UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF CAR DETECTION SYSTEM USING ULTRASONIC SENSING

This report submitted in accordance with requirement of the UniversitiTeknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Electronic Engineering Technology (Electronics Industry) Hons.

By

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DECLARATION

I hereby, declared this report entitled “PSM Title” is the results of my own research except as cited in references.

Signature : ……

Name : ……

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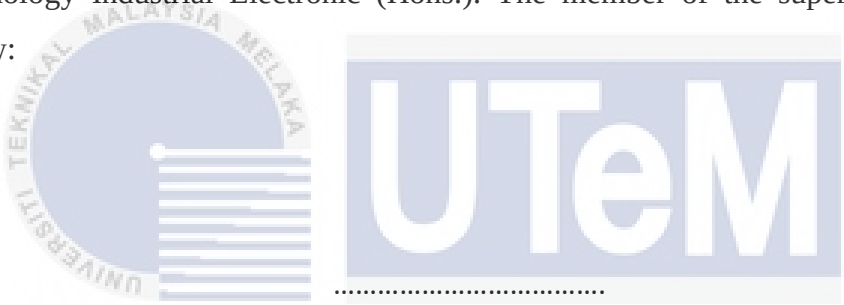
APPROVAL

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 Engineering Technology Industrial Electronic (Hons.). The member of the supervisory is as follow:



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(Project Supervisor)

ABSTRAK

Pada masa kini, teknologidalamkeselamatankenderaantelahsemakinmeningkatdenganpesatuntukmengurangkanrisikokemalangankeretasemasamemandu. Satumasalahyang amatmembimbangkanapabilapemandutidakdapatmenentukanjaraksebenardengankenderaanlain. Peningkatan "Smart Cars" memerlukanperantibaru yang dapatmengukurjarakdalamlingkunganberapasentimeterkebeberapa meter jarakantaraduakenderaanbergerak.

Projekinimemberitumpuankepadasistempengesanandengannisbah yang tinggikeupayaandanharga yang lebihberpatutanuntukkenderaanmampumilikdanmensasarkankepadapengesananjarakkereta di hadapan. Bagimengesanjarak, sisteminibiasanyadigunakanpadakereta yang mahalseperti Mercedes, Volvo dan Nissan. Hal inikeranasystem iniadalahteknologibarudanmenggunakankos yang tinggiuntukpemasangan. Sisteminibiasanyamenggunakansistempenglihatan, sistem radar yang mahaluntukkespemasangan. Kebanyakansemuakeretamempunyaiaplikasilitar sensor di belakangsebagai sensor belakang, titikbutadantempatletakkereta. Lingkunganjarakhanya 0 meter hingga 4 meter. Dengancaraini, sensor diperlukanuntukmenutupkawasanitu. Sisteminiadalahsangatdiperlukanuntukmenunjukkanjarakkeselamatansemasamemandukeretadalamkeadaantrafik yang biasa. Olehitu, pengesanultrasonikdigunakanuntukmengesanjarak yang bolehmenunjukkannilaijarakdanmenggunakanpetunjukuntukamaran. Kemudian, sistemmenghantaramarankepadapemanduamarankepadapemandusepertikeadaan LED

dan buzzer. Untukmengukurjarak, sensor ultrasonikakandikawalolehpengawal. Pengawalinidigunakanuntukmenetapkanpelbagaijarak, paparan LCD, set amarandankeadaan LED.

ABSTRACT

In the present day, innovation in vehicles has been quickly expanding to minimize the danger of auto collision while driving vehicle. An issue that regularly worried by the driver are can't be decide the real separation from another vehicle. The change of "savvy autos" requires new gadgets that can quantify separates in the scope of a couple of centimeters to two or three meters between two moving vehicles. The project focusing on the detection system with high ratio of capability and more affordable price for low-end vehicle and aiming on front car detection. For the distance detection, this system usually used on expensive car likely on Mercedes, Volvo and Nissan because this is new technology expensive to install. This system usually use the vision system, radar system that expensive to install. Mostly all car have a sensor circuit application at back as the reverse sensor, blind spot and parking. The range of distance is only 0 meter to 4 meter, in this manner, the sensor require to be found successfully to cover the area. This system are really needed to display the range of safety distance region while driving cars in recent traffic situation. Therefore, the ultrasonic sensing detect the distance that can showing the value of distance and use the indicators for the warning. Then, the system send the warning to the driver the warning to the driver such as LED

condition and buzzer. To measure the distance, ultrasonic sensor will be controlled by the controller. The controller are used to set the range of distance, LCD display, set the warning and LED condition.

DEDICATIONS

This report is committed to my beloved guardians Khosim bin Saad and MashitohbintiMansor who instructed and upheld me all through the way toward doing this project. They guided me all through my project and support me financially.

ACKNOWLEDGEMENT

First of all I would like to thank God, who has given me strength to carry out my project despite failures and hardship. Then, thank to my supervisor Miss SitiHalmabinti Johari. She has been very supportive and helpful throughout the by completing this project. I appreciate her knowledge, guidance, and time.

For my dearest family, I need to express gratitude toward them for the motivation and love they exhibited me. Much obliged to you to them for supporting me financially. Next, I might need to thank my buddies whom had given me mental support and budgetary support to help me in completing this venture. I esteemed every help I had gotten for everybody around me. It was an amazing association in doing in venture.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

LCD	Liquid Crystal Display
LED	Light Emitter Diode
SA	Situation awareness
BLIS	Blind information system
NIR	Near-infrared
CPU	Central Processing Unit
MIPS	Million instruction per second
RAM	Random-access memory
ROM	Read-only memory
I\O	Input /Output
PC	Personal computer
PIC	Programmable Interface Controllers
IDE	Integrated Development Environment

CHAPTER 1

INTRODUCTION

1.1 General introduction

Driving a car in current traffic conditions is highly risky. The high risk could occur when the driver driving over restrictions and sleepy while driving a car. The impact evasion advances are getting to be well known in U.S. engine vehicles and more automakers are touting the potential security advantages. A problem that often concerned by the driver arecannot be determine the actual distance from another vehicle[1].

This project is to upgrade the safety to the vehicles user by using sensor. So, the driver in charge can take action to prevent from collision. The system is installed to the front of the vehicle monitors the distance to the vehicle directly ahead, as well as a vehicle traveling in front of the preceding one[2].

The improvement of “smart cars” requires new devices that are able to measure distances in the range of a few centimeters to a couple meters between two moving vehicles [3].Parks aids as well as intelligent suspensions and headlamp leveling are some good examples of features that require a distance measurement to be performed with contactless sensors. A sensor is define as the device that receives and responds to a signal or stimulus [4]. The SRF05 ultrasonic sensor has been designed to increase flexibility, increase range, and to reduce costs still further[5]. The range of this sensor 0.02 meter up to 4.5 meters. Figure 1.1 on the next page show the range of distance between car and bus.

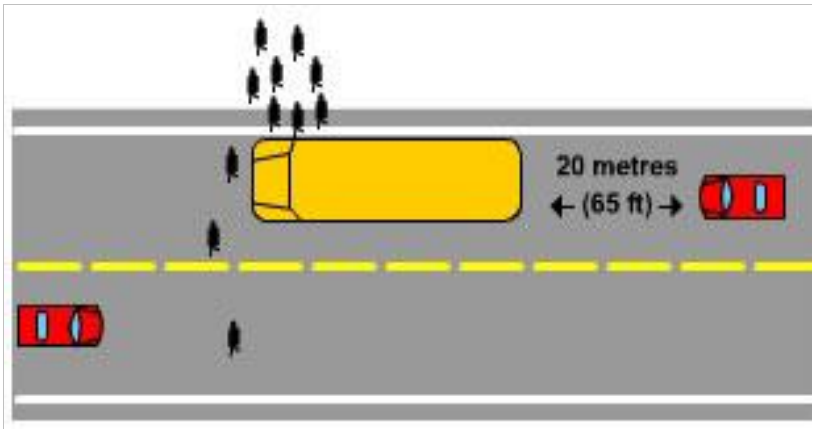

Figure 1.1: Detection systemexplanation

1.2 Problem Statement

In the present day, advancement in vehicles has been rapidly growing to minimize the risk of car crash while driving vehicle.The high number of occurrences has brought about the expanding utilization of logically a smart and convincing driving-guide framework[6]. The driver always not follow the rule of safety distance region while driving.The present day, the innovation taking into account indicators like camera, laser, ultrasonic and radar are no doubt applies in top of the line and cutting edge vehicle to screen blind side district, separation identification and stopping mechanism. A ultrasonic sensor work impeccably in whatever climate condition particularly in stormy climate on the grounds that in submarine the sonar was utilized as a part of which ultrasonic wave are utilized to sense the distinction obstacle or any object[7].

For the distance detection, this system usually used on expensive car likely on Mercedes, Volvo and Nissan because this is new technology expensive to install. This system usually use the vision system, radar system that expensive to install.Mostly all car have a sensor circuit application at back as the reverse sensor, blind spot and parking[7]. This system are built to trigger the driver always follow the safety distance according to the traffic rule. Figure 1.2 below show the sensor detect the distance from the front car.

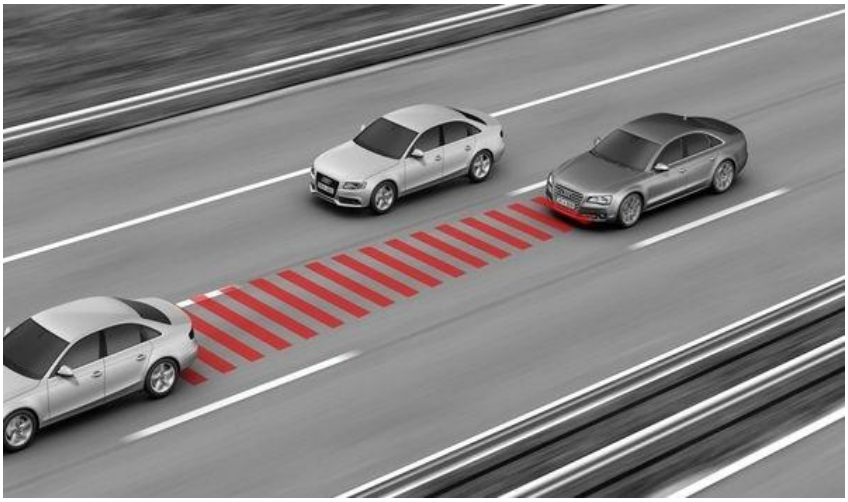

Figure 1.2: The Audi car with detection system

All the top of the line and cutting edge vehicles are well on the way to have installed way to deal with recognition framework and these dynamic location frameworks are for the most part not accessible for low-end vehicle[8]. This recognition framework in top of the line vehicle is likewise revamped go about as driving an auto help framework for drivers and actualize into low-end vehicles. Be that as it may, the high thing expense and foundation cost and the capacity of the thing down to earth are the part of the segment which don't pull in the low end customers to utilize this framework. The driving help of better recognition or observing system for vehicles is extremely attractive to low-end vehicles to identify separation locale. So that, the exploration of identification framework with high proportion of capacity and more reasonable cost for low-end vehicle is an essential task to decrease mischance among vehicle.

1.3 Project Objectives

The objectives of this project are:

I. To study the performance of the ultrasonic sensor on car system detection.

II. To develop the cars system detection using an ultrasonic sensor detecting object when cars enter the safe distance region.

III. To analysis the performance of this system measured the range of the distance.

1.4 Project Scopes

There have several scopes of work have been determined are as follows:

- This project is aiming on front car detection. This system is suitable apply for car. The proposed system will use an ultrasonic technology.
- To measure the distance, ultrasonic sensor will be controlled by the controller. The controller are used to set the range of distance, LCD display, set the warning, LED condition and automatic braking system.
- The affectability of the sensors needs expected analyzed, as it commit affect some restrain in the detection process.
- The range of distance is only 0 meter to 4 meter, in this manner, the sensor require to be found successfully to cover the area. Thus, a particular device should be intended to repair the position of the sensors at certain separation.
- To applied the combination of automatic braking system with the front car detection system.

1.5 Thesis Outline

This project involves six chapters. Chapter 1 consists of the creation of the project that explains the project in general. The problem statement will be discussed based on several issues and problems that devoted to this project. The objectives of the project will be discussed and scope of the project is explained.

For the Chapter 2, contains literature review that related with this project. The explanation of literature review based on gathered information from the journal, thesis, internet, reference books and relevant article.

Then, the Chapter 3 contains the methodology that explains in detail the overall project flow of system. The main methodology that has been stressed out related the distance between another cars.Chapter 4 contains hardware and software implementation and in Chapter 5, the results and analysis are discussed.

At long last, Chapter 6 contains the conclusion and proposal of the task. Reference referred to and supporting informative supplements are given toward the end of this anticipate report.

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

Literature review was done all the entire task to collect the information and enhance abilities expected to finish this anticipate.The fundamental hotspots this anticipate are previous related projects, thesis, books, journals and articles which are generally acquired from online databases gave by UTeM library. This part concentrates on the essential ideas and all major speculations which identified with this anticipate.

2.2 Distance detection system

This system are really needed to display the range of safety distance region while driving cars in recent traffic situation. Accidents among the carsoften happen when the drivers does not legitimately check the scope of security separation district while driving. The surrounding zone of the driver and the condition momentum of circumstance for possiblerisk should be considered as driver need to take after another vehicle. Situation awareness (SA) in the perception and recognition phases is important when a person has time on hand such as when changing lanes. SA can be classified into three levels [9]. The level one is perception of elements in the environment, level two for comprehension of current situation and level three for project of future status.

These days, discovery checking framework is executed in a few vehicles. Typically, top of the line and cutting edge vehicle utilizing implanted arrangement of separation discovery observing. At that point, low-end vehicle need driving help of blind spot watching system[10]. Either introduced system or driving help the fact of the matter is emerge to improve security while driving a vehicle. Case in point, BMW(5series) model have the dynamic blind spot distinguishing proof to prepared driver if there any expected potential peril in blind spot zone.

The Figure 2.1 below show the dynamic blind side discovery arrangement of BMW (5series) model remove blind sides and really permits drivers to dodge crashes while switching to another lane. Using radar identifying to perceive component vehicle and set at the back of the vehicle. This system alerts drivers if a vehicle is in their blind spot region vehicle. The figure 2.1 demonstrate the model of BMW (5series) having BLIS framework.

Figure 2.1: The BMW(5series) having BLIS system

Refer to the Figure 2.2 and Figure 2.3in the next page shows the real-time object detection system of Mercedes Benz S-Class Sedan model is ability help to detect the object of arbitrary shapes and really permits drivers to maintain a strategic distance from crashes when close to the pedestrian place [11]. Using shape-based to detect entity of object and placed at front of the vehicle. This system alerts drivers if any object at front vehicle with showing the image[12].

Figure 2.2: The vision of intelligent drive on Mercedes Benz

Figure 2.3: The vision of intelligent drive on Mercedes Benz

Double 12.3-inch high-determination screens join the clarity of simple style instruments with exact enlivened showcases of driving frameworks, vehicle settings, excitement and route[13][14]. A console-mounted touchpad makes the propelled framework natural to utilize.

2.3 The ideas from the previous research for distance detection system.

2.3.1 A New Approach to Urban Pedestrian Detection for Automatic Braking[15].

In this paper, the system based on the coverage of different sensing technologies (laser and vision) in a specific scenario considered. The fusion of laser scanner and vision can provide a quick and robust detection in case of suddenly appearing pedestrians. The laser scanner gives a rundown of ranges in which a walker may show up, while the camera can recognize the passerby notwithstanding when individuals is not yet noticeable to the laser scanner.The Figure 2.4 below show the illustration pedestrian covered up by vehicles thatcannot identified by a laser scanner situated in the front guard however can be recognized utilizing vision.

Figure2.4: Pedestrian covered up by vehicles may not be identified by a laser scanner

The combination of laser scanner and vision can give a brisk and powerful recognition if there should be an occurrence of all of a sudden showing up people on foot. The laser scanner gives a rundown of zones in which a person on foot may show up, though the camera can identify the passerby, notwithstanding when he/she is not yet unmistakable to the laser scanner. The primary trademark required by this framework is the capacity to perform the following:

- Quickly detect pedestrians, given the short working range and the particularly high danger of collision with a pedestrian suddenly appearing behind an obstacle.
- Detect pedestrians as soon as they appear, even when they are still partly occluded.
- Limit the search to specific areas, which are determined by a quick preprocessing.

I. Sensor selection

In this paper, the camera that used in this system is an AVT Guppy F-036B for a few reasons. The sensor of 752 × 480 pixels has a viewpoint proportion of somewhat under 15/9, which is especially reasonable for car applications since it outlines a huge sidelong region, which regularly contains important data. The affectability covers both the obvious and NIR spectra. During the evening, a high reaction to the NIR radiation permits the location of items because of a particular brightening.

II. Vehicle setup

For the vehicle setup, the laser scanner and NIR headlamps are situated in the front guard as appeared in Figure 2.5 below.

Figure 2.5: The laser scanner integration and the headlights.

The NIR camera is set inside the driving lodge close to the back perspective mirror as appeared in Figure 2.6 that appear in the following page. A smaller PC (an Intel Core 2 Duo–based Mini-ITX) is introduced in the boot. The installed FireWire A controller is utilized to associate the camera. A RS422-to-Universal-Serial-Bus (USB) connector furnishes a simple association with the laser. Likewise, inertial information are assembled through the CAN transport utilizing a USB connector.The framework was produced to handle a certain yet exceptionally regular situation, though it doesn't cover the numerous different hazardous circumstances that may happen in an urban environment.The Figure 2.6 below show the installation camera inside the vehicle.

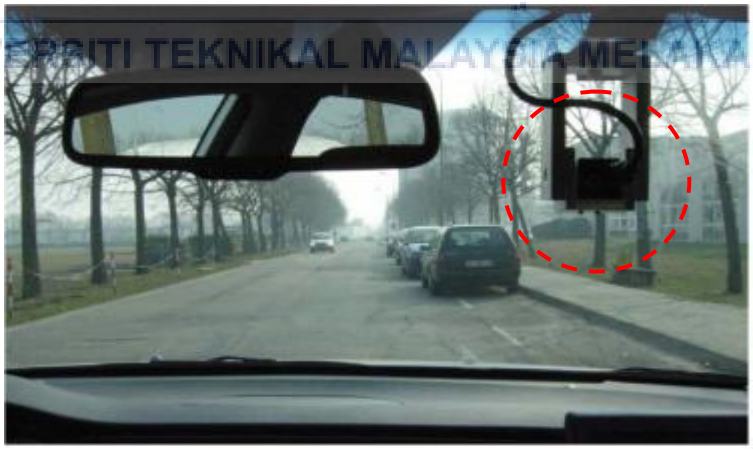

Figure 2.6: Installation camera inside the vehicle.

2.3.2 An Ultrasonic Sensor for Distance Measurement in Automotive Applications[16].

This paper describes an ultrasonic sensor that is able to measure the distance from the ground of selected points of a motor vehicle. The sensor depends on the estimation of the season of flight of the ultrasonic heartbeat, which is reflected by the ground. The measuring head has been mounted onto the back of an auto as appeared in Figure 2.7 beneath.The figure shows the equipment which has been equipped with four potentiometer sensors to measure the spring heights during the car movement. A portable digital recorder has been used to record the ultrasonic sensor and the potentiometer outputs. Tests have been performed at different speeds on asphalt and rough ground.The Figure 2.7 below show the placement of potentiometer sensor.

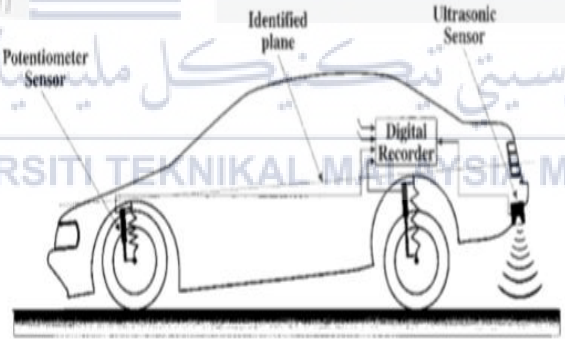

Figure 2.7: The placement of potentiometer sensor

The output of four potentiometers has been used to compute a distance reference value to be compared with the ultrasonic measured distance. The end spring heights, which have been estimated by adding the tire deformations to the spring heights measured by the potentiometers, have been used to identify the plane of

the vehicle body. The distance reference value that corresponds to the distance the ultrasonic sensor should produce has been determined by putting the measuring head coordinates into the identified plane equation.

In this paper, they describe a low-cost ultrasonic distance meter that performs contact less measurement of the height from the ground of a vehicle body. The sensor performance is better than many commercial devices. The sensor has been designed to satisfy requirements in the automotive field. The sensor can measure the distance in the range of 0.1–0.3 m and standard uncertainty of 1 mm in the temperature range of 0 C to 40 C. Tests have been performed in real driving conditions and have shown a regular behavior of the sensor under all typical driving maneuvers for speeds of up to 33 m/s (120 km/h). The sensor features a simple and costless analog processing of the signal without employing microprocessors. The Figure 2.8 below show the result typical test (the thick line is the ultrasonic sensor output, while the thin line is the computed output). D is the height of the measuring head at rest.

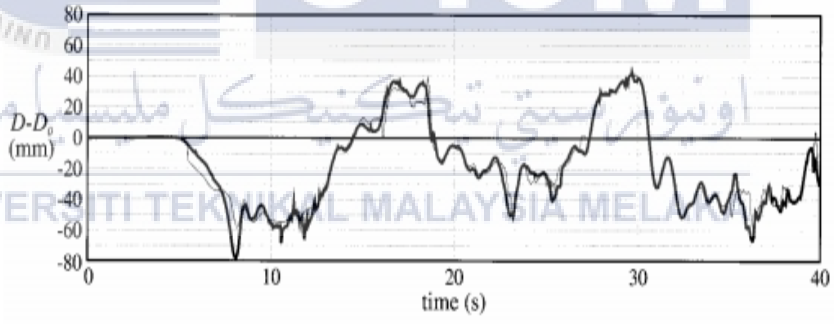

Figure 2.8: The test result (the thick line is the ultrasonic sensor output, while the thin line is the computed output). D is the height of the measuring head at rest.

2.3.3 Distance Measuring (Hurdle detection System) for Safe Environment in Vehicles through Ultrasonic Rays[7].

This paper describes an ultrasonic sensor that is able to detect the different type of objects. The sensor able to operate normally until the sensor detects possible risk.By implementation this system, the vehicle able to operate normally until the sensor detect the possible is at risk. In this paper introduced the new technique for safety against accidents with eights ultrasonic sensor are used to detect the different type of object [7].

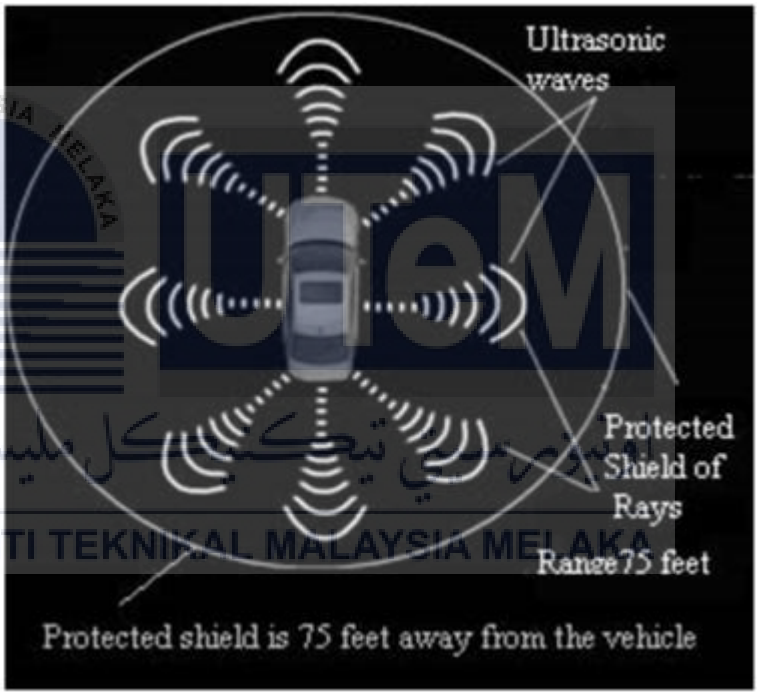

Figure 2.9: wall response on hurdle

To do this objective 8 ultrasonic indicator are utilized. The scope of these sensors are equivalent to 75 feet implies that the sensor sense ultrasonic beams at separation 75 feet. The separation secured the ultrasonic beams will be extended. The ultrasonic beams get vanished in the wake of voyaging a separation of 75 feet. All the sensor are appended with the vehicle in a way that made a ultrasonic

divider around the vehicle yet no crossing between ultrasonic flood of the sensor as appeared in Figure 2.9 above.

The divider are just used to get the data about the obstacle. This is means neither confines the driver did not back off the speed of the auto like Mercedes Benz for instance in light of the reason that the driver may have some better alternative to handle the discovery issue. The Figure 2.10 underneath demonstrate the ultrasonic divider creation.

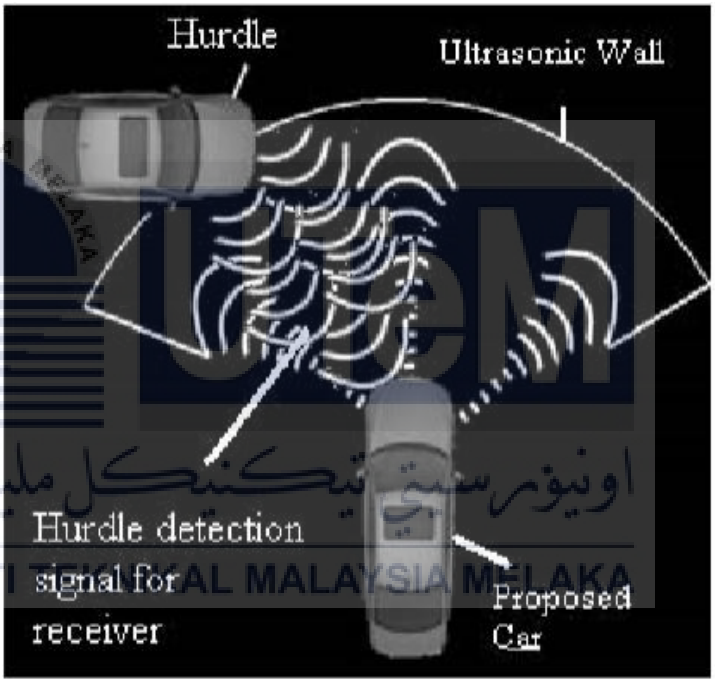

Figure 2.10: Ultrasonic wall creation

The sensor are installed with the vehicle in the way that the made of ultrasonic divider around the vehicle to distinguish the moving toward article from either side. In this layer all pillars travel independently with no covering between them. The sensors joined to all sides of vehicle work according to their foreordained headings. For example, if a challenge begins from left 50% of vehicle, simply left sensor will send the banner to the PC. With a particular true objective to find that the PC has gotten movement from which specific sensor.

CHAPTER 3

METHODOLOGY

This part clarifies the strategy connected in this anticipate to guarantee the accomplishment of the undertaking targets. Beginning from the general work process of the task and took after by software and hardware development of cars detection system. The software and hardware system integration and testing will be described at the end of this chapter.

3.1 System Process

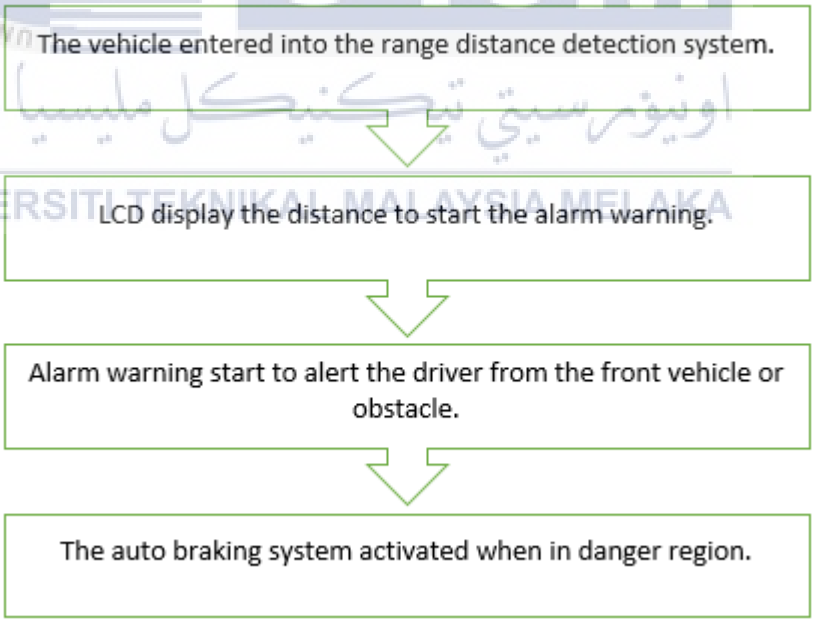

Figure 3.1: System Process

3.1.1 Flow chart

The workflow of the project is illustrated in Figure 3.1. The flow chart below explained each stage of the workflow.

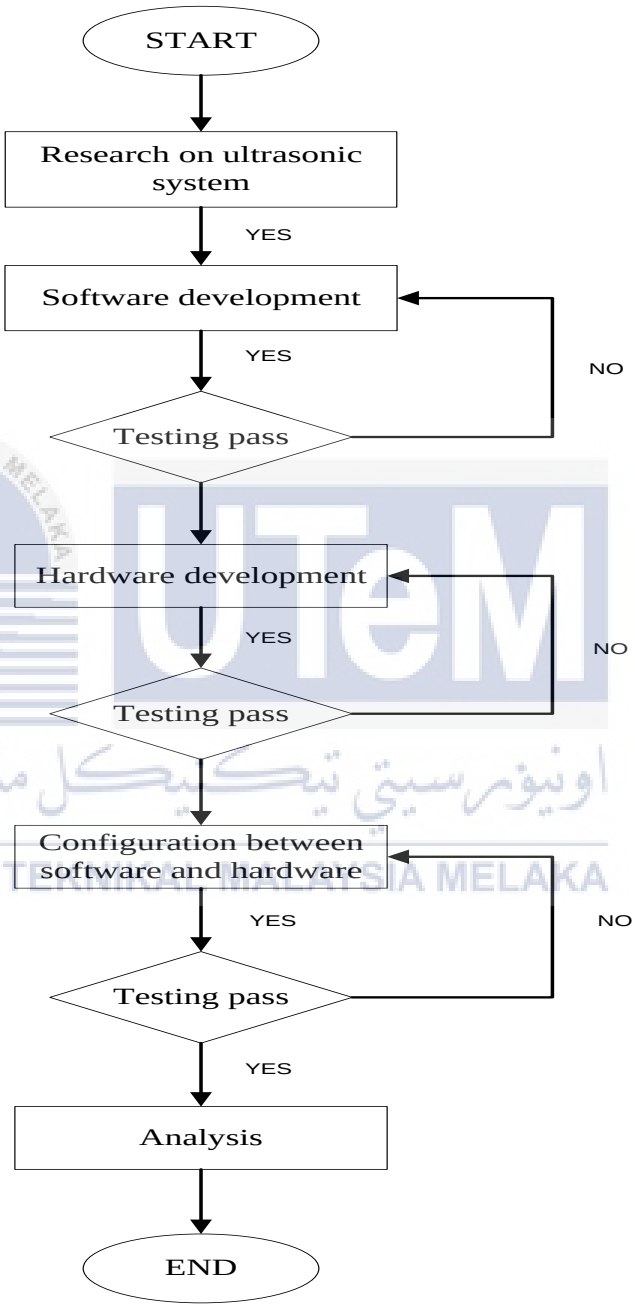

Figure 3.2: Project workflow

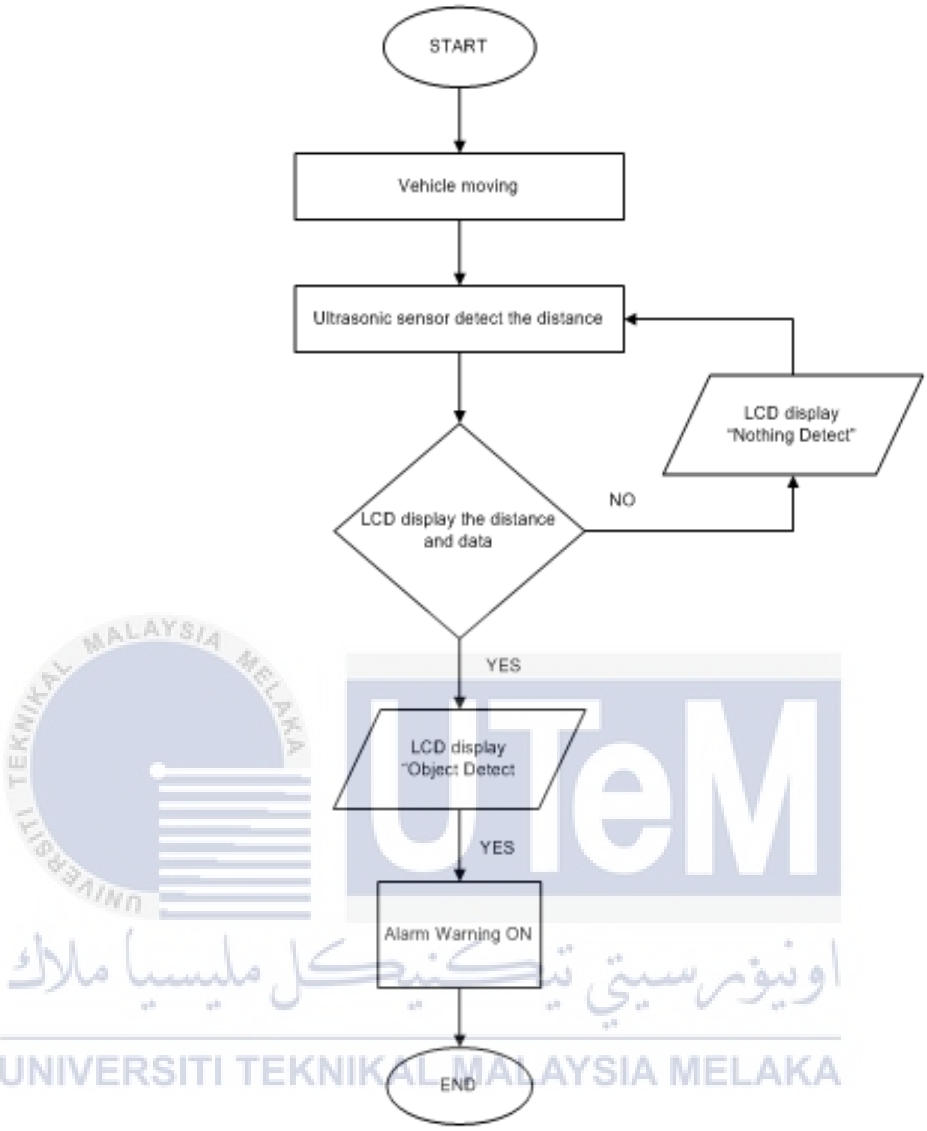

Figure 3.3: Alarm System Flow Chart

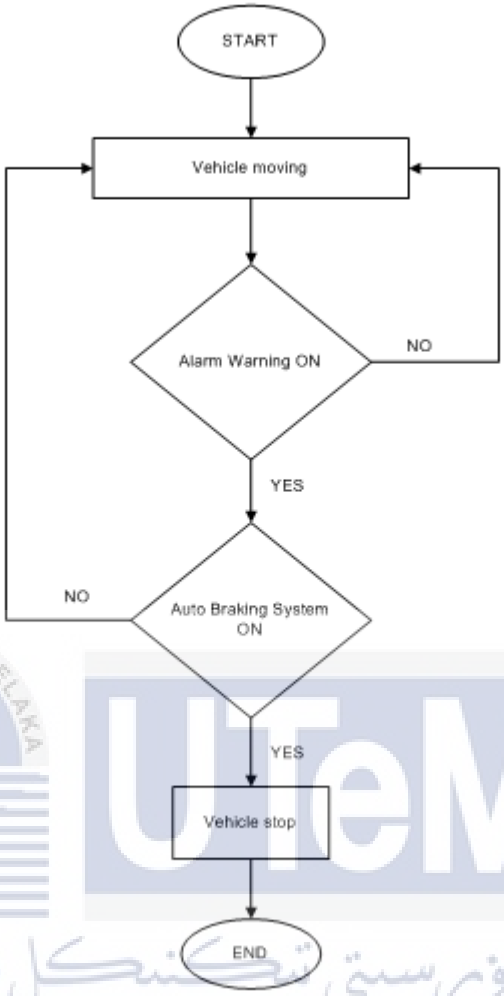

Figure 3.4: Auto Braking System Flow Chart

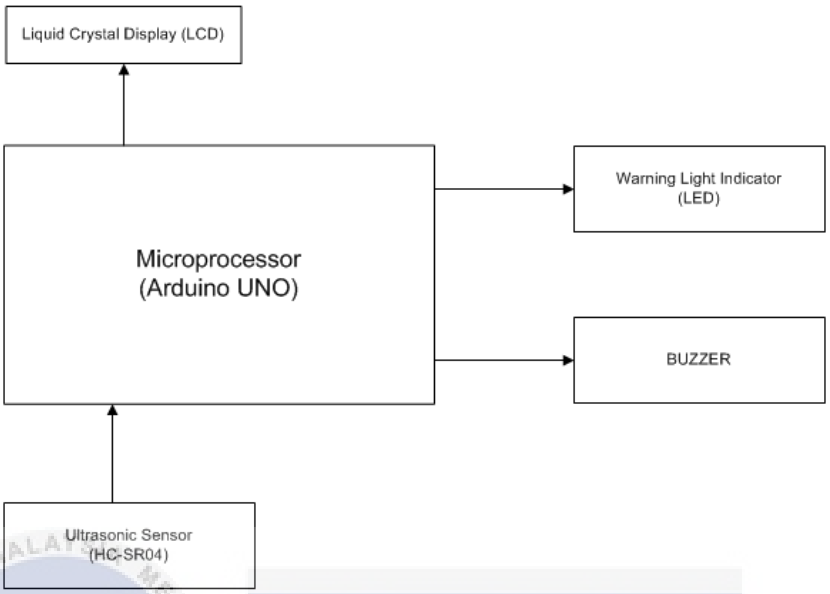

Figure 3.5: Block Diagram of System Detection of Alarm Warning Indicator

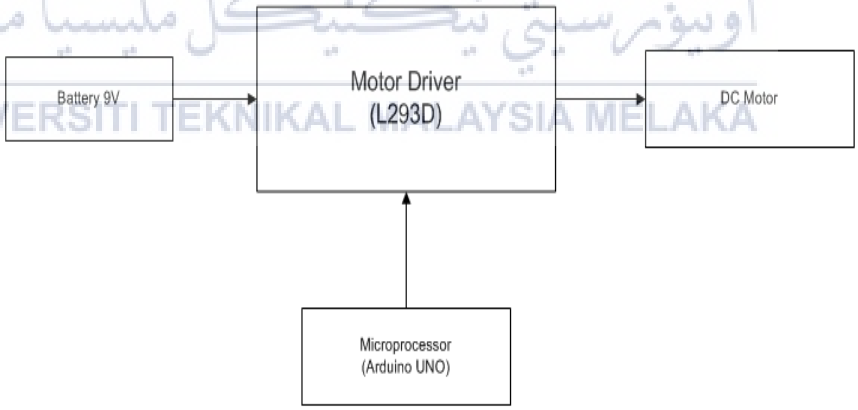

Figure 3.6: Block Diagram of Auto Braking System

3.2 Software

3.2.1 Proteus design

Proteus Design Suite is incitement programming made by Labcenter Electronic Ltd. which was an association set up in 1988. Proteus Design Suite gives the ability to co-animate microcontroller code with respect to a mixed mode SPICE incitement circuit. With the improvement on this product, clients can decrease their time and increment proficiency, adaptability and quality in outlining their own particular model. Errands that should be possible through Proteus software are for example co-reproduction of microcontroller programming, schematic passage, circuit incitement, source level investigating, diagnostic informing and with fringe demonstrate library gave.

Figure 3.7: Proteus software

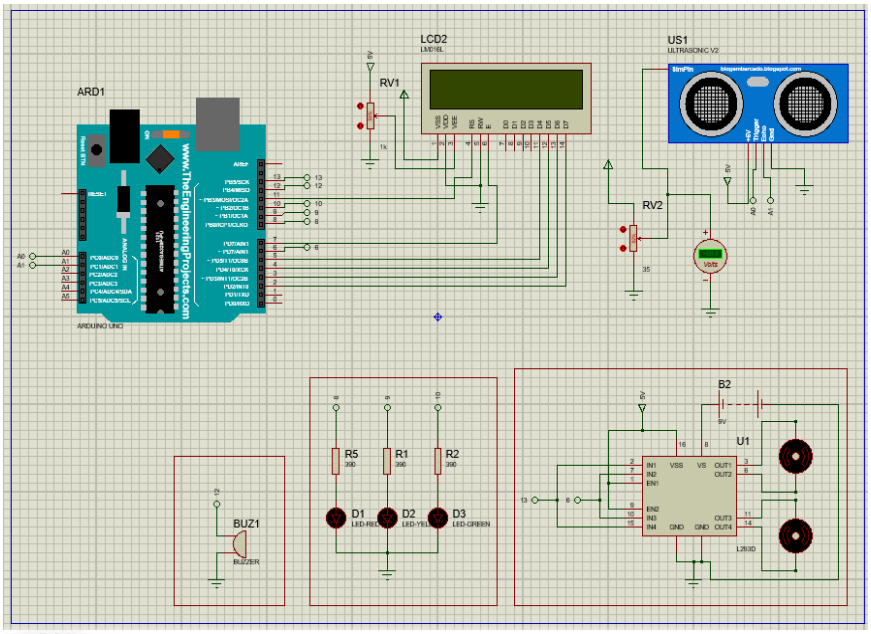

Figure 3.8: the simulation circuit

3.2.2 Arduino

An Arduino is an open-source devices arrange in perspective of easy to use on programming and gear[17]. The open-source Arduino Software (IDE) makes it simple to make code and trade it to the board. The earth is made in Java and in context of Processing and other open-source programming. The Arduino organize has wound up being extraordinarily exceptional with individuals fundamentally beginning with gear and in light of current conditions.Not in any way like most past programmable circuit sheets, the Arduino does not require a substitute bit of equipment (called an item configuration) recollecting the genuine goal to stack new code onto the board that can fundamentally utilize a USB interface. Also, the Arduino IDE utilizes a kind of C++, making it more clear to understand how to program. An Arduino gives a standard packaging consider that breaks out the parts of the little scale controller into a more open bundle.

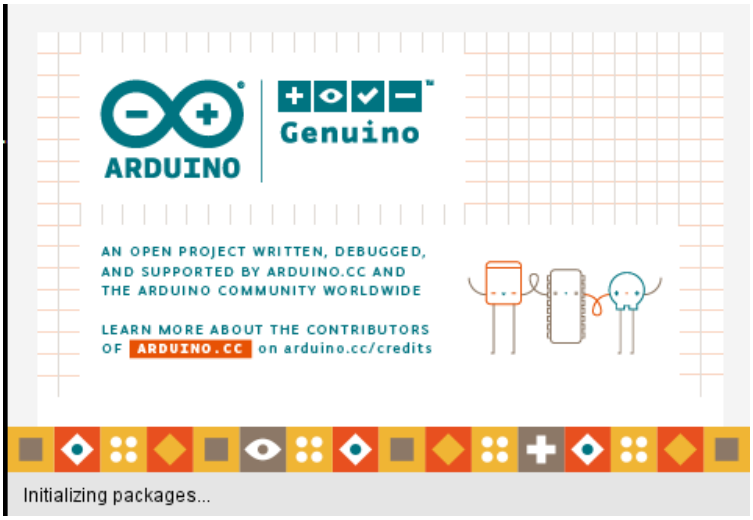

Figure 3.9: Arduino software

3.3 Hardware

3.3.1 Microcontroller

A microprocessor consolidates the elements of a CPU on a solitary incorporated circuit. Microchips utilize consecutive computerized rationale as they have inner memory [10]. Microchips deal with numbers and pictures addressed in the twofold numeral system and are planned to perform math and method of reasoning operations that make usage of data on the chip. There are a couple of assorted sorts of chip fitting for programming at Future Electronics which the most generally perceived sorts requested by a couple of parameters including clock repeat, data transport width, MMAC/MIPS/FLOPS, Flash size, RAM measure, ROM estimate, I\O voltage, save memory size and packaging sort. It is a PC processor on a microchip and is a multipurpose.It is likewise as the programmable gadget that utilizations advanced information as info and gives results as a yield once it forms the contribution as indicated by directions put away in its memory.

Arduino is an open-source stage utilized for building gadgets ventures [17]. The fundamental framework comprise of microcontroller with different fringe interfaces that is modified by a current programming stage. Arduino incorporates both a physical programmable circuit board (reliably hinted as a microcontroller) and a touch of programming, or IDE (Integrated Development Environment) that keeps running on PC. In addition, the Arduino IDE utilizes an altered kind of C++, making it less asking for to understand how to program and the Arduino Uno is one of the more standard sheets in the Arduino family and an impossible decision for tenderfoots. The Figure 2.10 below show the Arduino Uno.

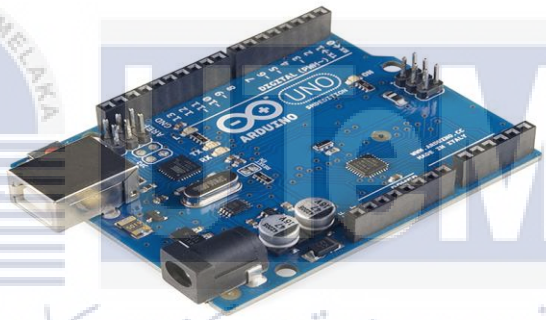

Figure 3.10: Arduino Uno

3.3.2 Ultrasonic sensor (HC-SR04)

Ultrasonic Sensors are independent strong state gadgets intended for non-contact detecting of strong and fluid items. Sensors that perceive sound are basically intensifiers. While we are acquainted with the dynamic form as it speaks to the basic receiver in the music business, electrostatic and piezoelectric sensors are additionally utilized as a part of estimation and as locators in such applications as modern, therapeutic, apply autonomy, and recognizable proof and following[18].

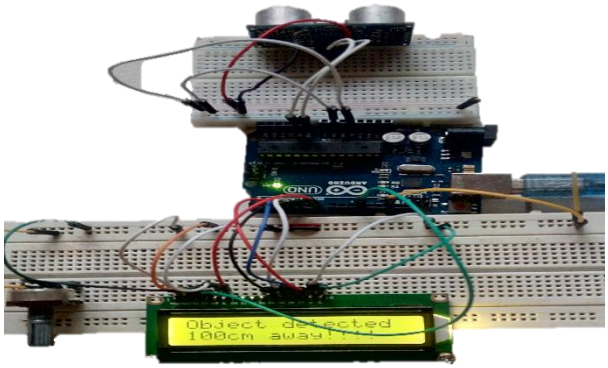

Figure 3.11: The ultrasonic HC-SR04

The ultrasonic transducers have piezoelectric valuable stones which reverberate to a favored repeat and devotee electric imperativeness into acoustic essentialness and the other route around [11] [12]. Ultrasonic signs resemble capable of being heard sound waves, with the exception of the frequencies are much higher. The Figure 3.12 underneath demonstrate the representation of ultrasonic sensor transmitter and transducer.

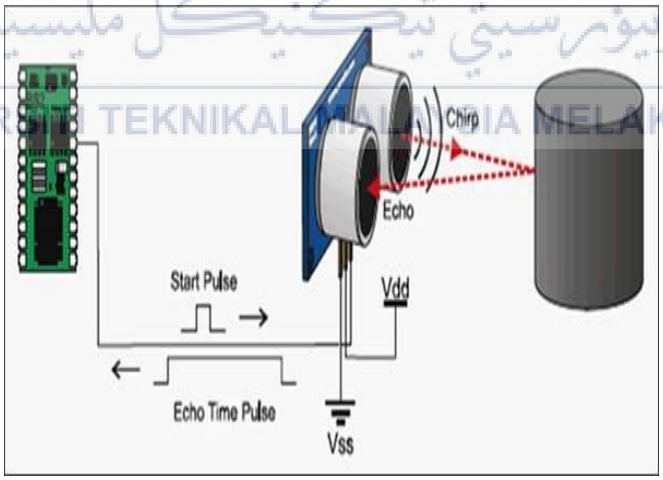

Figure 3.12: The illustration of ultrasonic sensor transmitter and transducer

The Figure 3.12 above show the illustration of ultrasonic sensor andhow waves transmitted perfectly fiddle of a cone that are reflected from the protest

and reflected to the transducer. The yield sign is passed on to play out some sort of appearing or control constrain. A base division from the sensor is required to give a period put off so that the "echoes" can be deciphered. The factors which can affect the operation of ultrasonic perceiving join the objective surface edge, savvy surface unpalatability or changes in temperature or stickiness[18].

3.3.3 Liquid Crystal Display (LCD)

LCD one of the significant piece of this anticipate recognition framework to show the scope of security separation district to driver. LCD remains for fluid precious stone showcase. They come in numerous sizes. Various multinational associations like Philips Hitachi Panasonic make their own one of a kind of LCD to be used as a piece of their things. All the LCD plays out similar limits (demonstrate characters numbers unprecedented character). LCD (Liquid Crystal Display) screen is an electronic presentation module and find a broad assortment of employments.

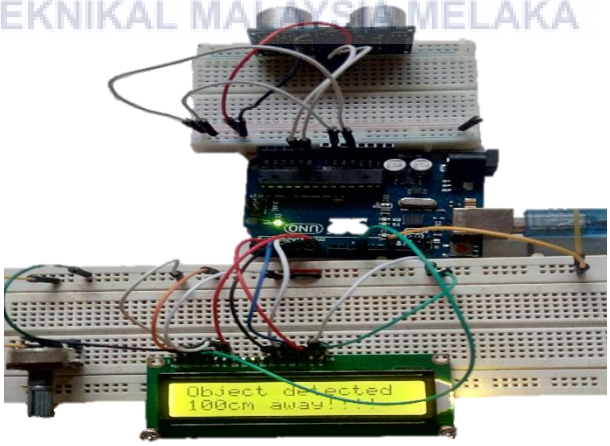

Figure 3.13: The Liquid Crystal Display (LCD)

The 16x2 LCD showcase is extraordinarily basic module and is by and large used as a piece of various devices and circuits ASCII characters. Their written work PC projects is also same and they all have same 14 pins (0-13) or 16 pins (0 to 15). These modules are bolstered more than seven section and other multi fragment LED. The reasons being LCD are more direct, effectively programmable and have no basic of demonstrating exceptional and even custom character and advancements. A 16x2 LCD proposes it can demonstrate 16 characters for each line and there are 2 such lines[19]. In this LCD every character is showed up in 5x7 pixel framework. This LCD has two registers, especially, Command and Data.The Figure 2.13 and table 2.1 on the following page demonstrates the pin and depictions of LCD. All LCD have:

- VCC pin
- Eight Data pins
- GND pin
- RS pin
- RW pin
- EN pin
- V0 pin

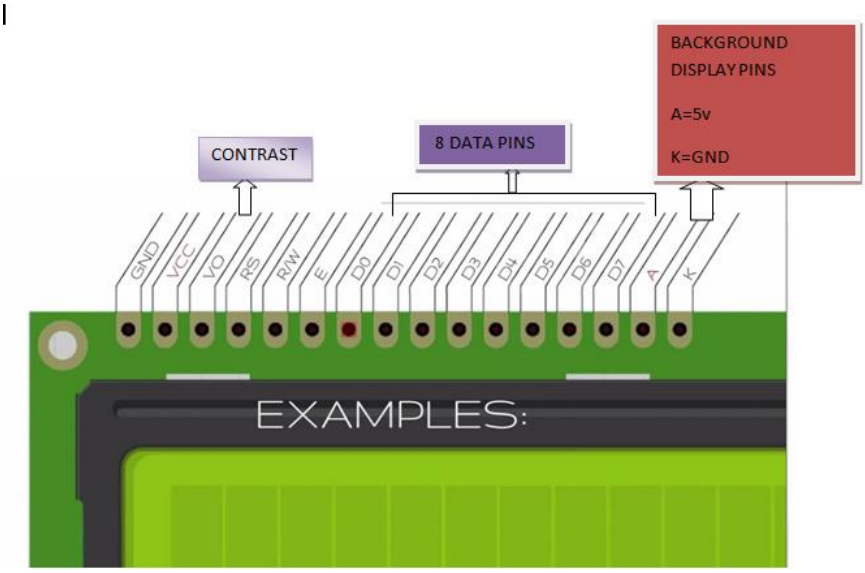

Figure 3.14: Liquid Crystal Display (LCD) pins

3.3.4 Buzzer

A piezo-buzzer is an audio signaling device. Figure 3.12 below demonstrate the sort of piezo-buzzer utilized as a part of this venture and the Figure 3.13 demonstrate the association in Proteus software of the buzzer. Piezo signal is an electronic device that usages sound motioning to make sound. A piezo create power when there is mechanical weight associated with certain material like piezo fired in the piezo chime. A sound flag source or influencing electronic circuit can impel piezo electric ringer. Piezo flag is used as a piece of this dare to caution the driver when the vehicle goes into the peril go territory.

Figure 3.15: Piezo buzzer

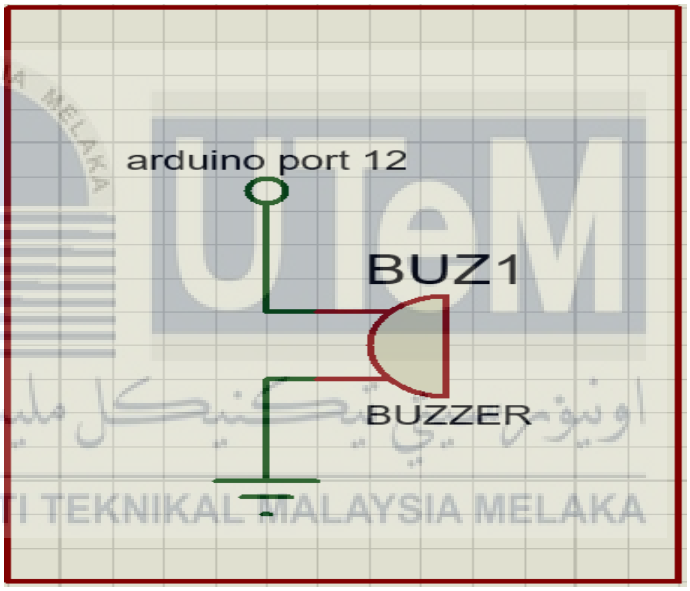

Figure 3.16: Connection in schematic circuit of piezo buzzer in Proteus

3.3.5 Motor Driver (L293D)

The L293D IC is a typical motor driver or motor driver IC which licenses DC engine to drive on regardless. The L293D is a 16-pins IC which can control an approach of two DC engines meanwhile in any course. It proposes that you can control two DC engine with a solitary L293D IC. The L293D are fourfold

high-recurring pattern and stream half-H drivers. The L293 is wanted to give bidirectional drive surges of up to 1 Ampere at voltages from 4.5 V to 36 V [20].

The H-bridge is a circuit which permits the voltage to be flown in either ways. As the without a doubt know voltage need to change its course to be set up to turn the engine in clockwise or against clockwise bearing. Consequently, H-connect IC are perfect for driving a DC motor. In a solitary L293D chip there are two h-Bridge circuit inside the IC which can pivot two dc engine wholeheartedly. Due its size it is particularly utilized as a bit of motorized application for controlling DC engines[21] [22]. There are two Enable Pin on L293D motor driver. Pin 1 and Pin 9, for being able to drive the engine, the pins 1 and 9 should be high. For driving the engine with left H-associate that need to engage the stick 1 to high. For right H-Bridge, need to make the pin 9 to high. On the off chance that anybody of the either pin 1 or pin 9 goes low then the engine in the relating segment will suspend working. It would appear that a switch.

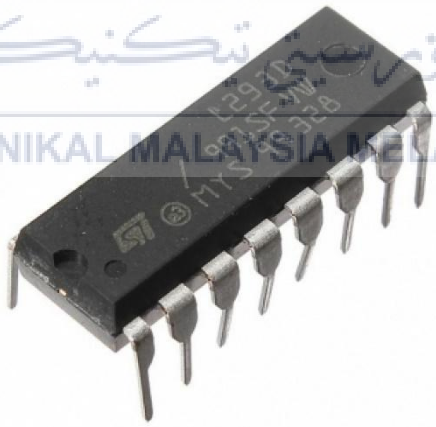

Figure 3.17: Motor Driver L293D

3.3.6 DC motor

A DC motor is any of a class of electrical machines that movements the flood of current electrical power into mechanical power. The most comprehensively saw sorts depend on upon the qualities made by appealing fields. Pretty much a broad assortment of DC motors have some interior instrument, either electro-mechanical or electronic, to unpredictably change the course of current stream in part of the engine. Most sorts make rotational advancement a straight engine plainly passes on oblige and improvement in a straight line. DC engines were the central sort generally utilized, since they could be controlled from existing direct-current lighting power diffusing structures.

A DC motor speed can be controlled over a wide range, utilizing either a variable supply voltage or by changing the way of current in its field windings. Little DC engines are utilized as a bit of devices, toys, and machines. The general engine can tackle coordinate present yet is a lightweight engine utilized for adaptable power instruments and machines[23]. The heading of turn of a this engine is given by Fleming's left hand lead, which conveys that if the pointer, center finger and thumb of the left hand are stretched out routinely reverse to each other and if the forefinger addresses the course of engaging field, center finger demonstrates the strategies for present, then the thumb addresses the bearing in which drive is experienced by the post of the DC motor.

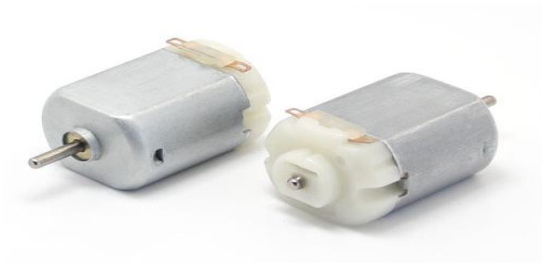

Figure 3.18: DC Motor

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Introduction

This project are aims to get the exact value of distance between two moving cars. During the design stage being test, test cases are written such as each case has an expected result outcome against which the actual outcomes are compared. This project focusing on development of ultrasonic sensing detect the distance that can showing the distance and use the indicators for the warning. Then, the system send the warning to the driver the warning to the driver such as LED condition and buzzer. Figure 4.1 below show the illustration of the distance region between two moving cars.

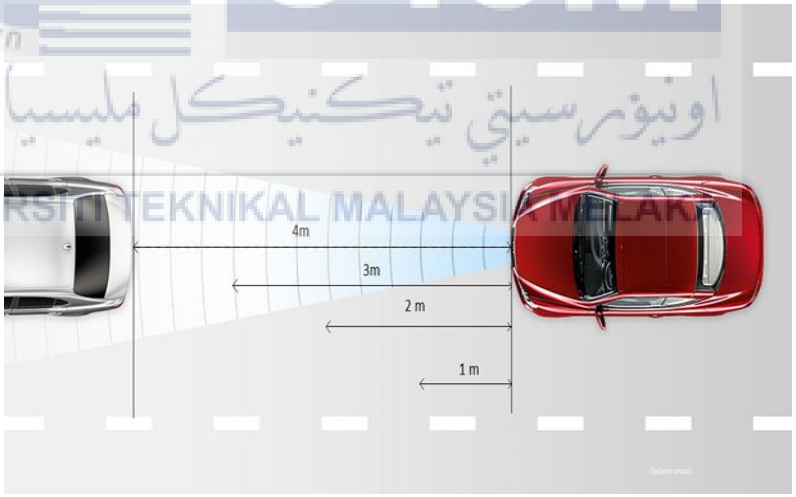

Figure 4.1: The illustration of the distance region between two moving cars

4.1 Overall Implementation

From the figure underneath demonstrate that the model of the venture and the perception. Extend model in Figure 4.2 was not ready to get the fancied outcome as the show of the LCD was not steady. The characters modified in the coding just show now and again while investigating. The issue may because of the inaccurate association on PCB format outline. The operation had done effectively in the wake of investigating, the separation showed on the LCD. Additionally coding adjustment was done and for programmed slowing mechanism. Alteration of the framework could be finished before the show of the venture model. The circuit on the bread board would be welded into the PCB for wiring associations.

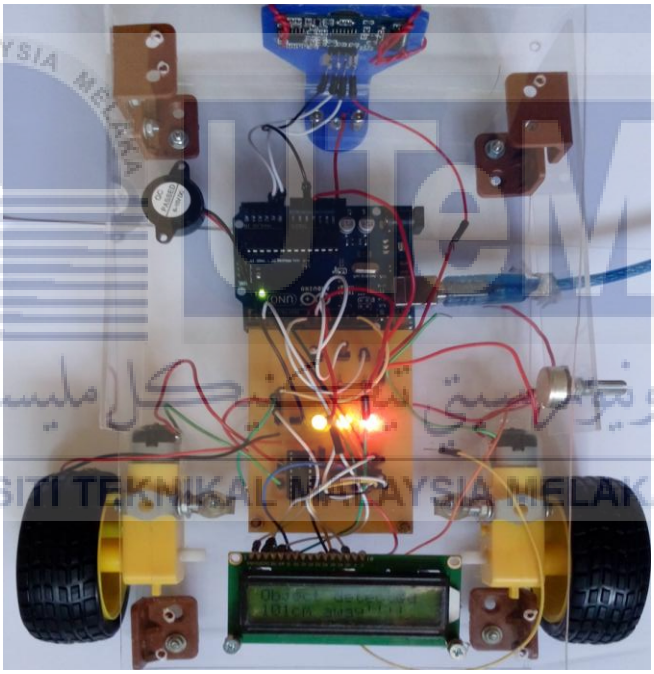

Figure 4.2: Project prototype

Distance (cm)	LED Warning (, ,)	Alarm Warning beep (LOW, MIDDLE, HIGH)	DC Motor speed
<400		LOW	High speed
<300		MIDDLE	Low speed
<200		MIDDLE	Low speed
<100		HIGH	Stop
Over 400	No warning	No warning	High speed

Table 4.1: Range of distance, alarm, LED condition and braking system

The figure 4.2 above show the project prototype for the car detection for the ultrasonic sensing. There are overall observation has been taken for this project. The table 4.1 above show the resultof the alarm warning and braking system. From the table 4.1 above when the distance over 400 cm the alarm warning did not give any alert and the automatic braking system still not activated. The system start to activate when the vehicle passed through into the range lower than 400 cm and the LED green ON with the LOW beep buzzer. Then, when the distance is lower than 300 cm and more than 100 cm the LED green and LED yellow are ON with the middle beeping of buzzer and at this time the automatic braking system start to activated by slowing the vehicle and lower the 100 cm the LED red, green and yellow are ON with high beeping of buzzer and the automatic braking system stop the vehicle immediately if the driver with the same speed. This system have been done by two weather condition that is day and night. The ultrasonic sensor perform normally at this two condition. The experiment was done by doing all the condition shows above. The figure below show the all the condition that has been done.

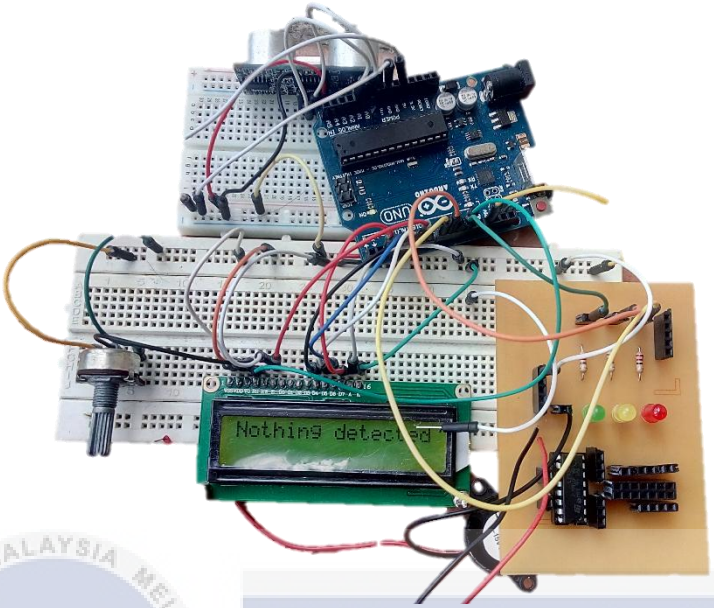

Figure 4.3: No object detect when out of range

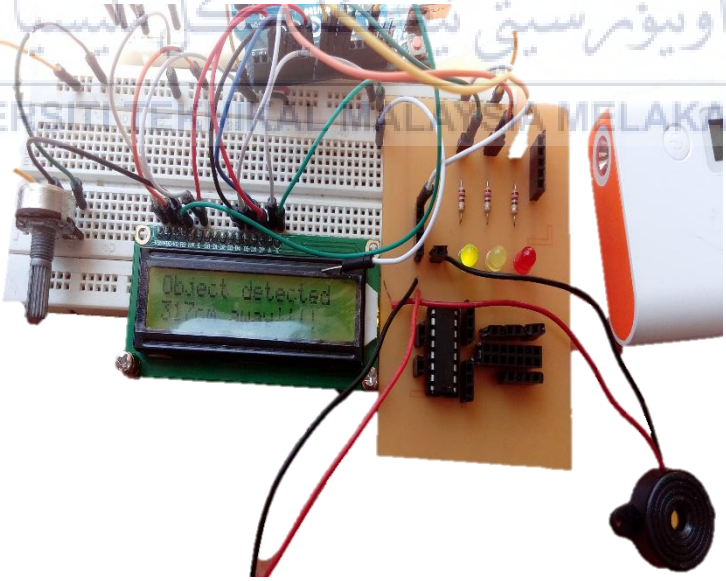

Figure 4.4: LED condition less than 400 cm

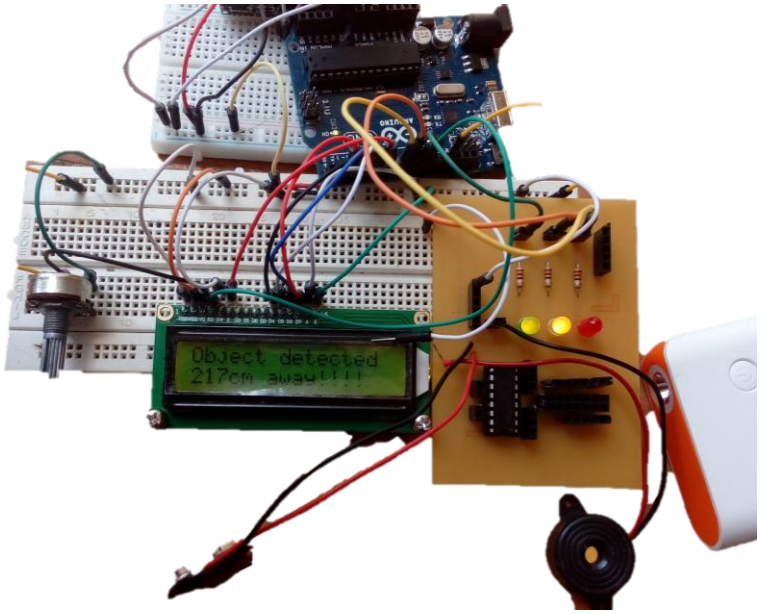

Figure 4.5: LED condition less than 300 cm

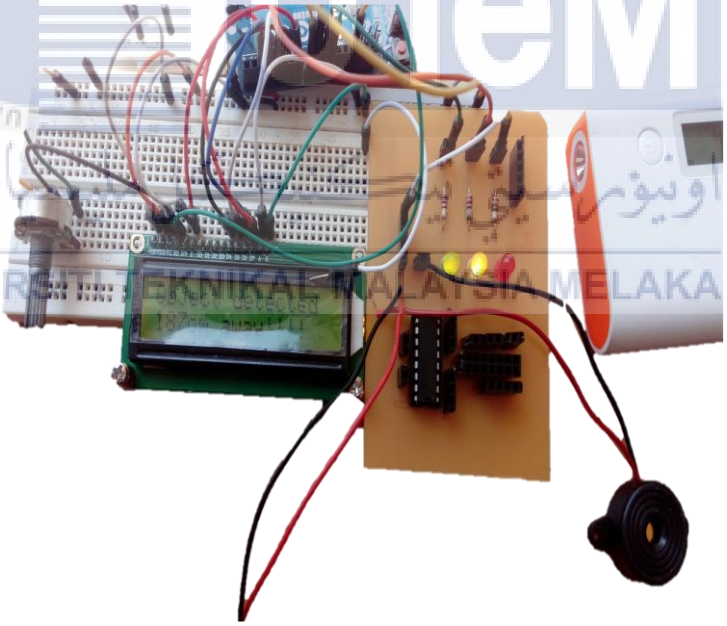

Figure 4.6: LED condition less than 200 cm

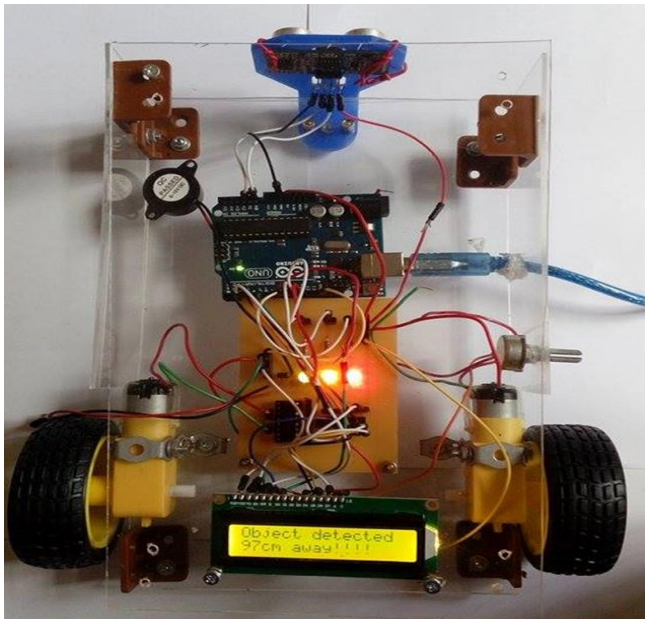

Figure 4.7: LED condition less than 100 cm

4.2 Liquid Crystal Display Testing

The display on LCD is an important factor to show the distance of the sensor. Since the maximum distance range of the sensor that are stated in datasheet as 0 cm to 400 cm. The actual measurement was take to prove its read by showing on LCD display. Figure 4.8 show the Liquid Crystal Display testing.

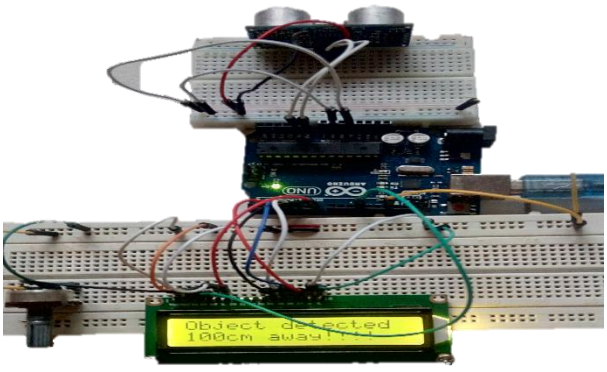

Figure 4.8: LCD testing

4.3 Ultrasonic Sensor HC-SR04 Range Testing

The reading of ultrasonic sensor HC-SR04 is an important factor in finding the effective distance of the sensor. Since the maximum distance range of the sensor that are stated in datasheet as 2 cm to 400 cm. the actual measurement was take to prove its read by showingon LCD display. Figure 4.2 show the ultrasonic testing.

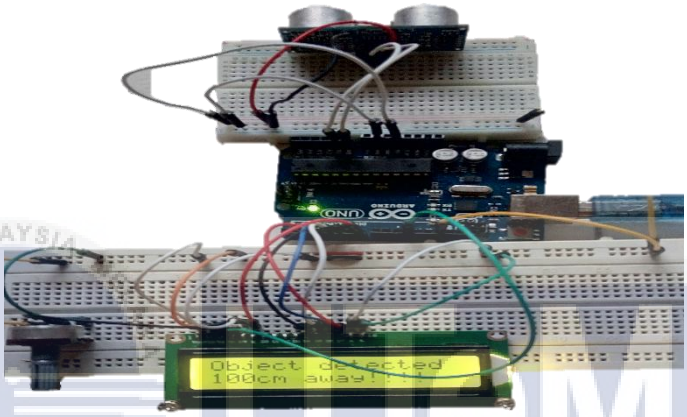

Figure 4.9: Sensor testing

Table 4.2:object far to near

Time (s)	Distance (cm)
0.023	396
0.048	397
0.382	396
0.783	397
1.182	394
1.599	396
2.016	395
2.433	392
2.849	388
3.266	378
3.682	373
4.099	364
4.515	352

4.932	342
5.349	330
5.766	318
6.182	304
6.598	288
7.015	278
7.432	266
7.848	246
8.265	230
8.682	214
9.099	200
9.515	180
9.931	161
10.348	140
10.781	124
11.214	103
11.631	85
12.032	69
12.431	53
12.831	41
13.232	30
13.631	18
14.015	9
14.382	3
14.748	2

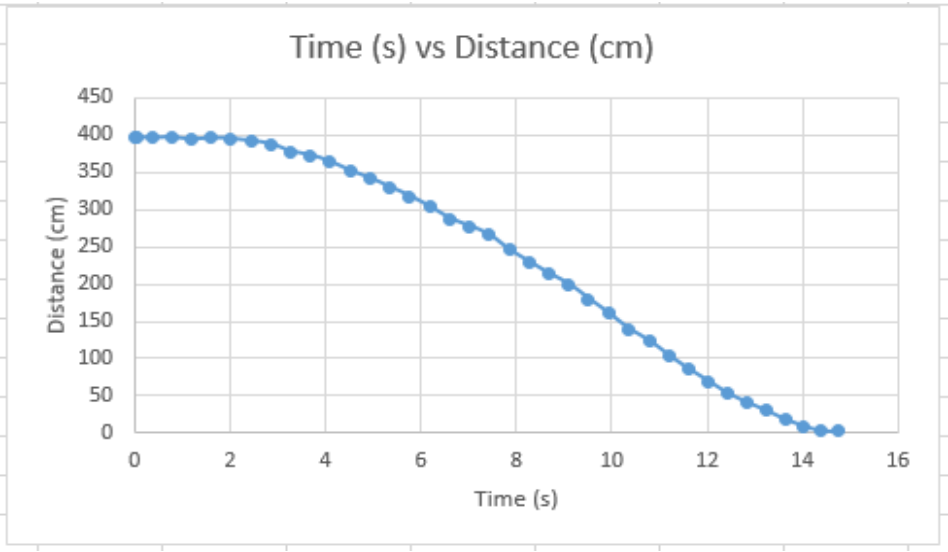

Figure 4.10:graph distance from far to near

Table 4.3: Object near to far

Time (s)	Distance (cm)
0	2
0.001	2
0.516	2
1.182	2
1.532	4
1.899	10
2.282	18
2.666	26
3.049	34
3.432	43
3.816	52
4.199	62
4.582	72
4.965	84
5.349	95
5.748	106
6.165	117
6.582	130
6.999	141

7.415	147
7.832	162
8.249	168
8.665	180
9.081	193
9.498	194
9.915	198
10.332	207
10.765	221
11.198	252
11.631	267
12.498	298
12.932	307
13.365	321
13.798	333
14.231	339
14.664	348
15.531	365
15.965	373
16.398	380
16.831	390
17.264	402

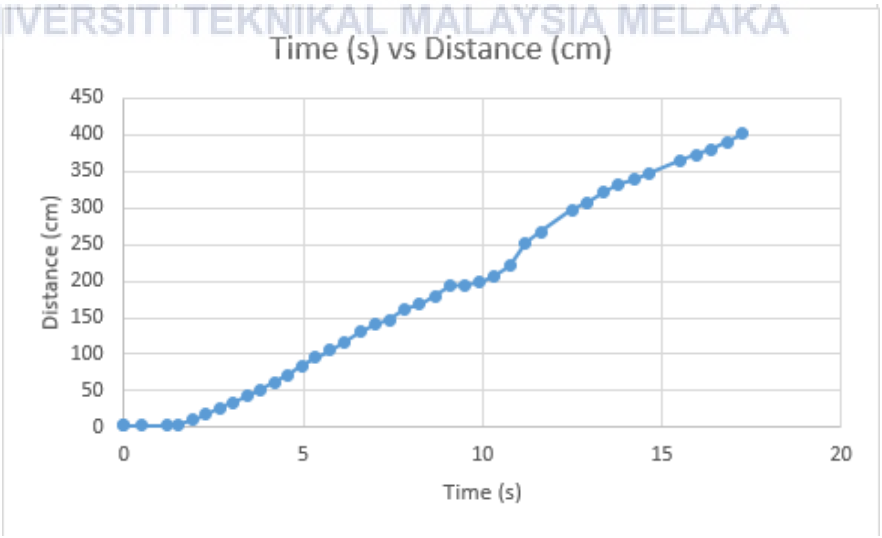

Figure 4.11:graph distance from near to far

The table 4.2 and 4.3 shows the value of time and distance through. From the table, the graph have been plotted to show the relationship between time and distance through. The figure 4.10 above show that the relationship between time versus distance from 400 cm to 2 cm. From the table and graph, shows that the reaction time to detect the maximum object at 396 cm is 0.023 seconds. The reaction time get from maximum reaction time minus minimum reaction time got 0.023 s. On the off chance that the protest is 10 cm far from the sensor and the speed of the sound is 340 m/s or 0.034 cm/µs and get the sound wave should travel. However, what will get from the Echo pin will be double that number on the grounds that the sound wave needs to go forward and bob in reverse. So with a specific end goal to get the separation in cm expected to duplicate the got travel time esteem from the Echo pin by 0.034 and divide it by two.

4.4 Simulation circuit in Proteus software

The simulation was done after the schematic circuit completely finished. This circuit included Arduino Uno as controller LCD, ultrasonic sensor, LED, buzzer and motor as the output.

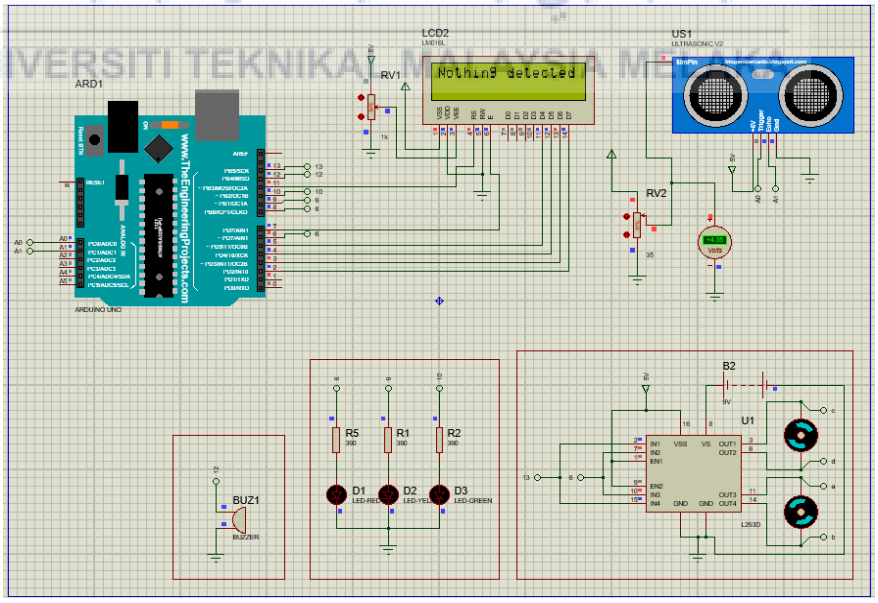

Figure 4.12: the stimulation running when distance over 400 cm

The Figure 4.12 above show the sensor detect out of range that is more than 400cm. The buzzer and LED OFF.

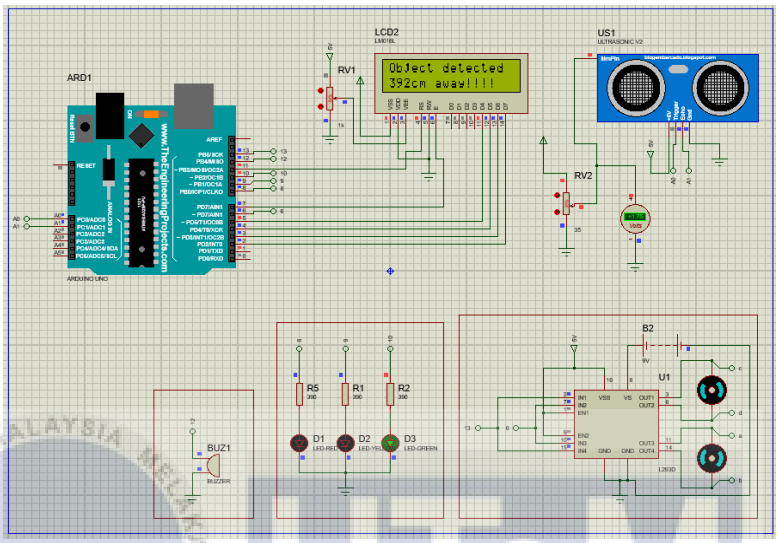

Figure 4.13: the condition when distance lower than 400 cm

The Figure 4.13 above show the sensor detect the distance that is less than 400cm. The buzzer beep low and LED green ON. The LCD show the reading and object detected.

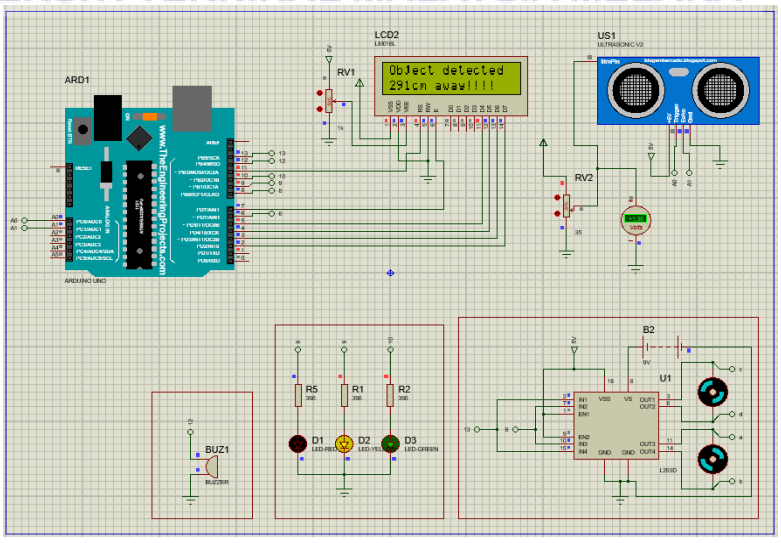

Figure 4.14: the condition when distance lower than 300 cm

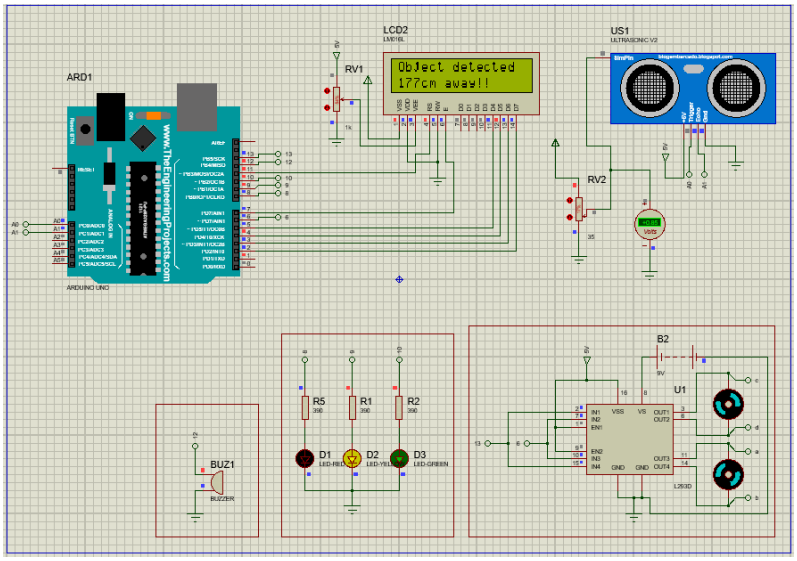

Figure 4.15: the condition when distance lower than 200 cm

The Figure 4.14 and Figure 4.15 above shows the sensor detect the distance that is less than 300 cm until more than 100 cm. The buzzer beep at the middle, LED green, LED yellow ON. The LCD show the reading and object detected. The DC motor become slower when the near and stop at certain condition that have been set.

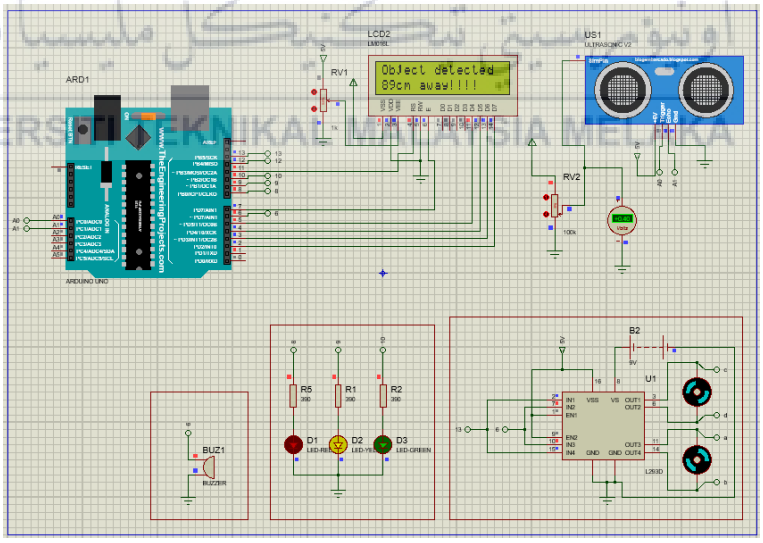

Figure 4.16: the condition when distance lower than 100 cm

The Figure 4.16 above shows the sensor detect the distance that is less than 100 cm. The buzzer beep high, LED green, LED yellow, LED red are ON. The LCD show the reading and object detected. The DC motor become slower when the near and stop at certain condition that have been set.

4.5 Discussion

4.5.1 Distance detection system

` The system in this project were design to help give the driver warning when there are have any obstacle in front of the vehicle to avoid from the collision while driving with the automatic braking system. The design of this system is different from other

4.5.2 Simulation

In the stimulation part, the system circuit design and coding were being successfully. The operation of this system was being test in Proteus software. From the stimulation, it was observed to see the input and output system with all the conditions. From the observation, the system were successfully achieved with result of stimulation. The communication between microcontroller using Arduino Uno and ultrasonic sensor HC-SR04 are the important part as it is the target to focus for this system.

4.5.3 Hardware

In the equipment part, issues had happened amid when planning the PCB design on ISIS programming for the framework. PCB drawing was in the etching lab of FTK. The parts were bound into its position on the PCB board and the program was hex into the microcontroller. At the point when the framework was exchanged on with the association of dc info, the LCD on without showing any

characters. Investigating was done to discover the motivation behind why the LCD couldn't show characters programed by the wrong association pins. Components were bound again to guarantee the voltage stream, multi-meter was utilized to check the short out of the PCB associations. The characters on the LCD could be shown now and again when the multi-meter was utilized for investigating. Be that as it may, the explanation for the issues of the LCD have been found because of wrong association. The conceivable purpose behind this condition was the shameful associations made amid the PCB format configuration handle.

Keeping in mind the end goal to make the model of the project before meeting the due date of the venture there is another issue as the execution of sensor introduced at little prototype. The performance of sensor are not stable while detect the object more than 200 cm. this due to the limitation of the characteristic of the ultrasonic sensor. The distance get are not stable get problem to this system to work properly especially at open space. This may because of the noise from environment.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.0 Introduction

This chapter discusses about the conclusion of the overall this project and also discusses about problem, limitation and recommendation for future improvement that can be made for this project.

5.1 Summary

This front car detection system is suitable to apply for low-end vehicle in Malaysia. In this system using the ultrasonic sensing that can read range of the distance but in small range for prototype project. The characteristic of ultrasonic sensor that are able to monitoring this system to make this system function properly and able to help the driver avoid from collision.

5.2 Achievement of objectives

The project prototype of the front car system detection has been successfully developed to achieve the objectives.

1. To study the performance of the ultrasonic sensor on car system detection.
2. To develop the cars system detection using an ultrasonic sensor detecting object when cars enter the safe distance region.
3. To analysis the performance of this system measured the range of the distance.

The literature review was successfully done by referring from the previous related projects conducted by others. This part focused on the important ideas and all main theories which identified with this anticipate. By completing this project, the implementation of the hardware and software of this system were created. The system were successfully done combined between hardware and software of the front car system detection. According to this system, this system shows are not very effective and reliable to detect and monitor the range of distance between two vehicles or obstacles. The ultrasonic sensor are not recommended to use for this system because not effective to measure the large distance range. It has been successfully tested, the front car system detection did not work well when the obstacle far but this system work well when in small distance range.

5.3 Troubleshooting Problem

The problem faced in this project was in hardware prototype as the connection have to be carefully made for the system to operate properly. Then, by completing this project was having the problem on serial interfacing coding between ultrasonic sensor HC-SR04 and microcontroller that needed to take a lot of time to research.

5.4 Recommendation for future development

For recommendation of this project to make development for long range monitoring distance object by using VDM70-250-R/20/87/160laser sensor as a replacement for HC-SR04 ultrasonic sensor. This laser sensor has several advantages compare to ultrasonic sensor which are:

- Modulated visible red light and infrared light.
- Can detect distance 0 to 250m on reflector.
- Resolution 0.1 mm or 0.125 mm.
- Light source using laser diode.
- Operating voltage from 18 to 30V
- Measuring method using Pulse Ranging Technology (PRT).

Figure 5.1:VDM70-250-R/20/87/160laser sensor

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APPENDIX A – Main Coding

APPENDIX B – Gantt Chart

Appendix A – main coding

```
#include <LiquidCrystal.h>

LiquidCrystallcd(11, 7, 5, 4, 3, 2);


intled_red = 8;

intled_yellow = 9;

intled_green = 10;

intpingPin = A0;

intinPin = A1;

int motor = 6;

int motor2 = 13;


// setup speaker pin number

int speaker = 12;


// speaker tone interval

unsigned long tone_time = 0;
```

```
//============================
============================
==

//NUMBERS TO CHANGE

// speaker tone.  Change the number to
change the tone

int pitch = 5000;


intbeep_time = 15;  // multiplyer for
beep interval.  change this number to
change beep interval


//create distances for program (distances
in cm)

intdistance_min= 2; //minimum range

intdistance_start= 100;

intdistance_stop= 90;

intdistance_mid = 200;

intdistance_max = 300;
```

```
intdistance_over = 400; // maximum range


void setup()
{
// set up the LCD's number of columns and rows:
lcd.begin(16, 2);
Serial.begin(9600);
//initialize led pins as outputs
pinMode(led_red, OUTPUT);
pinMode(led_yellow, OUTPUT);
pinMode(led_green, OUTPUT);

 //initialise speaker pin as an output
pinMode(speaker, OUTPUT);


 //initialize ultrasonic pins as an output and input
pinMode(pingPin, OUTPUT);
pinMode(inPin, INPUT);
pinMode(motor, OUTPUT);
}


void loop()
{
// send the value of analog input 0:
Serial.println(analogRead(A0));
// wait a bit for the analog-to-digital converter
 // to stabilize after the last reading:
delay(2);

 // establish variables for duration of the ping,
 // and the distance result in inches and centimeters:
long duration, distance, inches, cm;


 // The PING))) is triggered by a HIGH pulse of 2 or more microseconds.
 // Give a short LOW pulse beforehand to ensure a clean HIGH pulse:
pinMode(pingPin, OUTPUT);
digitalWrite(pingPin, LOW);
delayMicroseconds(2);
```

```
digitalWrite(pingPin, HIGH);
delayMicroseconds(10);
digitalWrite(pingPin, LOW);


 // The same pin is used to read the signal from the PING))): a HIGH
// pulse whose duration is the time (in microseconds) from the sending
  // of the ping to the reception of its echo off of an object.
pinMode(inPin, INPUT);
duration = pulseIn(inPin, HIGH);
  // The speed of sound is 340 m/s or 29 microseconds per centimeter.
  // The ping travels out and back, so to find the distance of the
// object we take half of the distance travelled.
distance = duration / 29 / 2;


Serial.print(distance);


// convert the time into a human readable distance
cm = microsecondsToCentimeters(duration);


 // if distance is too large (probably not being measured properly)
 // will discard the result.
if (cm > 200)
{
        lcd.clear();
        lcd.setCursor(0,0);
        lcd.print("Nothing detected");
        analogWrite(motor, 255);
        analogWrite(motor2, 0);
}
else
{
         // clear lcd content
        lcd.clear();
        // set the cursor to column 0, line 0
        // (note: line 1 is the second row, since counting begins with 0):
```

```
        lcd.setCursor(0, 0);
        lcd.print("Object detected ");
        lcd.setCursor(0, 1);
        lcd.print(cm);
        lcd.print("cm away!!!!");


}

delay(500);

if(distance >= distance_max&&
distance <distance_over)
{
        analogWrite(motor, 190);
        analogWrite(motor2, 0);
        digitalWrite(led_red,LOW);
        digitalWrite(led_yellow,LOW);
        digitalWrite(led_green,HIGH);
        speaker_beep(distance);


 }

else if(distance >= distance_mid&&
distance <distance_max)
{
        analogWrite(motor, 50);
        analogWrite(motor2, 0);
        digitalWrite(led_red,LOW);
        digitalWrite(led_yellow,HIGH);
        digitalWrite(led_green,HIGH);
        speaker_beep(distance);

 }

else if(distance >= distance_stop&&
distance <distance_start )
{
        analogWrite(motor, 0);
        analogWrite(motor2, 0);


        digitalWrite(led_red,HIGH);
        digitalWrite(led_yellow,HIGH);
        digitalWrite(led_green,HIGH);
        speaker_beep(distance);
```

```
 }


else if(distance <distance_stop )
{
        analogWrite(motor, 255);
        analogWrite(motor2, 0);
        digitalWrite(led_red,HIGH);
        digitalWrite(led_yellow,HIGH);
        digitalWrite(led_green,HIGH);
        speaker_beep(distance);

 }

else if(distance >distance_over)
{
        analogWrite(motor, 255);
        analogWrite(motor2, 0);
        digitalWrite(led_red,LOW);
        digitalWrite(led_yellow,LOW);
        digitalWrite(led_green,LOW);
                noTone(speaker); //turn off
speaker

  }


}

voidspeaker_beep(int DISTANCE){
if((millis()-tone_time) >=
(DISTANCE*beep_time))
{
tone(speaker, pitch);
tone_time = millis();
 }
else if((millis()-tone_time) >= 100)
{
noTone(speaker); //turn off speaker
 }


}

longmicrosecondsToInches(long
microseconds){
```

```
// According to Parallax's datasheet for the PING))), there are
// 73.746 microseconds per inch (i.e. sound travels at 1130 feet per
// second). This gives the distance travelled by the ping, outbound
// and return, so we divide by 2 to get the distance of the obstacle.
return microseconds / 74 / 2;}

longmicrosecondsToCentimeters(long microseconds){
// The speed of sound is 340 m/s or 29 microseconds per centimeter.
// The ping travels out and back, so to find the distance of the
// object we take half of the distance travelled.
return microseconds / 29 / 2;}
```

Appendix B – Gantt Chart

Project Planning in Gantt Chart