ULTRASONIC PARK CONTROLLER

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DEDICATION

Special to my mom and my family, thanks a lot for all your support and love.

For my friends, thank for helping and guide me for all this time.

Hope all of us will success and happy ever after.

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ABSTRACT

This project was done to help the drivers to get sense of how far their car is away from an object or wall. There are many accidents causes by the failure of unpredictable distance. This project is designed to make sure the driver know when to stop their car while driving especially for parking their car. By using the theory of Sound Navigation and Ranging (SONAR) of ultrasonic sensor, the distance will be estimated using the transmitter and receiver transducer. The atmega32 will be used as the system controller. The piezo speaker will produce a beep sound with the lighting LED. At the end of this project, by using this ultrasonic park controller, the driver can park their car more easily.

ABSTRAK

Projek ini dibuat untuk membantu pemandu mengetahui jarak kereta mereka dari halangan ataupun dinding. Terdapat banyak kemalangan yang berlaku berpunca dari kegagalan pemandu dalam menganggar jarak kenderaan mereka. Projek ini direka untuk memastikan pemandu dapat memberhentikan kenderaan mereka pada jarak yang selamat terutama sekali apabila meletakkan kenderaan. Projek ini menggunakan teori pengesan navigator bunyi dan jarak bagi pengesan ultrasonik untuk menganggar jarak kenderaan dengan menggunakan pemancar dan penerima. Didalam projek ini, ATMEGA32 digunakan sebagai sistem pengawal. Pembesar suara jenis piezo akan menghasilkan bunyi dan LED akan memancarkan cahaya apabila kereta berdekatan dengan halangan. Dengan menggunakan projek ini, pemandu dapat meletakkan kenderaan mereka dengan lebih mudah.

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LIST OF ABBREVIATION

AVR	Automatic Voltage Regulation
PIC	peripheral integrated circuit
ARM	Advanced RISC Machine

CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

Most people around the world owns car or are daily drivers. Among these drivers, it's not entirely untrue to assume parallel parking or rearwards parking is one of the most cumbersome parts of their driving experience. It takes years of driving experience and rigorous practices to avoid a fender bender or an ugly scratch across the bumper [3].

The purpose of ultrasonic park controller is to help the car parking become easy and safety by sensing the distance between the car and the object. The system works by emitting a continuous stream of ultrasonic pulses from the front of a car and use the return times of the pulses to calculate distance. The current distance is then displayed on the LCD, so the distance to move the car can be judge. At the same time, the device emits a sequence of audible beeps with lighting of LED due to the rates which varies with distance. At close range, the beeps fade into a constant tone with all the LED lighting. It helps to park as close as possible without diverting eyes from the windshield.

1.2 PROJECT OBJECTIVE

The objectives of this project are:

(i) To design and build an ultrasonic park controller that will help driver park their car easily.

(ii) To study the process of receiving and transmitting signal by ultrasonic sensor.

(iii) To learn how the ATMEGA32 program in microcontroller function in determine the distance between the car and the object.

1.3 PROBLEM STATEMENT

Nowadays, there are many accident causes by the failure of unpredictable distance. Driver especially the new one often fails in predict the distance because of they afraid and not confident with their self. To avoid this situation a tools need to alert them. Beside that, some people afraid if their new brand car get scratched at front of rear while parking. In addition, it takes a year of driving experience and rigorous practices to avoid a fender bender or an ugly scratch across bumper.

To overcome this problem, an ultrasonic park controller designed to help drivers for estimate how far their car with obstacles or object.

1.4 SCOPE OR WORK

This project will use an ultrasonic sensor to determine the distance between the object and the car. This sensor will place at front and back of the car that can detect distance from 1 inch until 20 inch. The signal of sound waves will be produce and then will be detected by the receiver and send to the microcontroller. The microcontroller will calculate the distance using the signal received from the transmitter. The distance then will be displayed on the board by presenting the distance value and beeps sound.

1.5 THESIS OUTLINE

This thesis consists of 5 chapters. First chapter will discuss of the introduction of this project and why the project were done. The second chapter is about the literature review and previous research that related to this project.

The project methodology will be discussed in chapter 3. In this chapter, the method used for the project, component and technique is explained in detail to make sure the project going smoother and can achieve the target.

Chapter 4 is about the result based on the work done. All the result obtained will be displayed and analyzed in this part. The last chapter is for discussion and conclusion. All the problem found will be discussed and the conclusion from the project will be made. Some suggestion also discussed for improvement.

CHAPTER II

LITERATURE REVIEW

2.1 ULTRASONIC

2.1.1 DEFINITION

Ultrasonic or ultrasound, derived from the Latin words "ultra," meaning beyond, and "sonic," meaning sound, is a term used to describe sound waves that vibrate more rapidly than the human ear can detect.

Sound waves travel as concentric hollow spheres. The surfaces of the spheres are compressed air molecules, and the spaces between the spheres are expansions of the air molecules through which the sound waves travel. Sound waves are thus a series of compressions and expansions in the medium surrounding them. Although we are used to thinking of sound waves as traveling through air, they may also propagate through other media [3].

The technical name for one expansion and one compression is a cycle. Thus, a vibration rate of 50 cycles per second produces 50 expansions and 50 compressions each second. The term frequency designates the number of cycles per unit of time that a sound wave vibrates. One cycle per second is called a hertz and is abbreviated Hz. Other useful units of scale in ultrasonics are kilohertz (kHz), which represents 1,000 Hz; and megahertz (MHz), representing 1,000,000 Hz or 1,000 kHz [2].

Most people can only detect frequencies of sound that fall between 16 and 16,000 Hz. Ultrasonics has come to describe sound waves with frequencies greater than 16,000 Hz, or 16 kHz. Some insects can produce ultrasound with frequencies as high as 40 kHz.

Table 2.1 velocity of sound in various media [2]

Material	***Velocity (ft/sec)***
Sea water	5023
Distilled water	4908
Chloroform	3237
Dry air at 0°C	1086
Hydrogen at 0°C	4212
Brick	11,972
Clay rock	11,414
Cork	1640
Paraffin	4264
Tallow	1279
Polystyrene	3018
Fused silica	18,893
Aluminum	16,400
Gold	6658
Silver	8790
Concrete	12,000
Stainless steel	16,400

[a]All measurements at 25°C (room temperature) unless otherwise indicated.

2.1.2 ULTRASONIC SENSOR

Ultrasonic sensor (also known as transducers when they both send and receive) work on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor. Sensors calculate the time interval between sending the signal and receiving the echo to determine the distance to an object.

This technology can be used for measuring: wind speed and direction (anemometer), fullness of a tank, and speed through air or water. For measuring speed or direction a device uses multiple detectors and calculates the speed from the relative distances to particulates in the air or water. To measure the amount of liquid in a tank, the sensor measures the distance to the surface of the fluid. Further applications include: humidifiers, sonar, medical ultrasonography, burglar alarms, and non-destructive testing [6].

Systems typically use a transducer which generates sound waves in the ultrasonic range, above 20,000 hertz, by turning electrical energy into sound, then upon receiving the echo turn the sound waves into electrical energy which can be measured and displayed.

The technology is limited by the shapes of surfaces and the density or consistency of the material. For example foam on the surface of a fluid in a tank could distort a reading.

Figure 2.1: ultrasonic sensor [6]

2.1.3 ULTRASONIC TRANSDUCER

An ultrasonic transducer is a device that converts energy into ultrasound, or sound waves above the normal range of human hearing. While technically a dog whistle is an ultrasonic transducer that converts mechanical energy in the form of air pressure into ultrasonic sound waves, the term is more apt to be used to refer to piezoelectric transducers that convert electrical energy into sound. Piezoelectric crystals have the property of changing size when a voltage is applied, thus applying an alternating current (AC) across them causes them to oscillate at very high frequencies, thus producing very high frequency sound waves.

Ultrasonic transducers send and receive waves for many types of sensing. Examples include distance, proximity, level, nondestructive evaluation, web break detection, counting, and security applications. They typically operate at their resonant frequency with various construction options, beam patterns, and power levels.

Ultrasonic transducers have many critical specifications. Transmitting frequency is the usable frequency range of the device. Bandwidth is the difference between low and high operational frequency limits. Rated signal power available from transducer is another important specification. Transmit sensitivity is the ratio of sound pressure produced to input voltage. Receive sensitivity is the ratio of output voltage produced over sound pressure sensed. The beam angle is the total included angle of ultrasonic beam. In general, a high frequency transducer will produce a narrow beam and a lower frequency transducer a wider beam. The beam angle can be influenced somewhat by the transducer housing construction [10].

Ultrasonic transducers come in different styles for different applications. Plain general-purpose transducers, including air transducers, are available with no specialized features. More specialized styles are common as well, such as contact transducers for placing directly on the surface to be measured. Dual element transducers have two elements in the transducer housing and allow the transmitter and receiver to operate independently. The elements are angled toward each other to create a reflective transmit/receive pathway. Angle beam transducers include mounted transparent angle blocks and are often used for weld inspection and flaw detection. They typically utilize refracted shear waves to detect flaws throughout the depth of welded areas. Immiscible transducers are designed to be totally submerged in a liquid medium, most often fresh water. The protected element style has the transducer element protected for use on rough surfaces. Delay line transducers are versatile, often with replaceable head options such as membranes and wear caps. They are used to gage or detect flaws such as delimitations in thin materials. Shear wave transducers introduce shear waves into material without using an angle beam wedge. The ratio of shear wave components to longitudinal components can exceed 30dB. Medical style transducers and housings are designed for specific medical applications.

Common features available for ultrasonic transducers are array configuration for connecting more than one transducer in series or parallel; temperature compensation circuitry that compensates for sensitivities changing with ambient temperature; and optional analog output. Most transducers output analog voltage, but may have provisions for current loop output, etc.