Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF SMART GLOVE WITH MOBILE APP THAT HELP NORMAL PEOPLE TO SELF-LEARN MALAYSIAN SIGN LANGUAGE.

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Bachelor of Technology Electronics Engineering (Telecommunication)

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A thesis submitted in fulfilment of the requirements for the Bachelor of Technology Electronics Engineering (Telecommunication).

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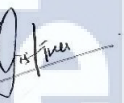
DECLARATION

I declare that this report entitled “Development of Smart Glove with Mobile App That Help Normal People to Self-Learn Malaysian Sign Language” is the results of my research except as cited in referencesThe thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature:



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APPROVAL

I hereby declare that I have read this dissertation/report and in my opinion this dissertation/report is sufficient in terms of scope and quality as partial fulfilment of the Bachelor of Technology Electronics Engineering (Telecommunication)

Signature:

Supervisor Name : Muhammad Izzat Zakwan Bin Mohd Zabidi

Date: 25/02/2021

DEDICATION

Dedicated, in grateful appreciation for the support, encouragement and understandings to my beloved family and also my friends that help throughout my event of creating this research paper.

This research is also dedicated to my supervisor Mr. Muhammad Izzat Zakwan Bin Mohd Zabidi. For future re-completing the research study and for future researchers, the paper can be used as their guide or references.

ABSTRACT

Sign language was used as a means of communicating over many centuries ago, where this language is a combination of gestures or corporal movement and facial expressions to express the thoughts of a speaker. Learning sign language can be problematic and confusing for ordinary people, where most of them do not have the basics of the word. Besides that, learning any language after a certain age is more challenging, and sign language is not common in an ordinary school. The goal is to develop a system that can transcend the barrier of contact between the deaf/mute people and ordinary people. Next, this research paper aims to develop an intelligent glove with a mobile application that can help ordinary people learn the Malaysian Sign Language (MSL) for themselves. The Malaysia's deaf community adopts a variant of sign language, which is the Malaysian Sign Language (MSL) was modified from the American Sign Language, and most people in this community regard sign language as their primary means of communication. This paper addresses the issue of the recognition system for sign languages, which aims to help the disabled communicate with ordinary persons. Therefore, in this project, hand gesture recognition technologies will use the data-glove method, which utilizes individual glove-based devices to capture hand posture and movement. This glove uses a microcontroller such as Arduino as processor and accelerometer as a sensor to recognize hand gestures defined by alphabet, number, and several Malaysian Sign Language words. The hand gesture data will attach to the Bluetooth module and show message and speech to the android mobile application. In conclusion, this project is focusing on helping normal people self-learning in reducing the gaps between people with disabilities

ABSTRAK

Bahasa isyarat digunakan sebagai alat komunikasi berabad-abad yang lalu, di mana bahasa itu merupakan gabungan gerak isyarat atau pergerakan badan dan ekspresi wajah untuk mengekspresikan pemikiran penuturnya. Belajar bahasa isyarat boleh menjadi masalah dan membingungkan bagi orang biasa, di mana kebanyakan mereka tidak mengetahui asas-asas perkataan Selain itu, pembelajaran mana-mana bahasa selepas umur tertentu adalah lebih mencabar, dan bahasa isyarat kurang dipraktikkan di sekolah untuk menolong orang lain dalam memahami bahasa tersebut. Oleh itu, matlamat utama projek ini adalah untuk membangunkan satu sistem yang boleh melangkaui halangan hubungan antara komuniti pekak/bisu dan rakyat biasa. Seterusnya, matlamat kertas kerja ini adalah untuk menghasilkan sarung tangan pintar dengan aplikasi mudah alih yang dapat membantu orang biasa belajar Bahasa Isyarat Malaysia (BIM). Komuniti orang pekak di Malaysia menerima pakai pelbagai variasi bahasa isyarat tetapi komuniti ini mengutamakan Bahasa Isyarat Malaysia (BIM) yang telah diubahsuai dari Bahasa Isyarat Amerika (ASL) dan kebanyakan orang dalam komuniti ini menganggapkan bahasa isyarat sebagai cara komunikasi utama mereka. Artikel ini membincangkan sistem pengenalan bahasa isyarat, yang bertujuan untuk membantu orang kurang upaya berkomunikasi dengan orang biasa. Oleh itu, dalam projek ini, teknologi pengecam isyarat tangan akan menggunakan kaedah sarung tangan data, yang menggunakan peranti berasaskan sarung tangan individu untuk merakam postur tangan dan pergerakan. Sarung tangan ini menggunakan mikrokontroler seperti Arduino sebagai pemproses dan akselerometer sebagai sensor untuk mengenali gerak isyarat yang ditentukan oleh abjad, nombor dan beberapa perkataan bahasa isyarat Malaysia. Data isyarat tangan akan dilampirkan ke modul Bluetooth dan memaparkan pesan dan ucapan dalam aplikasi mudah alih Android. Kesimpulannya, projek ini memberi tumpuan kepada membantu orang biasa melakukan pembelajaran secara pensendirian supaya mengurangkan jurang antara orang kurang upaya dan orang biasa

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Therefore, with the guidance and support from people around me, I want to give credit to those who helped me achieve in the final year project. I want to express my sincere gratitude and respect towards my project's supervisor, Mr. Muhammad Izzat Zakwan Bin Mohd Zabidi, for his kind support and encouragement. Without his continued support and interest, the project would not be like what it likes today. May Allah bless and reward him for his sincerity, endeavour and contribution in the way of knowledge.

I also want to thank my beloved parents because I will not be able to do well in my final year project without them. They did give me a lot of support, both from money and moral support, to continue for what I had started.

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% - Percentage

Vs - Voltage supply

Ω - Ohm

LIST OF ABBREVIATIONS

ADC	Analog-to-Digital Converters
ASL	American Sign Language
BNN	Backpropagation Neural Network
CNN	Convolutional Neural Network
HTML	Hypertext Markup Language
I2C	Inter-Integrated Circuit
IMU	Inertial Measurement Unit
K-NN	K-Nearest Neighbors
LCD	Liquid Crystal Display
LDA	Linear Discriminant Analysis
LED	Light Emitting Diode
MSL	Malaysian Sign Language
PC	Personal Computer
SIBI	Indonesian Sign Language
UAV	Unmanned Aerial Vehicle
YOLO	You Only Look Once

CHAPTER 1

INTRODUCTION

1.1 Background of Study

According to the World Health Organization, about 5% of the world's population suffers from an impairment like deaf and blind even though 5% may seem low, over 360 million worldwide(World Health Organisation, 2013).

Some organizations, such as the Convention on the Rights of Persons with Disabilities (CRPD) during 2010 in Malaysia, have approved assistance in protecting the right of persons with disabilities. As stated in the Salamanca Agreement, every country has a right to its own mother tongue, the UN Traditional Equal Opportunity Law and Disability Participation Plan. (Jamil Hashim, 2009).

In Malaysia, the deaf community adopts a version of signs, Malaysian Sign Language (MSL), derived from the American Sign Language (ASL). The plurality of people in this group considers sign language as their primary medium of communication.

The language of a sign was used by man as a communication medium many centuries ago, which means the movements of body motion, and facial expressions concurrently converge to convey the meaning of the speaker.

However, few people understand sign language. Those with disabilities may find it difficult to communicate or even express their thoughts to others using sign language as their daily communication tool.

Books are commonly used in Malaysia as the primary learning tool for sign language; however, it is not that effective for most people as recently. Therefore, it lacks creativity and interactivity for regular people to learn sign language. Apart from books, videos on sign language also available, but it also lacks interactivity (Mokhtar, Anuar and Anuar, 2017).

It is then possible to interactively learn Malaysian Sign Language by integrating animation or images into the device. As the World Wide Web is the most comprehensive educational website, the software should be available through computers, tablets and mobile devices on the Internet. (Mokhtar, Shamsul Anuar and Shamsul Anuar, 2017)

This paper addressed the system's problem for understanding sign language, which is expected to help people with disabilities interact with ordinary people. The technology for recognizing sign language in this project will use the data glove process, which utilizes individual glove-based devices to capture hand posture and movement. This glove uses a microcontroller such as Arduino as a processor and accelerometer to recognize hand gestures defined by alphabets, numbers and a combination of words. The hand gesture's data output is connected to the Bluetooth module, and the text and speech to the mobile learning application are presented.

1.2 Problem Statement

Learning sign language can be problematic and confusing for ordinary people, where most of them do not have the basics of the language. Besides that, learning any language after a certain age is more challenging, and sign language is not common in an ordinary school.

Another difficulty in studying sign language is that a social setting's standard communication pace will be too daunting. It takes communications to a completely different level and demands that need in mastering eye gazing to navigate the give-and-take of communal interactions better.

There seem to be many job opportunities for the disabled community in recent times, as it is significantly increasing every year. It should also be an opportunity for ordinary people to communicate with the deaf and mute community to help make each work proceed smoothly and efficiently. Frequently, the people had a hard time learning the sign language by themselves, and the software for learning the language need to be paid for.

It is a development designed to help disabled people communicate in a way that involves data handles or vision. The recognition process has been going on for over three decades, and this research area is still firm. It is also evident that developments in technology in computation, content, sensors, and process recognition can help invent a different generation of glove systems reliable, accurate, easy and cost-effective to use in many applications.

As far as how "hard" it is, that varies in every person, and in the end, it will be like this for any other language. Take it one step at a time to learn any language or experience new things in human life.

1.3 Objective

In accomplishing the following objectives, this research is carried out:

a) To build a mechanism to solve the difference between the deaf and the blind and ordinary people.
b) To create a glove approach that is comfortable, cheap, highly accurate, and possible to use in many applications.
c) Developing a mobile application by incorporating animations and pictures in helping ordinary people self-learn Malaysian Sign Language (MSL).
d) To test the accuracy of this system and improving the previous work.

1.4 Scope of Project

Scopes are a general outline of what this study will cover. The contents will be functional to guarantee those projects are heading in the right course to attain the objective. In developing the smart glove, the project also has a limited to a specific criterion. The criteria are obtaining the gesture of certain alphabets, numbers and in creating mobile applications.

First of all, it is in obtaining success rate of gesture in alphabets and numbers, and it is because certain alphabets or numbers hand movement will take more than a one-time gesture. Therefore, to get the accuracy and some alphabets have the same motion and differ, it's necessary to use a contact sensor. The flex sensor is quite expensive as a solution; use one hand as a prototype in developing the smart glove.

Next, creating mobile applications with creative and user-friendly will mostly help make ordinary people interested in learning. People will mainly seek portable electronic gadgets in modern technologies, so creating mobile apps will certainly help the learning process.

This project will use Arduino Nano as the microprocessor since its more suitable than Raspberry Pi and another controller in implementing it in a glove. Other components, such as the MPU sensors and accelerometer, will help obtain the accuracy of sign gestures. MIT apps inventor will use in creating mobile apps that user-friendly and creative apps. Lastly, this project mainly focuses on helping ordinary people self-learning reduce the gaps between people with disabilities.

1.5 Thesis Structure

Chapter 1:

The first chapter gives a brief overview of the idea. This chapter is about the background of the project. The focus was on the project overview, goals, problem statement and project scope.

Chapter 2:

The second chapter covers the concept, theory and some of the hardware components employed in this project. This chapter further explains the word used for this research project.

Chapter3:

The methodology is explained in this section. The methodology chapter is a timetable or steps to complete and structured reports of studies to be carried out to achieve this goal. This chapter explains the procedure for completing the project and detailed information on the development of this project.

Chapter4:

This chapter discusses the results and the feedback that get based on the methods. Both models, data collection and analysis have been thoroughly discussed. The results were compared with the objectives outlined to present those theories and conclusions.

Chapter 5:

The conclusion and future work are discussed in this chapter. This section ends with guidelines for improved system performance based on desired outcomes.