UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMART GLOVE FOR BLIND PEOPLE BY USING ULTRASONIC TECHNOLOGY

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours

by

ISKANDAR DZULKARNAIN BIN HAMZAH

B071610721

950221-05-5363

FACULTY OF ELECTRICAL ENGINEERING TECHNOLOGY

2019

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Sesi Pengajian: 2019

Saya **ISKANDAR DZULKARNAIN BIN HAMZAH** mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (X)

☐	SULIT*	Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972.
☐	TERHAD*	Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan.
☒	TIDAK TERHAD	

Yang benar,

.....

ISKANDAR DZULKARNAIN BIN HAMZAH
Alamat Tetap:
LOT 152,
KAMPUNG JELATOK MENDOM
71750 LENGGENG
NEGERI SEMBILAN

Tarikh:

Disahkan oleh penyelia:

.....

DR. SAHAZATI BINTI MD. ROZALI

Tarikh:

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

DECLARATION

I hereby, declared this report entitled DEVELOPMENT OF SMART GLOVE FOR BLIND PEOPLE BY USING ULTRASONIC TECHNOLOGY is the results of my own research except as cited in references.

Signature: ……

Author : ISKANDAR DZULKARNAIN BIN HAMZAH

Date:

APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technlogy of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive) with Honours. The member of the supervisory is as follow:

Signature: …….

Supervisor : DR. SAHAZATI BINTI MD. ROZALI

Signature: …….

Co-supervisor: Ramlan bin Latip

ABSTRAK

Tujuan kajian ini adalah untuk membangunkan prototaip Smart Glove untuk Orang Buta untuk meningkatkan mobiliti mereka. Sistem yang dicadangkan akan menggunakan teknologi sensor ultrasonik HC-SR04 sebagai sensor untuk mengesan jarak yang akan mengaktifkan buzzer dan vibrator apabila pengguna semakin dekat dengan halangan di sekelilingnya. Dalam projek ini, jarak yang diukur oleh sensor ultrasonik akan dihantar kepada penerima. Data yang telah diukur akan dipaparkan pada skrin LCD. Dengan menggunakan sistem ini, mobiliti orang buta akan bertambah baik. Sistem ini dijangka berada dalam kos rendah, ringan dan mesra pengguna.

ABSTRACT

The purpose of this study is to develop a prototype of Smart Glove for Blind People in order to improve their mobility. The proposed system wilt use ultrasonic sensor HC-SR04 technology as a sensor to detect the distance which will activate the buzzer and vibrator when the user is getting close to the obstacle around them. In this project, the distance that measured by ultrasonic sensor will be transmit to the receiver. The data that has been measured will be displayed on the LCD screen. By using this system, the mobility of blind people will improve. The system is expected to be in low cost, lightweight and user friendly.

ACKNOWLEDGEMENTS

I would like to express gratitude and appreciation to all those who gave me the possibility to complete this report. A special thanks to my PSM Supervisor, Dr. Sahazati binti Md. Rozali, whose help, stimulating suggestion and encouragement, helped me to coordinate my project especially in writing this. I'm also express sincere appreciation to my Senior Lecturer, Dr. Mohd Badril bin Nor Shah for his guidance, advise and motivation.

I'm also indebted to University of Technical Malaysia, Melaka. My sincere also extends to all my colleagues and other who provided assistance various occasions. Their view and tips are useful indeed. I'm grateful to my family member for funding cost of this project.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS

ETA	-	Electronic Travel Aids
UART	-	Universal Asynchronous Receiver Transmitter
USB	-	Universal Serial Bus
WHO	-	World Health Organization
PING	-	Packet Internet Groper
KHz	-	Kilohertz
MHz	-	Megahertz
LED	-	Light Emitted Diode
DIP	-	Dual In-Line Package
cm	-	Centimeter
mm	-	Millimeter
I/O	-	Input/Output
ICSP	-	In-Circuit Serial Programming
ADC	-	Analog to Digital Converter
LCD	-	Liquid Crystal Display
GND	-	Ground
IDE	-	Integrated Development Environment
PCB	-	Printed Circuit Board
TTL	-	Transistor-Transistor Logic

CHAPTER 1

INTRODUCTION

1.1 Introduction

In 2010, the Department of Welfare has estimated about 64,000 registered blind people in Malaysia and estimates of the number are believed to increase as much as two times higher by 2020. It shows that the problem of illiteracy among the population in Malaysia is relatively high and serious. The definition of blindness can be defined such that when a person has no sense of sight directly diseases most commonly leading to blindness are cataracts, retinal diseases, refractive errors, glaucoma and corneal disease.

1.2 Background

Nowadays a lot of systems that support the blind was invented. This facility is called Mobility Aids Electronic otherwise known as ETA. ETA is a device that was introduced as a mobility aid for blind people. General, the tools typically used by blind people are the stick and guide dogs. Blind person using a stick around their feet to detect presence of an obstacle. Meanwhile, the dog is using trained dogs to assist the blind in order to avoid any obstacle in their way.

However, these method has its own weakness. For example; the stick can only detect obstacle which have a relationship with their touch. This is in efficient in this modern era because too many obstacle since there are various construction around them. Furthermore, this method can not accurately detect the obstacles above the knee.

1.3 PROBLEM STATEMENT

Most of the ETA device has its own weakness as an example; the training phase is required for the blind to make themselves synonymous with the tool. In this context, they need to be trained by experts to use a cane to perform their daily tasks. Furthermore, the sick is only able to detect obstacles up to 1 meter if there is contact between the rod and obstruction. The method uses a guide dog requires professional training and high costs. Also a guide dog can not read the signals that are too complex to interpret traffic lights. Thus, the accident might happen to the blind because of this group can not feel the existence of the barriers to the right. They have to rely on others to bring them to a specifics location or they just can walk in the places that they are accustomed to it.

1.4 OBJECTIVES

1. To develop a prototype of smart glove system for a blinded people.
2. To implement the design system in a daily usage of blinded people.
3. To analyze the performance of the designed system in terms of the location and the distance of obstacle.

1.5 SCOPES

1. Smart glove based on ultrasonic sensing mobile, lightweight, inexpensive, and user-friendly.
2. The project focuses on the detection of objects that are in front of users in a certain range depending in the type of sensor used.
3. The proposed system is to use ultrasonic technology. These sensors can detect obstacles at a minimum distance of 2cm to a maximum of 70cm.
4. The system will issue a warning in the form of a buzzer sound and vibration motor vibration at a distance of 2cm-70cm.
5. To analyse the performance of the designed system in terms of the location and the distance of obstacle.

1.6 PROJECT FRAMEWORK

Basically the work consist of five main chapters. The first chapter of the thesis discuss briefly about the whole project. There are other elements that will be discussed in this chapter that is a problem that occurs due to the development of this project. By identifying the problem, it led the construction of the objectives, scope and trend studies.

Chapter two discuss the literature that discuss the types of sensors will be used in the development of smart gloves for the blind. It includes a description of how the device will work.

In chapter three, all the methods used in the course of this project are briefly described. Basically, this is a hardware-based projects. This chapter also includes project management, where will discuss the process and actions that have been made to achieve the target. The process has been made including the procedure, effective planning, organizing and controlling the resources in the specified time period.

In the fourth chapter, the results which were acquired in the course of the experiment are discussed. All discussion are focused on the results of ultrasonic sensors. The results will determine whether the device is designed compatible for use as a tool for the blind.

Finally the last chapter, it will include the conclusions and recommendations of this project for better data size . The complete system can operate properly and will help blind people to run their daily routines easier.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Blind people are those who have low propensity for identifying the smallest detail with healthy eyes, and blind when they are exposure to visual acuity 6/60 or horizontal extent with both eyes open less than 20 degrees. This means that they are legally blind have to stand 20 feet from an object to see the same object as clear as those n normal vision. In 2009, the World Health Organization (WHO) estimates that there are about 285 billion people in the world who are visually impaired, of which 45 billion are illiterate and 269 with low vision.[1]

Autonomous navigation are designed for those who have sight problem to enable them to perform their daily activities. Generally, most of them may not be able to withstand this challenge as it requires physical and mental effort which is great. They usually use a cane and a guide dog for mobility and navigation. However, they can still be exposed to danger because both of these methods is to detect low-level barriers. Furthermore, the method of using a dog guide training needs high costs.

Electronic Mobility Aids or called ETA a device with a sensor technology that will act as a medium to facilitate movement.

2.2 TYPE OF STICK

Stick is a long rod used by blind people for the purpose of mobility while travelling. The first rod is designed after World War 1. Their goal is to form a stick to detect obstacles. This tool can be used to detect hoes, stairs, and the slope of the ground or any object around a person. When using crutches, someone will use one end of the stick touching the ground for walking. There four types of sticks. The first type is along stick as shown in Figure 2.1, and staff is the longest. Long stick is the most commonly used by the blind because it does not require high costs.

The second type is the rod guide as shown in Figure 2.2. This stick is shorter than the length of the rod where only up to the waist of the user. Thus, the device has a lower mobility function and just focus on the lower part of the user. This stick can be used to detect holes, rocks and small containment barrier.

The third version of the stick is a stick symbol but these tools are not designed for mobility because the design to remind people that a user blind. Stick function is for people to lend a hand to the blind.

The last type is the stick for the children or known kiddie stick. The purpose of this rod is designed for use by children who have the same characteristics as long cane.

Figure 2.1 Long Stick

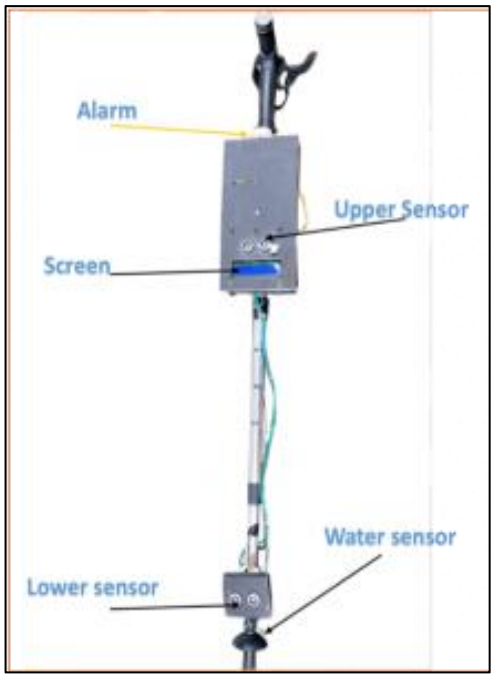

Figure 2.2 Rod Guide

Another method is to use a guide dog for mobility system than the stick. Guide dogs are assistance dogs trained to lead blind people or people with impaired vision. Figure 2.3 shows a blind person with a guide dog guide a blind person to move from one place to another. Guide dog are trained to navigate around the various obstacles, and will signal if there is an obstacles, and will signal if there is an obstacle in front. Dog guide as previously stated must be professional trained to guide the blind to blind. However, the use of guide dogs is limited because the dog was unable to understand complex instructions. For example, dos cannot interpret traffic light on the highway. Therefore, this method is also considered less appropriate if practiced today.

Figure 2.3 Blind people with guide dog

2.3 Electronic Travel Aids (ETA)

Many technological advances implemented in the ETA device based on a study conducted by the researchers. Among these tools is a sensor-Mowat, the Guide Sonis, Sonic Hunter Road, Rd Guide, Belt Nav and several other ETA device has a better ability to detect obstacles at the same time. These tools are all based on the use of ultrasound or laser technology.

2.3.1 Mowat Sensor

Mowat sensor is an aid to ambulation for individuals with visual impairment as yous can see in Figure 2.4. It is a lightweight, handheld device, similar to a flashlight, that detects objects by sending out brief pulses of high-frequency sound (ultrasound). The device vibrates when it detects an object, and users can tell how close they are to the object by the rate of vibration. The device ignores everything but the closest object within the beam. Thus, the blind can learn a barrier trough the vibration generated by thie sensor. By the way, this sensor can not detect obstacles on the ground as there are holes or humps on the road and is limited to the distance around the sensor only. This tool was invented in New Zealand by Geoffrey C. Mowat used with sonar sensors. He often brings Mowat Sensor in a pocket to be presented to the public.

Figure 2.4 Mowat Sensor

2.3.2 Sonic Guide

Sonic Guide represent a kind of relief with the use of these tools in the head . this tool was created by Kay at Centerbury University, Christchurch, New Zealand using the application glasses. The device attracted the attention of many researches because of multi-branch structureof the instrumentation tool is more modification to the device, such as using audio system.

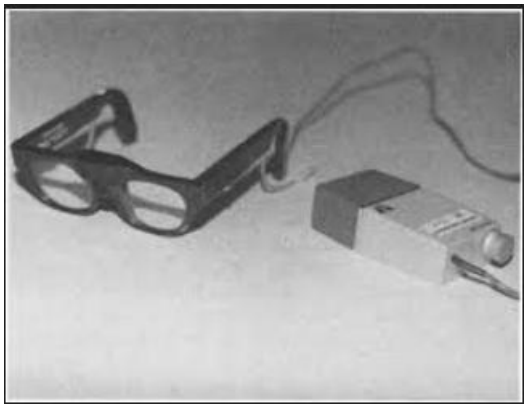

Figure 2.5 Sonic Guide Glasses

Figure 2.5 shows however the device is applied to the frame of the glasses. associate degree supersonic device is placed in an exceedingly frame of glasses that sends a sign frequency ultrasound. the space to the article is encoded within the frequency of low-fequency tone. Thus, the user will estimate the space to the article of the sound created.

2.3.3. The Search Sonic

The Search Sonic is ultrasonic sonar equipment designed for the blind and visually impaired. The installation of overhead for enabling users to be able to use their hands freely (see Figure 2.6). This device has two deliveries, three receivers transducers are mounted on the head. The transducers receives the signal from obstacles and is controlled by a microcomputer system. Detection of a particular object is like a note scale music and automatically adjusted by the microcomputer.

Figure 2.6 The Search Sonic

Sound direction depending n the direction of the detected object. Furthermore, this tool also provides the traveler with extra detection area above the waist. This tool can be regarded as both the mobility device due to the use of this tool is limited to the waist.

2.3.4 Rod Guide

Figure 2.7 shows the structure of the rod guide comprising sensors mounted on the ends of the handle. Meanwhile, a second sensor mounted on the steering wheel and control the devices detect objects around them. In this situation, the users feels as control commands through the physical power and the holder can take the easy road.

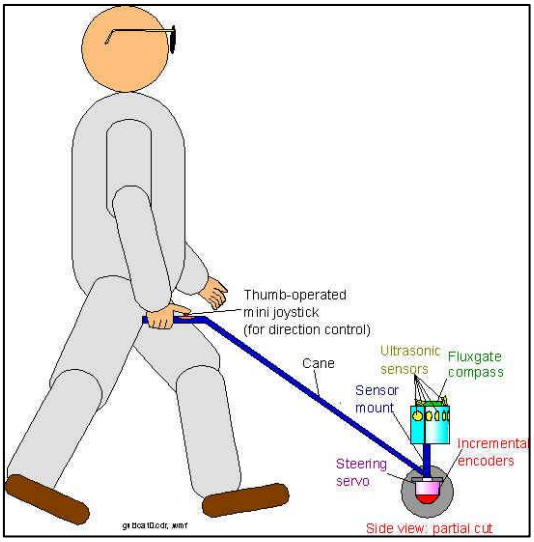

Figure 2.7 Rod Guide

The guide rod has a good market potential and distribution for both veterans of Blind Rehabilitation Center in western countries have been trained with this electronic mobility device. Moreover, the center of this giant has sent a staff member to Western University in Kalamazoo, Michigan, to provide training on how to use this device.

2.3.5 Belt Nav

Johann Borenstein is among the first propose a means Nav Belt at the University of Michigan in 1989. he disclosed above experimental mobile robot for navigation purposes. The device is equipped with ultrasonic sensors and connected to computer. There are two modes of operation of this device manual mode and image mode.

In this system, the signal obtained by the sensor are processed in the computer, and the causes the signal sent to the user with a stereophonic headphone stereo imaging techniques. Figure 2.8 shows how Belt Nav use.

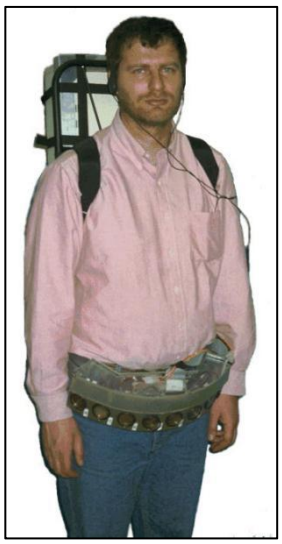

Figure 2.8 How To Use Belt Nav

2.4 Ultrasonic Sensor

Ultrasonic sensor function is to detect objects and react with measured distance. Ultrasonic sensor use to detect objects frequency. PING sensors designed to measure the distance of a solid object. This sensor has a measurement accuracy without contact with the measuring point of 3 cm up to 500 cm. Frequency is used to detect the object is about 20 kHz to 100 kHz . This tool is mainly used in the level of ambient noise, leak detection

and test material. Ultrasonic sensors are very commonly used as a sensor because it's cheap, simple design and effective way to measure the distance.

Ultrasonic sensors detect obstacles in its path by continuously sending ultrasonic waves. Ultrasonic receiver detects the ultrasonic waves and the information is sent to the microcontroller. Microcontroller warned by a voice massage if the obstacle is detected in the vicity. Ultrasonic sensors can be used to detect the object.

Figure 2.9 shows the operation of ultrasonic sensors to send and receive sonar to detect objects. Wave device comprising producers, the time counter, amplifier and the radiation section. Emitting ultrasonic sensors can be designed using the plate stepped Gallego Juarez where it consists of wave generation, amplification and radiation while the microphone is used as a receiver. Gallego Juarez stepped plate is also used to produce intense waves for parametric array.

Figure 2.10 shows a schematic diagram of an ultrasonic sensor. The material is lead zirconate titanate transducers with different polarization. Horn used as an additional linear and radiating plate will consist of reinforced high-intensity ultrasound.

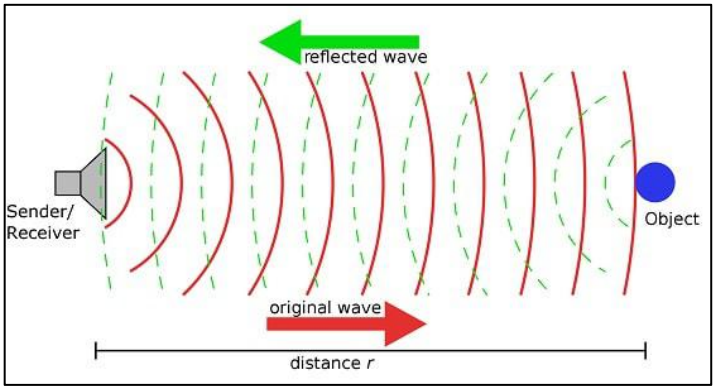

Figure 2.9 Sonar Illustration