



**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

**MUHAMMAD BASIIR BIN KHOSIM**

**B071310577**

**940110-10-6595**

FACULTY OF ENGINEERING TECHNOLOGY

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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** : .....  
**Date** : .....

## **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:

.....  
(Project Supervisor)

## ABSTRAK

Pada masa kini, teknologi dalam keselamatan kenderaan telah semakin meningkat dengan pesat untuk mengurangkan risiko kemalangan kereta semasa memandu. Satu masalah yang amat membimbangkan apabila pemandu tidak dapat menentukan jarak sebenar dengan kenderaan lain. Peningkatan "Smart Cars" memerlukan peranti baru yang dapat mengukur jarak dalam lingkungan beberapa sentimeter ke beberapa meter jarak antara dua kenderaan bergerak. Projek ini memberitumpuan kepada sistem pengesanan dengan nisbah yang tinggi ke upaya and harga yang lebih berpatutan untuk kenderaan mampu milik dan mensasarkan kepada pengesanan jarak kereta di hadapan. Bagaimanakah sistem ini biasanya digunakan pada kereta yang mahal seperti Mercedes, Volvo dan Nissan. Hal ini kerana sistem ini adalah teknologi baru dan menggunakan kos yang tinggi untuk pemasangan. Sistem ini biasanya menggunakan sistem penglihatan, sistem radar yang mahal untuk pemasangan. Kebanyakan semua kereta mempunyai aplikasi sensor di belakang sebagai sensor belakang, titik buta dan tempat letak kereta. Lingkungan jarak hanya 0 meter hingga 4 meter. Dengan cara ini, sensor diperlukan untuk menutup kawasan itu. Sistem ini adalah sangat diperlukan untuk menunjukkan jarak keselamatan semasa memandu kereta dalam keadaan trafik yang biasa. Oleh itu, pengesanan ultrasonik digunakan untuk mengesan jarak yang boleh menunjukkan nilai jarak dan menggunakan petunjuk untuk amaran. Kemudian, sistem menghantar amaran kepada pemandu amaran kepada pemandu seperti keadaan LED

dan buzzer. Untuk mengukur jarak, sensor ultrasonik dikawal oleh pengawal. Pengawal ini digunakan untuk menetapkan pelbagai jarak, paparan LCD, set amaran dan keadaan 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.

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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

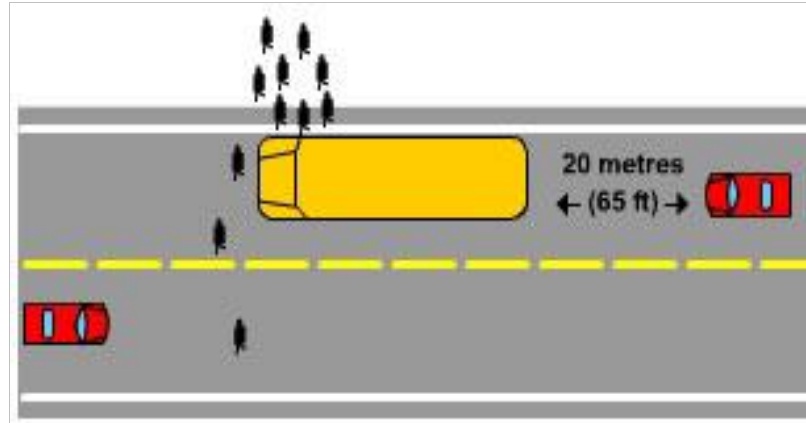
## INTRODUCTION

### 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 are cannot 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.

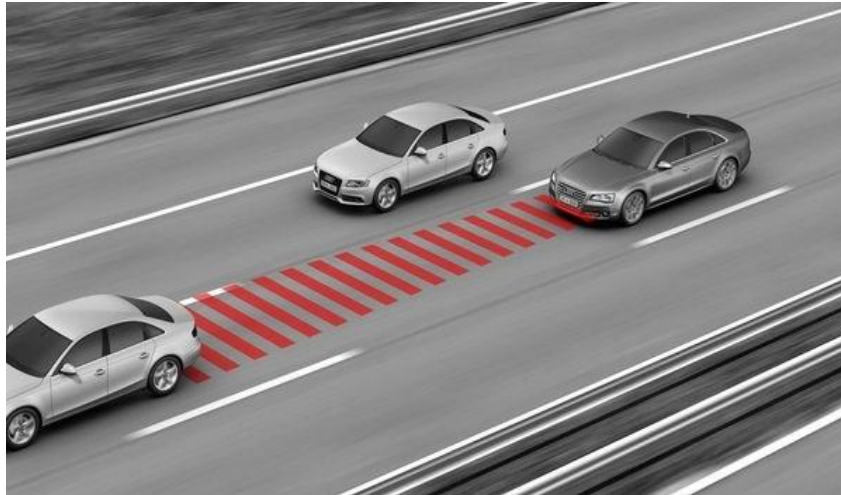


**Figure 1.1:** Detection system explanation

## 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.