WARNING SYSTEM FOR BARRIER DISTANCE

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"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of scope and quality for the award of Bachelor of Electronic Engineering (Industrial Electronics) with honours."

Signature : ……..
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I would like to dedicate this report to my family and my friends, whose encouraged and supported with a great help in completing it.

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Thank you,

ABSTRACT

The warning system for barrier distance is an interesting application for detecting the distance of barrier within detection area. It is built to help the blind people for prediction any barrier that will be interfaced. This system is integrated with voice alert system because it will produce nice sound to hear compared to alarm that produced noisy sound. This system is a microcontroller based which PIC16F877 is used to control the sequence of operation in the application. This project is focused to be implemented for the blind people because it will give more benefits especially in term of safety compared if using walking cane as the traditional guide devices that used before. With the reference distance that was determined early, so the obstacles can be detected easily and users will alert by warning voices that provided in the system.

ABSTRAK

Projek *Warning System for Barrier Distance* ini adalah aplikasi yang menarik untuk mengesan sesuatu halangan dalam sesuatu kawasan. Ia dibina untuk membantu orang kurang upaya terutamanya orang buta dalam menganggar jarak dan objek yang berada didalam lingkungan ketidakupayaan penglihatan mereka. Secara asasnya, system ini berfungsi apabila sesuatu objek atau halangan dikesan oleh pengesan ultrasonik dan akan mengaktifkan amaran dalam bentuk suara. Ini adalah kerana penggunaan suara sebagai amaran adalah lebih praktikal dan mengeluarkan bunyi yang lebih mesra pengguna berbanding dengan penggera yang mengeluarkan bunyi bising. Disamping itu, system ini juga diaplikasikan bersama system pengawal mikro berdasarkan pengawal PIC16F877 untuk mengawal turutan operasi dalam sistem ini. Projek ini lebih sesuai diaplikasikan kepada orang buta kerana ia memberi kebaikan terutama dari segi keselamatan berbanding menggunakan tongkat sebagai penunjuk arah yang telah lama digunakan sebelum ini.

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CHAPTER I

INTRODUCTION

Warning System for Barrier Distance detection is a system that will be implemented for handicap people especially blind people. This system purposely to improve the guidance of blind peoples which previously using walking cane as their device to detect the static object on the ground. Since the walking cane is a simple device that dedicated to detect static obstacles, uneven surfaces, holes and steps but the ranges are limited to its own size and not usable for detection of dynamic barriers and the obstacles that not located on the floor. Since the moving objects usually will produces noise while moving, blind people still can develop their sense of hearing to localize where the actually objects placed.

The system that will be designed is alert to the surrounding area of system due moving by using ultrasonic sensor and will send the feedback to user by nice sound that alert to user to determine the action should be taken. This system will be integrated with an ultrasonic sensor at the user's body that placed at the cloth.

The main part of this system is the sensor itself where detecting the obstacles of barrier in their way and send the signal to PIC and generate the output from voice recorder audio warning system. The range of this sensor will detect is about 1 meter to 3 meter away.

1.1 SCOPE OF WORK

The scope of work here is to develop warning system for barrier distance detection. The task is to design detection circuit which can work to detect the obstacles within its range. Once the obstacle is detected it will be generated by PIC16F877 microcontroller to activate the alert voice.

Since this project is about to detect the obstacles, a study has been made on ultrasonic sensor, where the obstacles can be detected through it. The characteristic of detection must be studied to determine the advantage and disadvantages of this sensor towards the detection area. The ultrasonic sensor will be supplied by 9 volt battery which is the best choice to drive the transmitter, receiver circuit. The transmitter and receiver circuit will be designed based on ping pong concept where the signal will be bounced before reach to receiver. The controller unit which is PIC microcontroller is developed by the C programming language. The output of this system is based on voice alert system which used ISD1416 chipcorder to store the instruction voice in 16 seconds. So, the voice recorder circuit will be attached to the system as the warning voice. The circuit will be activated by PIC microcontroller due the detection of the obstacles.

1.2 OBJECTIVES OF PROJECT

The objective of this project is to design a warning system that can sense the obstacles within certain distance area. The system that has to be designed is a portable system. Therefore the design must be considered user's movement. It also to study and design the sensor that will be used based on barrier detection. Ultrasonic sensor will be attached to the system because its ability to detect any barrier. Other objective in this project is to study the wide application of PIC microcontroller in order to control the detection and warning voice. The hardware and software element of this project must be identified in order to choose best application in developed the system. The objective of this system also to increase the user's safety when face the barriers.

1.3 OVERVIEW OF PROJECT METHODOLOGY

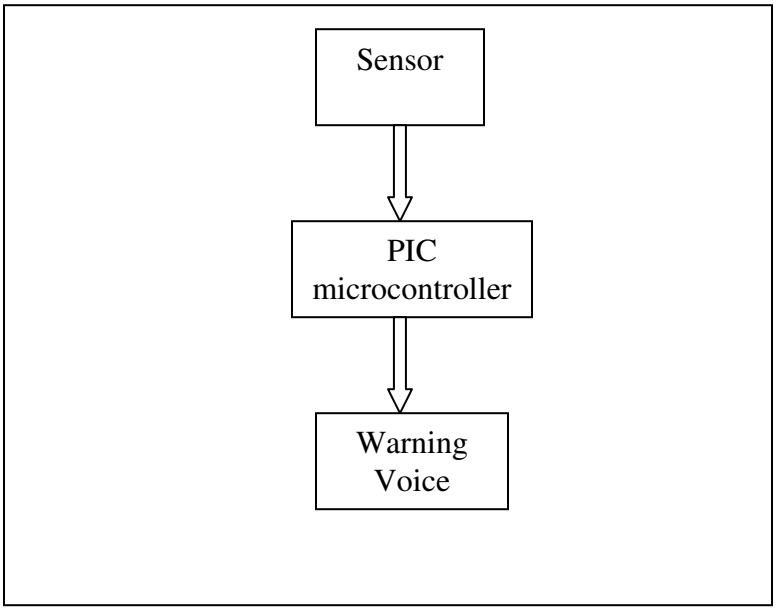

Figure 1.1: Block Diagram of Barrier Distance Detection

The sensor that used in this project is an ultrasonic sensor. It consisted of transmitter and receiver that will bounce the reflected signal transmitted to the receiver in approximately about 2 meter away from the obstacles. It will be connected to the PIC 16F877 microcontroller as the control unit in this system. PIC will generate the input from sensor and activated the output circuit which is voice recorder circuit to determine the action that should be taken by user.

The details operation of project methodology will be explained in project description in chapter 3.

1.4 PROBLEM STATEMENT

This system will be designed based on few fundamentals to determine the operation of distance sensor to detect obstacles more accurate. The theory and principle of operation sensor will be studied based on an implementation about vision robot that using sensor for mobile needs. Robot is controlled by complex system to guide it especially in order to detect distance because it cannot detect certain distance without sensors. Many sensors applied to robot like distance sensor, temperature sensor, motion sensor, and etc. The ability for robot to sense depends on how the sensors functioned at its body.

The system that will be designed is used almost same methods compared with mobile robot but it will be used for application to visually impaired people like blind people. Blind people also cannot determined how long the distance and obstacles that they walked through but they still have walking cane that guide them to sense any static objects. The problem is how about that moving obstacles will be detected although they can detect static objects only. The special thing about them is their instinct is very good. But their detection ability did not accurate and need some helpful things that will guide them more accurate in determine the barriers.

In this project, distance sensor will be design and construct based on ultrasonic application sensor to detect any kinds of objects that moving and placed at head-height which was the weak point for them to detect.

1.5 REPORT ORGANIZATION

This report consisted 5 chapters that described the process started from the introduction till the conclusion part of this project. Chapter 1 will be described about the introduction of this project in general and about the scope of work that related to the project also the methodology of this project in details. Besides it also described about the problem statement based from what kind of the system used and the applications that can be developed from the project.

In chapter 2, it will be described about the literature review that explained about the concepts that used in the previously related project. The operation of ultrasonic sensor as the detector element will be described deeply based on the function in certain purpose of the project. It included three major elements that will be discussed which are ultrasonic sensor, PIC microcontroller part, and the voice recorder.

Chapter 3 will be described about the project description that discussed the theory used to do the project. Moreover, the circuit operation also will discuss in this chapter together with the concepts of each components and analysis in general about the result that can be achieve. Besides it also discuss about the result and simulation that will be described in deeply in chapter 4.

In chapter 4 will be described about the project observation that consisted the results happen in order to make this project and the analysis in details about how circuits work and what problems may happened in the project.

Lastly, chapter 5 will be discussed and concluded the project based on the results and observation that obtained from the previous chapter. The conclusion that will be explained is based on the project execution and achievement. Lastly, the suggestion to make this project more successful will be described to update the new design for the future work.

CHAPTER II

LITERATURE REVIEW

In this chapter, the concept that is used in designing a warning system for barrier detection are depends on the theoretical and the previous related system that used the same concepts as the project. So, the theory that will be explained is about how the ultrasonic sensor used for detection unit and how PIC will be integrated in this system and generated output to voice recorder.

2.1 Ultrasonic Sensor

Ultrasonic is the study and application of the energy of sound waves vibrating at frequencies greater than 20,000 cycles per second which is beyond the range of human hearing. The application of sound energy in the audible range is limited almost entirely to communications, since increasing the pressure, or intensity, of sound waves increases loudness and therefore causes discomfort to human beings. Ultrasonic waves, however, being inaudible, have little or no effect on the ear even at high intensities. They are produced, commonly, by a transducer containing a piezoelectric substance for example a quartz-crystal oscillator that converts high-frequency electric current into vibrating ultrasonic waves [3].

Ultrasonic has found wide industrial use. For nondestructive testing an object is irradiated with ultrasonic waves; variation in velocity or echo of the transmitted waves indicates a flaw. Fine machine parts, ball bearings, surgical instruments, and many other objects can be cleaned ultrasonically.

They are placed in a liquid like a detergent solution or a solvent, into which ultrasonic waves are introduced. By a phenomenon called cavitations, the vibrations cause large numbers of invisible bubbles to explode with great force on the surfaces of the objects. Film or dirt is thus removed even from normally inaccessible holes, cracks, and corners. Radioactive scale is similarly removed from nuclear reactor fuel and control rods. In medicine ultrasonic devices are used to examine internal organs without surgery and are safer to genetic material than x-rays. The waves with which the body is irradiated are reflected and refracted; these are recorded by a monograph for use in diagnosis. Metals can be welded together by placing their surfaces in contact with each other and irradiating the contact with ultrasound. The molecules are stimulated into rearranged crystalline form, making a permanent bond. Ultrasonic whistles, which cannot be heard by human beings, are audible to dogs and are used to summon them.

2.2 Fundamentals (TOF) Time of Flight

The TOF method in figure 2.1 produces a range value when the echo amplitude first exceeds the threshold level after transmitting. In spite of the simple method like this, information obtained by the ultrasonic sensor is influenced by the characteristics of the sensing system, it of environment and so on [10].

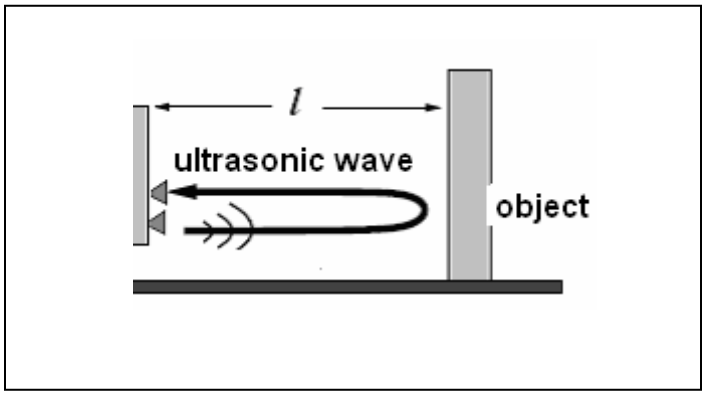

Figure 2.1: Principle of TOF method

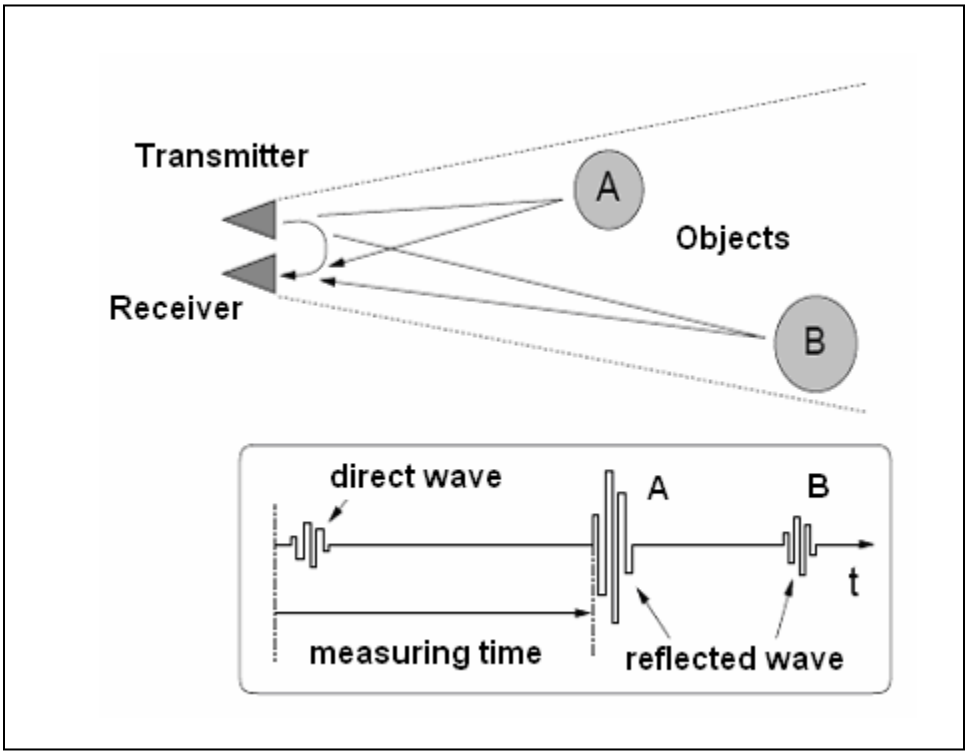

Figure 2.2: Model of reflected waves

Figure 2.2 shows a model of reflected waves, where there are two objects in a field of view. As an ultrasonic wave attenuates and spreads, the echo amplitude reflected off farther object is smaller even from the same objects. Because of using ultrasonic sensors, a transmitter and a receiver is used separately. So, the received waves include the direct wave from the