HAND SIGN LANGUAGE TRANSLATOR USING MOTION SENSOR

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This report is submitted in partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering with Honours

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Signature	:	……
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DEDICATION

I dedicated this thesis to my beloved parents, my project supervisor, UTeM lecturers and all my friends that help me throughout this degree life.

ABSTRACT

Hearing impairment and Speech impairment are form of disabilities that faced by a minor group of the society. By having those conditions will not only cause them a difficulty to communicate with the rest of people in the society, but also makes them hard to express their message. The main reason of this project is to break the barrier between deaf or mute community with the rest of the community by translating hand sign language into readable text. This project also can be access by everyone, it's like a platform that can allow anyone to access the algorithm anywhere. To make sure that this project achieves this target, an American Sign Language (ASL) Translator was created to translate ASL hand sign to readable English text. The LEAP Motion technology was implemented in this project to capture ASL fingerspelling hand sign gesture that been displayed by the user. The captured data is then being processed, recognized and classified into English letters. The translation letters will be displayed in the web so that user can know what have been translate. The average accuracy for all translation are more than 90% for pose and more than 65% for gesture. So, this technology can be used widely by all people so it can help translate the sign language into readable text.

ABSTRAK

Bisu dan pekak merupakan satu halangan yang dihadapi oleh sebahagian kecil masyarakat dunia. Dengan kecacatan ini, Orang Kelainan Upaya (OKU) ini bukan sahaja menghadapi kesukaran untuk berkomunikasi dengan masyarakat, tetapi ia juga menyebabkan mereka untuk menghadapi masalah untuk menyampaikan mesej mereka. Salah satu sebab utama projek ini adalah untuk memusnahkan halangan antara mereka untuk berkomunikasi dengan menterjemahkan Bahasa isyarat ke dalam texts yang boleh dibaca. Selain itu, projek ini juga boleh diakses oleh semua orang, dimana algoritmanya boleh didapati di mana sahaja yang mempunyai Internet. Untuk memastikan yang projek ini berhasil, Penterjemahan American Sign Language (ASL) akan dihasilkan bagi menterjemah ASL kepada teks Inggeris yang boleh dibaca. Teknologi LEAP Motion digunakan didalam projek ini untuk menangkap data yang sudah diberikan oleh pengguna. Data yang sudah didapati akan diiktiraf, diproses, dan diklasifikasikan kepada abjad Inggeris. Terjemahan abjad akan ditunjukkan di laman sesawang supaya pengguna tahu apa yang sudah diterjemahkan itu. Purata ketepatan untuk semua terjemahan mendapati lebih daripada 90% untuk Bahasa isyarat statik dan lebih daripada 65% bagi Bahasa isyarat bergerak. Jadi, teknologi ini boleh digunakan semua lapisan masyarakat kerana dapat membantu untuk menterjemahkan Bahasa isyarat kepada teks yang boleh dibaca.

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LIST OF SYMBOLS AND ABBREVIATIONS

For examples:

LMC	:	LEAP Motion Controller
ASL	:	American Sign Languages
API	:	Application Programmer Interface
GUI	:	Graphical User Interface
SVM	:	Support Vector Machine
HMM	:	Hidden Markov Models
3D	:	Three Dimension
TOF	:	Time of Flight
PMD	:	Photonic Mixer Device
TCP	:	Tool Control Point
IR	:	Infrared
K-NN	:	K- Nearest Neighbour
SDK	:	Software Developer Kit
HTML5	:	Hypertext Markup Language 5
FSM	:	Finite-State Machine

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CHAPTER 1

INTRODUCTION

1.1 Background Study

Speech Impairment is a form of disabilities faced by a minor group of the society. By having this disabilities, it will make them hard to communicate with the rest of society, nevertheless, it will make them more difficult to express their message. This project was proposed to break the barrier between the disability group and with all the society by translating the sign language (American Sign Language) into readable English text. This project suggests the use of LEAP Motion Controller (LMC) to identify the hand gestures and movement of a person that communicate his/her message using sign language.

1.2 Problem Statement

Speech Impairment people are group that often facing difficulties to communicate effectively with the favored people as most of them do not know how to interpret sign language. This will not only form a hurdle between them and the rest of the community in term of socialization but also influenced their working chances. Thus, a system that capable of translating sign, language into written text is crucial to smoothen the communication between those who are fortunate and those who are unlucky.

Even though the sign language recognition can also be done using the camera that using the image processing technology, using LEAP Motion Technology will have a better advantage because LMC does not depends on the outdoor light intensity. Normal camera will have such a difficulty in capturing images when the surrounding light intensity in under certain values. By using LMC, this kind of problem can be solve because LMC are using the infrared sensing.

From previous research, LMC are not easily to track gesture in their translation because gesture have a motion tracking in that. Some of ASL have a gesture in their sign language like letter ‘J’ and ‘Z’. So, a system that are able to recognize not only a pose sign language, a gesture also can be translated by the technology. It will help the unfortunate people to use this technology easily in the future.

1.3 Objectives

The objectives were set as main goal for the project to be achieved:

i. To analyze the hand gesture and the movement involved in sign language used by the disabled group.
ii. To implement LEAP Motion technology in the hand gesture and movement recognition.
iii. To design an application that can translate the sign language into English text.

1.4 Scope of Project

The scope of the project was a few of limitation and boundary range for the research work and for the project itself. Firstly, American Sign Language (ASL) was chosen as the target sign language because dialects of ASL and ASL-based creoles are used in many countries around the world, including much of West Africa and parts of Southeast Asia. ASL is also widely learned as a second language, serving as a lingua franca.

Secondly, English are the target language to be translated into. It is because we all know that English is the one language that well-known throughout the world. So, it will be easier for them to understand it.

Thirdly, my target group for this project is the one that having speech and hearing impairment. This groups is the most commonly user for the sign language. So, by targeting this group is much simple compare to other disabilities. Last but not least, we are using basic alphabet, numbers and basic gesture in ASL to put into the library.

1.5 Project Significance

The fundamental concept of this project is to convert the commonly used hand language, which is the American sign language into readable English text. By using motion sensing technology such as LEAP Motion Controller, the pattern recognition of hand gesture becomes more achievable.

The speech impairment community is constant having problem when they try to communicate with the rest of the society, as normal people are not hand sign language literate. Thus, by converting the hand sign language, natural language of deaf people to readable English text, a world-wide spoken language, is capable to minimize the obstacle faced by the deaf people in communication. So, upon commercialization, this project have a good future to have a significant good impact on the society, especially for the hearing and speech impairment community.

One of the advantages of this project including the breaking of the invisible blockade of communication as it allows fortunate people to understand the hand sign language expressed by the deaf people. This minor group shall no longer have problem to express their message to the normal people. This can indirectly rise the employment chances as many of the deaf people cannot present themselves to the employer well because the employer cannot understand what they try to convince.

In addition, the successful implementation of the project will help the learning of the sign language. There are a significant portion of hearing impairment group is not born with hearing defectiveness. They also can get this problem from illness or accident. So, they also need to learn the hand sign language. Therefore, by using this project, the education of hand sign language will become much easier, and it will help to self-learning of the hand sign language.