
# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## DEVELOPMENT OF SMART ASSIST DEVICE FOR VISUAL IMPAIRED PERSON

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

by

**KHAIRUL BARIYAH BINTI M.JANI**

**B071310340**

**910820-04-5574**

FACULTY OF ENGINEERING TECHNOLOGY

# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DEVELOPMENT OF SMART ASSIST DEVICE FOR VISUAL IMPAIRED PERSON**

SESI PENGAJIAN: **2016/17 Semester 2**

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# APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours . The member of the supervisory is as follow:

……

EN. WAN NORHISYAM BIN ABD. RASHID

(Project Supervisor)

# ABSTRAK

Sekarang terdapat banyak produk elektronik di pasaran yang boleh digunakan oleh orang yang buta untuk membimbing mereka berjalan berseorangan. Sebagai contoh, tongkat orang buta . Walau bagaimanapun, tongkat orang buta ini tidak dapat mengesan halangan diperingkat kepala dan kebanyakan mereka tidak mempunyai peranti untuk mengetahui lokasi orang buta jika hilang. Projek ini direka untuk membantu orang-orang buta untuk mengesan halangan di sekeliling mereka di peringkat kepala. Ultrasonik sensor dan penggetar telah dipasang dengan cermin mata hitam. Sensor telah ditetapkan pada sebelah kiri, sebelah kanan dan hadapan cermin mata hitam. Ia akan memberi amaran kepada pengguna kerana kedudukan halangan sama ada di sebelah kiri, kanan atau di hadapan pengguna. Selain itu peranti ini juga dapat mengesan lokasi orang buta dengan menghantar SMS kepada GPS dan GSM akan memberi lokasi langitude dan longitude kepada penjaga .

# ABSTRACT

Now here are a lot of electronic products on the market that can be used by blind people to guide their walking alone. For example, the stick of the blind. However, these products can not detect obstacles ranked head and most of them do not have a device to determine the location of the blind if it gets lost. This project is designed to help the blind to detect obstacles around them in the head. An ultrasonic sensor and a vibrator mounted with sunglasses. The sensor is fixed on the left, right and front of the sunglasses. It will warn the user because of the position of obstacles either to the left, right or in front of the user. Besides, this device can also track the location of the blind man by sending SMS to the GPS and GSM will give langitude and longitude location to a caregiver.

# DEDICATION

This report is dedicated to my beloved parents who always stay by my side and taught me that

to have the best knowledge is learned from my own experience life.

# ACKNOWLEDGEMENT

In the name of Allah, I am very grateful to be given this opportunity to express my appreciation goes to my family who have always supported me spiritually during my studies at the university. Secondly, I would like to thank my supervisor En Wan Norhisyam Bin Abd Rashid and assistant supervisor Pn. Raeihah Binti Md Zain for their cooperation, guidance and work hard to ensure the completion of this project. Besides, thanks to all my friends who have motivated me. Finally special thanks to University Technical Malaysia Melaka (UTeM) for their efforts to provide me with all the facilities and technical expertise to make this project a success.

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| | | |
|---|---|---|
| GSM | - | Global System for Mobile Communications |
| GPS | - | Global Positioning System |
| USB | - | Universal Serial Port |
| PWM | - | Pulse Width Demodulation |
| SMS | - | Short Message Service |
| CM | - | Centimetre |
| M | - | Meter |

# CHAPTER 1
# INTRODUCTION

## 1.1 PROJECT BACKGROUND

There are lots of electronic products in the market that can be used by a blind person to guide them. Some of the examples are, miniguide (ultrasonic mobility aid), ultrasonic ranging system stick and mobility aid using artificial vision. However, the cost of these products are quite expensive for a person with vision impaired to purchase. Besides that, these products have limitation to detect obstacles at the head level. Thus, this project aims to design a mobility aid for the blind people to detect any obstacles around them specifically at the head level. An ultrasonic sensor and a vibrator are planned to be mounted at a sunglasses worn by the blinds. The sensor will be fixed at the center of the sunglasses is functions to alert the position of any obstacle whether it is on the left, right or in front of the user. Besides that, the vibrator will vibrate in different frequency depending on the location of the obstacle. By using the device, the blind people can move around safer. The ultrasonic ranging system is to be used because the cost is lower and can cover a wider range of length in detecting obstacle. A sunglass is a great alternative for the impaired person to use because it is easier to carry.

### I.1.1 OBJECTIVE

The objectives of this project consist of three;

i. To design a device that can help the blind person to detect the obstacle at the head level.
ii. To design a device that is able to alert the user about the position of the obstacle either on the left, right or in front of them.
iii. To design device is able to alert the location of the blind people.

### I.1.2 PROBLEM STATEMENT

Most of blind people use a stick to help them moving around from one place to another. However, this is not enough for them because any obstacle on the head level is hard to be detected using a stick. Due to this problem, additional tools with security measures need to be designed to help them improve their safety. By designing the project, this will help to alert the user to avoid the obstacles that it is located at the same level and in front of the user's head. This device is designed to be mounted on a sunglass used by the visually impaired person. It also is a very useful tool for the caregiver to locate the position of the blind by using the GSM and GPS devices. At the same time, if there are any difficulties faced by the blinds, they can ask for help by pushing an alert button that is also designed at the sunglass, to alert their caregiver.

### I.1.3 SCOPE OF WORK

This project has both hardware and software parts. For the hardware, this device consists into two parts, the range finder system circuit and the sunglasses with sensors, vibrator, GSM and GPS. The range finder system is from 0 to 0.8 meter because normally the blind person moves slowly and they are able to avoid the obstacle which is near to them. The project focuses primarily on comfort and movement every day to the blind and also concerned about the limited terms of safety where using GSM as the interface circuit to provide instructions to contact

someone. A control unit for controlling all the elements are using Ultrasonic and vibration device. In addition, the driving force of this project is Arduino. It will act as the master device which controls the entire system of the project. In order to achieve the objectives of this study, this project will include all the information on the specifications of the device such as the characteristics and applications of the ultrasonic,GSM,GPS, and Arduino. Finally, it is necessary to select and analyse the data for the optimal results.

### 1.1.4 HARDWARE

The hardware part is the most important part because this is where the output signals come from. It consists of the sunglass, GSM, GPS and circuit box. In this project, Ultrasonic Range Finder will be choosing to be used to detect the obstacle. Three ultrasonic sensors will be built at the left, right and front of the sunglasses. The three vibrators will be placed at the left, right and front of the sunglasses and a circuit box will be placed in the beg. Once an obstacle is detected by the ultrasonic sensor, the vibrator will vibrate to alert user. If the obstacle is to be detected at the left side, the vibrator will vibrate once at the left side. If the obstacle is to be detected at the right side, the vibrator will vibrate once at the right side. Lastly, if the obstacle is to be detected in front of user, the vibrator will vibrate once at the in front sunglasses. When all sensors detected an obstacle, the vibrator will keep on vibrating continuously and the buzzer was function. GSM is used to transmit the data to caregivers. GPS is used to tell the location of the blind man.

### 1.1.5 SOFTWARE

The software used in this project will be the Arduino software. It functions as the program editor to write a programming for ultrasonic sensors, GSM and GPS. Proteus software is going to be used to simulate LM7805 voltage regulator circuit, LCD , buzzer, pager motor (vibrator) circuit and Arduino circuit designed in this project to achieve the expected result.

# CHAPTER 2
# LITERATURE REVIEW

## 2.0 INTRODUCTION

For the successfulness of this project, some studies and research of information have been done. The information is from research from many sources such as books, articles, journals, and the internet. All of this information is a guideline in conducting the project. The studies of information are based on some major component and topic that is related to the project hardware and software.

## 2.1 BACKGROUND OF VISUALLY IMPAIRED PERSON TRACKER

Now the technology development system detects obstacles and track the location of a person is growing very fast every year. The development of this technology not only be felt by normal people but also no exception to the disadvantaged (OKU). Control system design of this project showed a significant effect in terms of cost of production and maintenance costs. Based on this, the development of this project should take into account to meet user needs and affordable. At present, most systems detect obstacles problem solving used by a blind person through the use of technology has made people blind stick. Unfortunately, it is less secure because its use is only used to detect obstacles in the bottom of the foot. At the same time also stick blind people can not detect obstacles that are in your head. In this project, the mobile phone is used to track the location of the visually impaired with a better way to implement the GSM technology. Hardware circuit is an important part where all the corresponding components need to be considered before it can be gathered. In this project, Arduino Mega 2560 has been used as the main controller circuit. The device designed in this project was a mobility aid for the blind people to detect the obstacle around them at the head level. An ultrasonic sensor and vibrator were

mounted to the sunglasses. The sensors were fixed at the left and right side at the sunglasses it would alert the user due to the position of the obstacle whether on the left or right of the user. Besides that, the vibrator was vibrated in different frequency due to the location of the obstacle. By the guide of the device, blind individuals can move around more secure.

## 2.2 ULTRASONIC

Steve Johnson (2011) from Computational Systems, Inc have done an examination as for ultrasonic. He communicates that clatter is a vibration of particles through a medium, like air, oil, or metal, which moves entirely outward from its source. Vibrations can be separated to vitality levels at discrete frequencies and when the human ear distinguishes these levels and frequencies, it makes an interpretation of them into intensities and tones which are then transmitted to the cerebrum. The human ear can perceive frequencies between 20 Hz (Hertz) and 20 kHz. This degree is proposed as the organized being tuned in, or sonic, range. Frequencies over this reach are alluded to as ultrasonic. Ultrasonic instruments measure the ultrasonic frequencies and, through a technique called heterodyning, make an elucidation of the frequencies down into the discernable range. Moreover, the instruments will normally give a sort of visual sign (an advanced presentation or a simple meter) of the clamor force either as some rate of the instrument's yield or a real adjusted sound estimation in dB (decibel).

According to Michal Kelemen, Ivan Virgala, Tatiana Kelemenová, Ľubica Miková, Peter Frankovský, Tomáš Lipták, Milan Lörinc, Distance Measurement by means of Using Ultrasonic Sensor (2015). Ultrasonic partition sensors are proposed for non-contact division estimation and these sorts contain transmitter and gatherer or handset which can transmit and to get ultrasonic sound (Figure 2.1). Rule accepted is to assess time to fly of ultrasonic sound wave from sensor to saw article. An ultrasonic transmitter sends a sound rehash of above 18 kHz detectable all around at the rate of 344 meter for consistently (at 20°C) and the beneficiary gets the reflected sound from the article. Division between the transmitter and the thing can be figured by essential estimation by considering the time taken by the ultrasonic wave to go

from transmitter and got back (reflected) by the beneficiary. Estimation reach is up to a few meters.

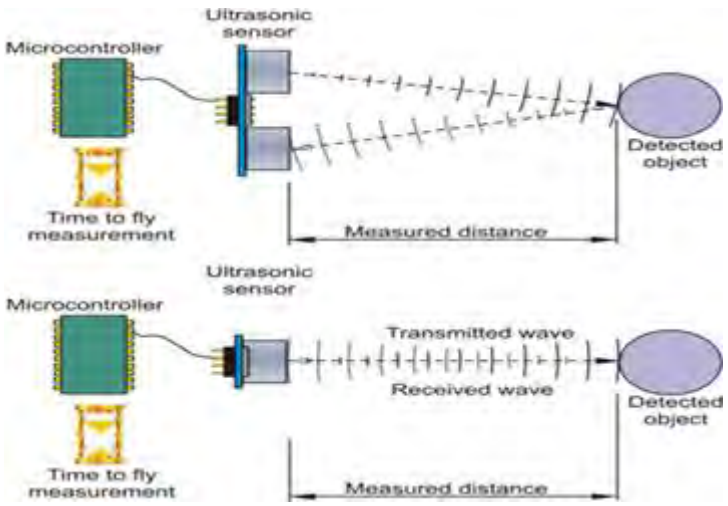


Figure 2.1:Ultrasonic sensor working principle

All materials reflect sound waves, so ultrasonic sensors are a fine decision for some errands. Incredibleness in the identification and estimation of movies, straightforward items, and fluids isolate these sensors from their photoelectric partners. Target shading or continuous shading changes likewise have no impact on ultrasonic sensors. Because of their utilization of sound waves, ultrasonic sensors likewise perform well in dusty, messy situations. Be that as it may, they don't work well with little focuses against vast foundations or targets, for example, froth batting that are phenomenal for retaining sound waves.

On the other hand, by referring to C. V. Subramanian, sound wave with frequencies more than 20 kHz are known as ultrasonic waves. The general frequencies range utilized are 0.5 MHz (Megahertz) to 20 MHz. The principle parameters about the ultrasonic are acoustic impedance, weight and power. Ultrasonic waves are grouped to four sorts admiration to the course of spread. These four types are longitudinal, transverse, surface and Lamb waves.

### 2.2.1 PROPAGATION OF ULTRASONIC WAVE

The movement of the ultrasonic wave can be comprehended through the vibration of a weight joined to a spring as in Figure 2.2. The augmenting and shortening movement happened for the spring is the way that the ultrasonic wave spreads. The groupings of relocations of mass for l (length) is termed a cycle. The quantity of cycle is known as the time of the vibration. The greatest removal for the mass is the plentifulness of vibration or wave. At the point when the wave is episode typical to an interface between two media, it is mostly reflected and incompletely transmitted.

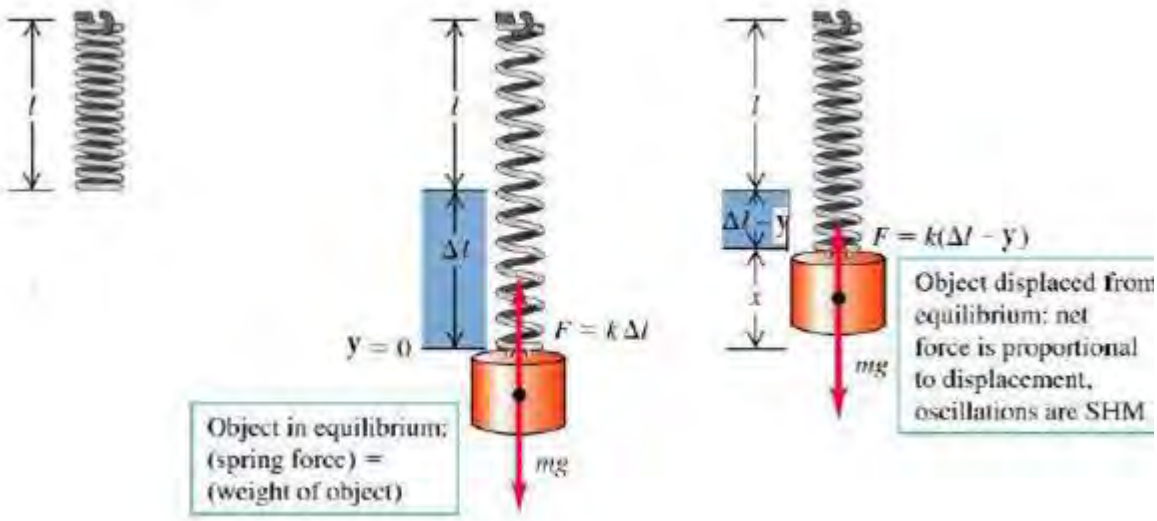


Figure 2.2: Spring in a relaxed position, Spring extend when load is added, Spring curtail when the potential energy of spring pulls back the load

As in Figure 2.3, the ultrasonic sensor determines the distance to a reflective surface by emitting high-frequency sound waves and measuring the time it takes for the echo to be picked up by the detector. The ultrasonic sensor can determine the distance to an object between 3 cm (centimetre) and 3 m away. If closer than 3 cm, the results are the sound waves echoing back to the sensor before the detector is ready to receive.

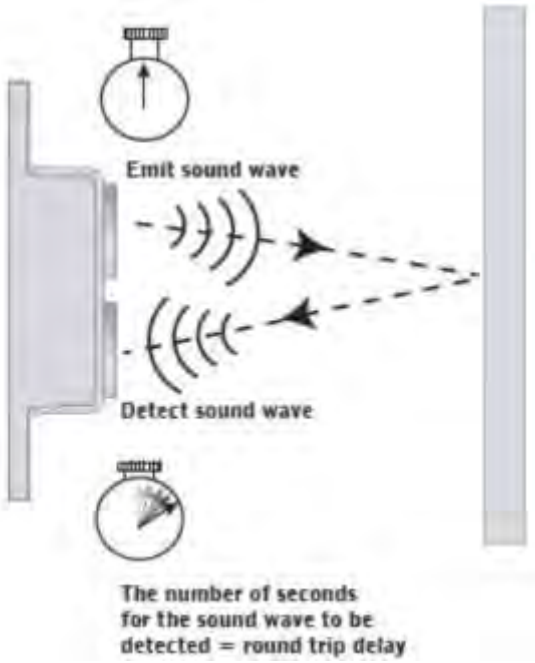


Figure 2.3: An ultrasonic sensor determines the distances

### 2.2.2 ULTRASONIC RANGING SYSTEM

According to Sanda-Ioana Morar, Amar Aggoun and Mircea-David Morar, the method mostly used in the ultrasonic measurement is the ultrasonic pulse echo method. Pulse-echo methods are generally based on the determination of the time of flight between a transmitted pulse and its echo. It is quite easy to measure the exact moment of pulse transmission. However, the moment of arrival is difficult to measure with high accuracy because of interference and noise. Sometime the ultrasonic ranging system may combine with optical scanning system. Compare within infrared and ultrasonic, infrared is more expensive and inaccessible as an ultrasonic system. The infrared running is impact by the shade of the deliberate item. Figure 2.4 shows the block diagram.

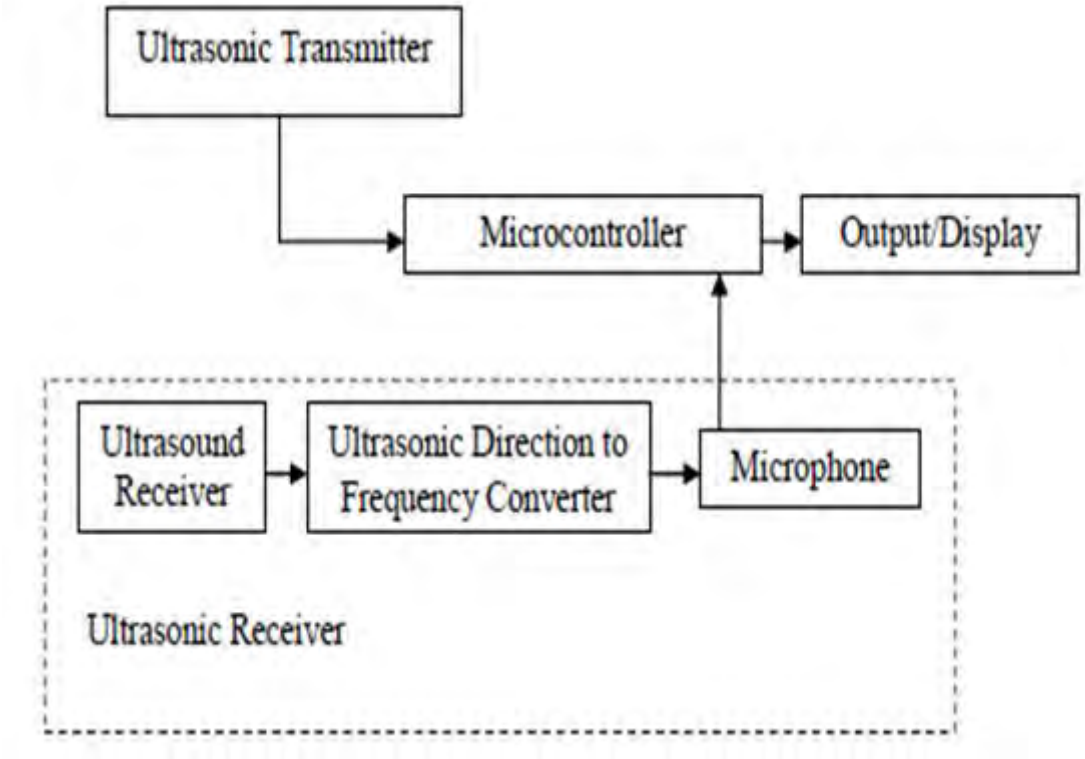


Figure 2.4: Block diagram of Ultrasonic Ranging System

## 2.3 GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

Oke A. O., Emuoyibofarhe J. O., Adetunji A. B displays the advancement and usage of a Global System for Mobile Communication (GSM)(2013). Based control framework for electrical apparatuses that empowers the complete control of the interface on which it is based. GSM module was utilized for getting short message administration (SMS) from client's cellular telephone that consequently empower the controller to take further activity like exchanging ON and OFF electrical apparatuses. The framework was coordinated with microcontroller and GSM system interface utilizing C dialect. The framework is actuated when client sends the SMS to the controller at home. Upon getting the SMS charge, the microcontroller unit then consequently controls the electrical apparatuses by exchanging ON then again OFF the gadget as indicated by the client's request. In other word, it peruses message from the cell telephone and react to control the gadgets as indicated by the got message.