will create platform-specific executable code (Abraham, 2016). These are intended to facilitate the use of web and native technologies across a range of platforms. Additionally, these applications are easier and quicker to develop. It refers to the use of a single codebase that runs across a