



Faculty of Electrical and Electronic Engineering Technology



**DEVELOPMENT OF SIGN LANGUAGE TRANSLATOR DEVICE
WITH INTERNET OF THINGS (IOT)**

MUHAMMAD AKMAL BIN IDRIS

Bachelor of Electrical Engineering Technology with Honours

2021

**DEVELOPMENT OF SIGN LANGUAGE TRANSLATOR DEVICE WITH
INTERNET OF THINGS (IOT)**

MUHAMMAD AKMAL BIN IDRIS

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



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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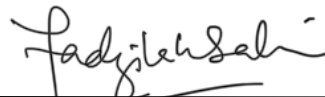
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I declare that this project report entitled “DEVELOPMENT OF SIGN LANGUAGE TRANSLATOR WITH INTERNET OF THINGS” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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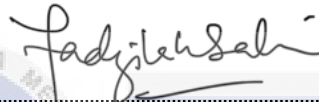
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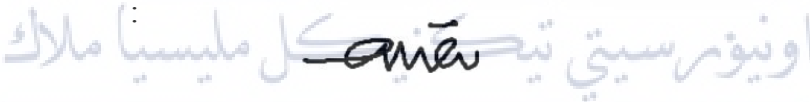
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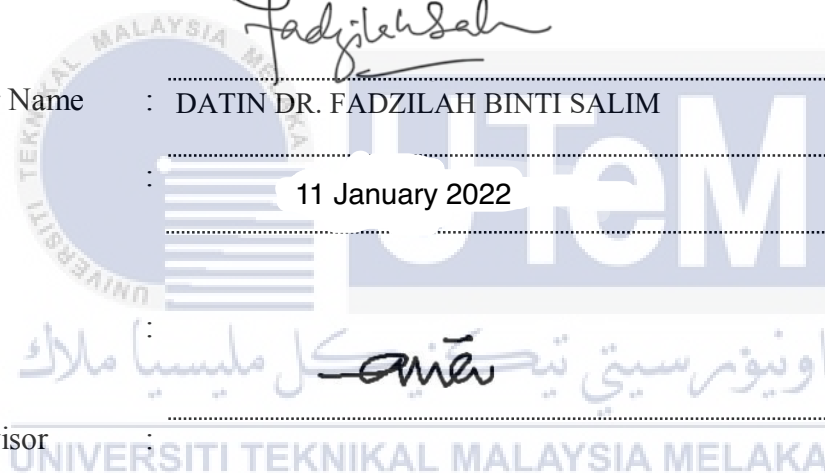
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DEDICATION

This project is dedicated to both my parents. My mother, Hazura Binti Moxsin who did not only raise and nurture me but also a source of motivation and strength during moments of despair and discouragement. Her motherly care and support have been shown in incredible ways recently. My father, Idris Bin Md Noor has been supporting me in my education and intellectual development by going through blood, sweat and tears over the years.



ABSTRACT

Deaf-mute term is used globally to describe the people who are unable to speak orally and those who need to use sign languages with their hand gestures to deliver information to others. The problem arises when most people do not familiar with sign languages, thus limiting the communications in daily life. There are some factors contributing to this, mainly that the society do not really recognize the mute-deaf and handicapped people to be part of them. There are not enough exposures as well in the education systems regarding these matters. Thus, the main objective of this project is to design a glove that can translate sign language into text that will be displayed using an Android application. This Android application is be integrated with Arduino microcontroller as a system. Arduino converts the data into strings and transfers the data via Bluetooth connection. The data is displayed into text. The sign language translator device performed well during the experimentation. Several hand gestures showing basic greetings and daily conversation routines have been produced. As a conclusion, this project is one of the approaches to put the recognition for the mute-deaf society to be acknowledged better in the future. So, this project brings new encouragements and awareness towards realizing their needs to counter these issues.

ABSTRAK

Istilah bisu pekak digunakan secara global untuk menerangkan orang yang tidak dapat bercakap secara lisan dan mereka yang perlu menggunakan bahasa isyarat dengan gerak isyarat tangan mereka untuk menyampaikan maklumat kepada orang lain. Masalah timbul apabila kebanyakan orang tidak biasa dengan bahasa isyarat, sekali gus mengehadkan komunikasi dalam kehidupan seharian. Terdapat beberapa faktor yang menyumbang kepada perkara ini, terutamanya masyarakat tidak benar-benar mengiktiraf golongan pekak bisu dan kurang upaya untuk menjadi sebahagian daripada mereka. Tidak terdapat pendedahan yang mencukupi dalam sistem pendidikan mengenai perkara ini. Justeru, objektif utama projek ini adalah untuk mereka bentuk sarung tangan yang boleh menterjemah bahasa isyarat ke dalam teks yang akan dipaparkan menggunakan aplikasi Android. Aplikasi Android ini disepadukan dengan mikropengawal Arduino sebagai satu sistem. Arduino menukar data kepada rentetan dan memindahkan data melalui sambungan Bluetooth. Data dipaparkan dalam teks. Peranti penterjemah bahasa isyarat menunjukkan prestasi yang baik semasa percubaan. Beberapa isyarat tangan yang menunjukkan salam asas dan rutin perbualan harian telah dihasilkan. Kesimpulannya, projek ini merupakan salah satu pendekatan untuk meletakkan pengiktirafan kepada masyarakat pekak bisu agar diiktiraf dengan lebih baik pada masa hadapan. Jadi, projek ini membawa galakan dan kesedaran baharu ke arah merealisasikan keperluan mereka untuk menangani isu-isu ini.

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LIST OF SYMBOLS

- - Degree of Bending



LIST OF ABBREVIATIONS

PSE	-	Pidgin Signed English
ASL	-	America Sign Language
IOT	-	Internet of Things
SEE	-	Signed Exact English
	-	



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CHAPTER 1

INTRODUCTION

1.1 Background

For almost a century, sign languages have been used globally by deaf and mute community to communicate in their daily lives. The languages are expressed as hand gestures and face expressions to make others understand the message the users want to deliver. As time passing by, the understanding of these sign languages is still not recognizable and familiarized by most of the public, making it hard for deaf and mute community to put themselves among the society and become more expressive.

Lately, there are some efforts to encounter these problems by scientists and educators. There are a lot of courses in universities that offer the sign languages as one of the subjects to be learned in campus too. Mainly, the sign languages are not standardized throughout the globe. For example, Figure 1.1 shows sign language user Americans used American Sign Language (ASL). This is not the same sign language used by others in other parts of the world. The problem becomes worse when these sign languages users even meet, they still cannot understand each other. It is unclear that how many sign languages currently exist worldwide. Each state, country and continent have their own perspective and native sign language, in which make them perfectly specific and hard to be categorized.



Figure 1.1 Sign Language User

The National Centre for Health Statistics estimates that 28 million Americans (about 10% of the population) have some degree of hearing loss. About 2 million of these 28 million people are classified as deaf (they can't hear every day sounds or speech even with a hearing aid). Only about 10% of these 2 million people were born deaf. The other 90% became deaf later in life. This is based on research by Colin Mathers (2000). The speakers of ASL need to face the reality and all the challenges waiting for them ahead. Not to forget, that these deaf and mute community includes the people who are deaf and mute and who are connected to them in the surroundings. Today, it is estimated that the number of users of American Sign Language falls between 250,000 and 500,000 Americans according to the research on Hearing Loss Prevalence (Frank R. Lin, 2011). On a large scale, a truly international sign language does not exist, however, ASL is one of the most popular sign languages in the world.

The other effort made was to invent a device that can directly translate the sign languages into understandable elements such as words and voices. This device has been developed from the 19th century until now. The problem is, there are no genuine approach and effort to commercialize these ideas. For that, the case study for this project is focusing on how to develop and invent the sign language translator as well as encouraging and increase the awareness towards appreciating the deaf and mute community.

1.2 Problem Statement

Sign language is not for everyone to understand. It is used widely across the globe but only for deaf and mute people only. The problem arises when most individuals do not familiar with sign language thus resulting in lack of awareness and miscommunications during the exchange of information. This cause communication barrier between normal people and deaf people. Therefore, this Sign Language Translator is developed to overcome those problems.

1.3 Project Objective

Specifically, the objectives are as follows:

- a) To design a glove that can translate sign language from hand gestures into text.
- b) To develop an Android application to be integrated with Arduino microcontroller as a system.
- c) To analyses the performance of the sign language translator device.

1.4 Scope of Project

This project covers on the translation of basic sign language of American (ASL). The basic terms are those sign that are used frequently in daily life such as greetings, directions and name of places and animals. An Android application also has been developed to functions as the display through any Android smartphones that runs the operating systems from Android 2.0 and above. The application is developed with a free source website, App Inventor 2 that allows the interaction of the application and microcontroller.

The project also focuses to build one glove instead of pairs because of costing, quality control and other purposes. This is mainly can give advantage to other aspects of the project that should be done before coming up with fully built device.

On the other hand, an Arduino microcontroller is used as the brain of the system implemented. The microcontroller functions as the comparator between the values of sensors such as gyro meters and flex sensors and changes them into strings or texts. These data are being sent away from the transmitter and receiver port through Bluetooth connection.

1.5 Project Outline

This report is divided into five chapters. All these chapters are discussed in detail through the course of the project's implementation.

Chapter 1 provides an overview of this project's background including a problem statement, objectives, project scopes and project outlines.

Chapter 2 highlights literature review on related work. Some journal articles have been collected and studied. Materials, devices, and technologies that have been used by preview research will be investigated.

Chapter 3 discusses the method's use to develop this project. The method and technique to be used were mentioned at methodology part. A block diagram will depict the entire scope of this project. The flow chart will be used throughout this chapter, as will the approach for completing this job.

Chapter 4 showed the results and discussion of analysis of the project development of sign language translator device then going into Chapter 5 of this project is to conclude the work that has been done so far throughout this project and recommendation for future works.



CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter investigates the past studies of the related work. Base on the project scopes, the data and information needed have been collected from various types of sources. This covers from books, journals, articles, organizations and websites. The comparison of ideas and methodology chosen to carry out this project.

2.2 ASL Against Different Types of Sign Languages

There are 3 types of sign languages in the US. Which is American Sign (ASL), Pidgin Signed English (PSE), and Signed Exact English (SEE). Each of them is unique and special in their own ways to represent words and expressions between the users.

ASL is used by most of the deaf community in the US because it's the most popular type of sign language. It is a visual language, which means the speechreading and listening skills are not needed to be fluent in ASL. Furthermore, it has been used widely across the nations within a century. ASL is a free-flowing language because the language completes itself when the users expand their expression as time passing by. It's rarely written or spoken, but mainly it's still easier to be translated compared to the other type of sign languages. Figure 2.1 shows the deaf-mute population in US.