



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ELECTRONIC WALKING STICK FOR VISUAL IMPAIRED

This report submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronic Engineering Technology (Telecommunication) with Honours.

by

MOHD AFIQ BIN CHANDI

B017410586

930401055127

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TAJUK: **ELECTRONIC WALKING STICK FOR VISUAL IMPAIRED**

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DECLARATION

I hereby, declared this report title “Electronic Walking Stick for Visual Impaired” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the award of Bachelor of Engineering Technology (Telecommunication) with Hours. The member of the supervisory is as follow:

.....

(PUAN WAN HASZERILA BINTI WAN HASSAN)

ABSTRAK

Tujuan utama projek adalah untuk membantu golongan orang cacat penglihatan dan melindungi mereka dari melanggar objek-objek semasa berjalan di luar ataupun melakukan perkara rutin seharian mereka. Tongkat yang masih digunakan oleh mereka sudah ketinggalan zaman dan langkah penambahbaikan perlu diambil, bagi memastikan golongan ini tidak ketinggalan zaman dan menikmati teknologi yang terkini. Tongkat yang masih digunakan oleh mereka mempunyai kekurangan upaya, dari segi mengesan objek dihadapan dan mengesan air atau lopak air. Bagi mengelakkan mereka daripada melanggar objek di aras kepala, maka sebuah prototaip akan dibina bagi melindungi mereka daripada melanggar sesuatu di aras kepala seperti dahan pokok. Prototaip ini akan dipasangkan pada topi, dan akan terdapatnya sensor di bahagian depan topi tersebut. Sensor yang akan digunakan dalam projek ini adalah, ultrasonik dan pengesan air. Ultrasonik ini bertujuan untuk mendapatkan jarak halangan dari pengguna, dan pengesan air pula bertujuan untuk mengesan jika terdapat air dihadapan pengguna. Arduino UNO pula akan digunakan sebagai pengantara perkakasan dengan perinsian. Perisian ini akan digunakan untuk menulis pengaturcaraan untuk projek ini. Pengaturcaraan ini akan ditulis pada perisian Arduino IDE, dan akan dimasukkan pada mikropengawal di Arduino UNO. Selepas itu, untuk bahagian notifikasi pada pengguna. Buzzer dan motor pengegar akan digunakan. Buzzer ini akan berbunyi mengikut keadaan situasi, kerana setiap situasi akan mempunyai frekuensi yang berbeza.

ABSTRACT

The main purpose of this project is to help the blind person to visualize the current situation for ensure them from hitting the obstacle or fallen while walking. Admit that, there has a blind stick for helping the blind person but it is a traditional blind stick and need to improvise for help blind person. Furthermore, the traditional blind stick has a limitation which is to notify the user about the presence of obstacle and water. Besides that, this project come out with the sensor at head level. It is design to avoid blind person hit the obstacle at head level such as branch or wall. The sensor at head level, are implement at a hat and will be wear by blind person. The sensors that will be used in this project are ultrasonic sensor and water sensor. Ultrasonic sensor is used to measure the distance between blind stick and obstacles. Then water sensor, used to detect the presence of water at ground. Arduino UNO is used for interfacing between hardware part and software part which is program coding for a project. For software part, Arduino IDE will be used to place the program and implement it to the microcontroller on Arduino UNO. For notification part, buzzer and vibrator will be used for notify the blind person about the current situation. The buzzer will be sound at a different frequency according to sensor detection.

DEDICATIONS

To my beloved parents Mr Chandi bin Paijan and Mrs Rossita bt Abdullah thanks for your moral support. Besides that I would to dedicate this project to my supervisor Puan Wan Haszerila Binti Wan Hassan that assists me develops this project. I also want to thanks to my lectures and friends that help me to develop this project.

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LIST OF ABBREVIATIONS SYMBOLS AND NOMENCLATURE

PIC	-	Programmable integrated Circuit
CPU	-	Control Process Unit
ROM	-	Read Access Memory
RAM	-	Read Access Memory
RFID	-	Radio Frequency Identification
GPS	-	Global Positioning System
GPRS	-	General Packet Radio Service

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter describes the background of the project, problem statement, objectives and scope which are related to development of electronic walking stick.

1.1 Background of Project

Traditional blind stick was improvement from black cane in 1931, then Lion' Club decide to paint that black cane to white cane for blind person safety. Ten years before, it already claimed by James Biggs [3] for paint that black cane to white cane after he feeling threatened by increasing of vehicle. James Biggs who has lost his vision after involved in an accident, then his idea for to make sure the driver realize of his presence.

Since that day, white cane or blind stick is widely used among the blind person. But there has a limitation when use the blind stick, blind person will realize the obstacles when make a contact with obstacles. After that, it also not suitable for detecting the obstacles at head level. Limitation of white cane, will limiting the blind person to visualize the current situation. There might hit the obstacles, and get injured from the impact. Next is, blind stick also not suitable for detecting the presence of water on the ground. Water on the ground might be the cause for blind person to slip when there steps on the water.

1.2 Problem Statement

Nowadays, common blind stick has been used by blind person. Blind stick has a limitation and it depends on disable person to visual what in front of them without knowing the distance of obstacle. Next limitation of white cane is, to detect the obstacle at head level of blind person. Disable people is easy to fall, even they just stepped on something such as cane. They also can be injured from that fallen. It is need to be upgrade, to ensure that it will really help for disable people in daily life.

1.3 Objectives

The objectives of this project consists of three:

- I. To understand the operation of ultrasonic sensor, water sensor and Arduino UNO.
- I. To design the blind stick with a sensor and give fast response to disable people.
- II. To develop a blind stick with a low cost and compatible to blind person.

1.4 Scope of Work

There are two scopes that need to focus on which involves the software and hardware part. The hardware part which is ultrasonic sensor is used to measure the distance between stick with obstacle. Meanwhile, the water sensor is used to give the signal to microcontroller. When blind stick is detecting water during disable people use that blind stick. Then, buzzer and vibrator will notify the user with a sound and vibrate. The software part includes the Arduino software to program the coding before burn it into Arduino kits.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter summarize the research that have been carried out from related fields of the project which involves the study of various types of sensors and overall working system of the projects.

2.1 White Cane

White cane also known as white stick, it was design in 1921 by James Biggs [3]. He was a photographer and become blind after an accident. The idea was come when, he start to worried about his safety at the road especially he realise the number of vehicle around his house start increasing. Then he start to paint the stick with a white colour, to ensure that people realise the presence of blind person. Then, until nowadays the blind stick in white colour and it was help to other people alert with a blind person. Realise that, white cane as a symbol to impaired person and there was a different rules to ensure that blind person is secure by according the countries rule.

At United Kingdom, the blind stick will have two red bands added at the bottom of stick to indicate that user is deafblind. Meanwhile, at United States rule for impaired is it can be used at public area. Then it also state that, blind person has a right of way to cross the road at any place. After that, it will be illegal for those who not a blind person use the white cane at public place. There are several types of blind stick,

example are long cane, guide cane, identification cane, support cane, kiddie cane and green cane.

Long cane also known as Hoover cane as shown in Figure 2.1 it was designed by Dr. Richard Hoover [11], the length of cane was depends on the height of blind person. It was designed to detect the object in front of user. Some believes, increase of length stick is guarantee safety of user. The reason is, it will prevent user from hit the obstacle and give some time user to make a decision to avoid the obstacles. Next is guide cane, it was a shorter cane because the length is from waist user to the ground. Because of shorter length, it suitable for detect the kerbs and step. After that, it will notify the user the presence of obstacles immediately.

Moreover, identification cane is more like an identification to alert others about the presence of blind people. Design was shorter than a long cane and lighter. It also not use as a mobility tool. Next is support cane, it was design for help user to keep stable while visualize. By obey the code colour which is white, it also can be used for others to identify the presence of blind person.

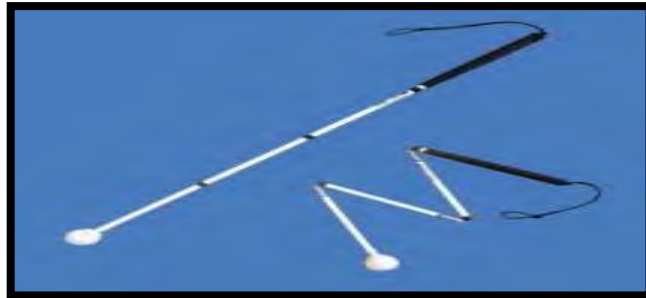


Figure 2.1: Example of white cane

2.2 Ultrasonic Sensor

Ultrasonic sensor which is the component that can measured a distance by using a propagation of wave, and the data measured from ultrasonic is reliable source as shown in Figure 2.2. Next is, it can be used in the poor lighting or in the dark place.

This is because, ultrasonic sensor is not a vision sensor and need any lighting to measure the distance. Ultrasonic sensor will transmit the wave pulse and receive the reflected wave echo, frequencies range is 40 kHz and 250 kHz. Human ears, cannot heard this wave frequencies because human ears can hear within 20 Hz to 20 kHz. After that to measure distances of obstacle, the receiver part will wait the sound wave echoes. The time delay between the transmitter and receiver echoes, will determine the distances of obstacle in front.

There has a limitation using ultrasonic sensor, which is it really sensitive with the object even though a flat surface or transparent surface. Besides that, it also can be used to image the dimensional, and identify the surface situation. Means that, it also can determine internal defect or the situation inside either it has a crack or else. This was used such as, to identify the condition of plate. The methodology is, ultrasonic sensor will transmit the wave and wait for the reflected wave sound. Transducer will be used, to change the wave signal into an electrical signal and it will display at screen. Moreover, it also can determine the location of crack such as the depth of crack and it will help to identify the location that might has a problem.

Next is, ultrasonic also does not has any radiation while the process happen. After that, ultrasonic also can measure the thickness of the surface. Even though the specimen of paper, the thickness of paper still can be measure by using ultrasonic sensor. Ultrasonic sensor has a limitation for measured the distance, realise that it was used of sound wave and the time delay between transmit with receiver will determined the distance. The echoes will happen when the sound wave hits an object, means that if transmit sound diverges it will cover the larger space. Then it will detect the unwanted space at the front. To overcome the problem, sound wave will transmit with a narrow beam. The purpose is to cover the important part only, while detect the obstacles. Ultrasonic also will be effect when the surrounding has a smoke in excessively way, and high humidity.

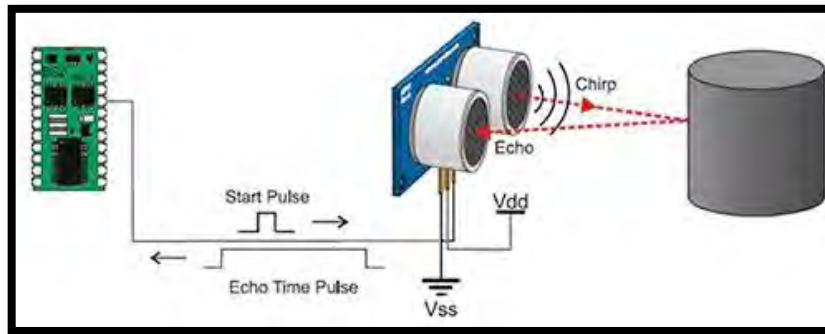


Figure 2.2: Ultrasonic sensor

2.2.1 Ultrasonic Transducer

The main component of ultrasonic is transducer part, it was a pair of component which is transmitter and receiver part. Transmitter part, will produced the sound wave or known as “ping”. While receiver will waiting the echoes from the transmit sound wave, then there will be determine the distance between the obstacles and sensor. Transducer come out with two type, first is piezo type and the other one is electrostatic type.

Piezoelectric functioning method is, it will transmit the high frequencies or sound wave when there has an electrical energy is applied on it. After that, it also can receive the sound wave and convert it to the electrical form. The receiver is, receive the sound wave from the echoes that happen while transmission from the transmitter. Usually, transmitter and receiver will placed together besides. The purpose is, to avoid the misplacement while receives the sound wave. The reason is when the sound is transmit in narrow beam, the echoes return to receiver is not faced the receiver because wave is misplaced from the receiver transducer part.



Figure 2.3: Transduce part

2.2.2 Ultrasonic Working Principle

Ultrasonic sensor need 5V for start the measurement or as a minimum value is $10\mu s$. After that, transducer transmitter will start transmit 8 cycle of ultrasonic burst at 40 kHz. Then the receiver will wait for the echoes return back, and during the delay happen it will measured the distance. The practical test for range ultrasonic sensor, best in 30 degree angle as shown in Figure 2.4.

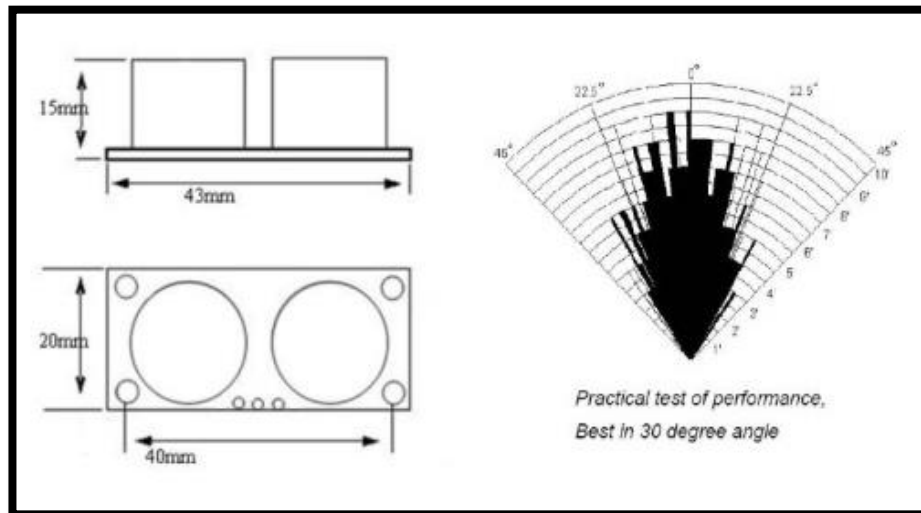


Figure 2.4: Ultrasonic range cover

2.3 PIC Microcontroller

Programmable integrated Circuit (PIC) microcontroller, it was contain of Control Process Unit (CPU), Read Only Memory (ROM), Read Access Memory (RAM), Input/ Output and Timer. All of that, was integrated on single chips. It will save the space of circuit and it was light in weight. After that, it also cheaper in price and readily available. Usually, microcontroller is use to controlled the output in automatically without any decision from human. It is because, it will give the output when input such as sensor is trigger on. The output from microcontroller, was depends on the command given from the human.

After that, microcontroller is easy to handle. This is because, it use C language level and it can be erase and replace with new command for the programmable part. Microcontroller was used in system, which is contain of motor (vehicle), robots, and numbering device or with a display output.

2.4 Arduino UNO Microcontroller

Arduino UNO used as interface, between the software part to the hardware part. The coding from the software, will be implement to the microcontroller on the Arduino UNO. Arduino Uno is use based ATmega328, it contain of 14 digital pin for input/output and separate by 6 analogue input, other 6 for PWM output. Next features at Arduino UNO is a 16 MHz crystal oscillator, USB connection, power jack, an ICSP header, and a reset button.

There has a software for conducting the Arduino UNO, software can be upload and there will be the programmable coding to the microcontroller. After simulate the coding and result coding is no error, then it can be transfer to the Arduino Uno that connect to the Personal Computer through USB interface. Figure 2.5 show the pinout of Arduino Kit.

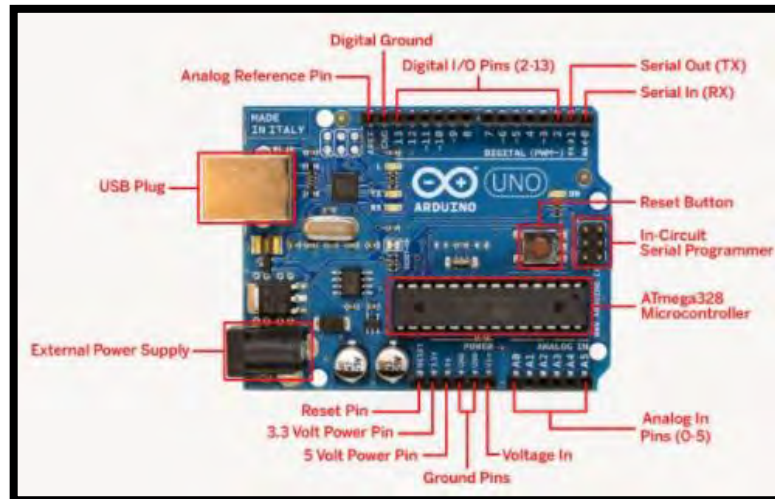


Figure 2.5: Pinout Arduino UNO kit

2.5 Past Related Project Research

2.5.1 Ultrasonic Blind Walking Stick

The idea come from, when they realise 15million from 37million people in worldwide are blind [1]. Impaired person, will need others for assistance during a daily life. Such as family members or trained dogs. Next is, not at every time family members can help them when they want. Because of family members has another routine in their life. Trained dog disadvantages is, its animal can make a right decision and never know human language. Hence that, this project was design to overcome the problem that has been faced. By implement the Ultrasonic sensor, to measure the distance between stick and any obstacle in front. Then to give the information to user, buzzer was used and it will sounded by according the range from the distance that has been measured from the ultrasonic sensor. Next is, heart of the circuit is microcontroller (ATMEGA328). It was like a computer, in a smaller size at a