UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SAFETY CAR ALERT SYSTEM

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

by

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

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I hereby, declared this report entitled “Safety Car Alert System” is the results of my own research except as cited in references.

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APPROVAL

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

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(Khairul Azha Bin A. Aziz)

ABSTRAK

Kereta atau kenderaan telah dianggap sebagai budaya kepada masyarakat yang mana ia sangat berguna serta dianggap mudah untuk dijadikan sebagai pengangkutan. Tetapi, selain dianggap sebagai satu pengangkutan yang mudah, ia merupakan salah satu pengangkutan yang mengalami kadar kemalangan yang paling tinggi serta paling berbahaya di antara pengangkutan yang sedia ada. Beribu-ribu manusia yang mati kemalangan yang berlaku pada setiap tahun, sama ada ia adalah kemalangan disebabkan kenderaan lain atau disebabkan objek yang tidak bergerak. Satu kaedah telah dikenalpasti untuk mengawal kemalangan yang berlaku disebabkan oleh beberapa faktor berikut seperti hilang kawalan, kecuaian ketika memandu, memandu dalam keadaan letih dan tidak mampu memberi tumpuan kepada jalan raya. Oleh kerana pasaran lama tidak menyediakan ciri keselamatan pada kereta-kereta murah dan lama, penggunaan alat-alat deria untuk mengesan jarak kereta di hadapan, belakang, kiri dan kanan. Penderia ini juga akan mengesan kandungan gas karbon monoksida yang terdapat di dalam kereta. Untuk projek ini, satu sistem amaran keselamatan untuk kereta berdasarkan android telah dibentuk. Empat penderia ultrasonik digunakan untuk mengesan objek dan satu penderia karbon monoksida digunakan untuk mengesan gas karbon monoksida. Dengan melaksanakan peningkatan yang mungkin dalam sistem keselamatan di dalam kenderaan, kenderaan dan penderia akan dapat beroperasi secara normal sehingga penderia mengesan risiko yang mungkin berlaku. Dalam projek ini, sistem akan memberi amaran kepada pengguna apabila penderia ultrasonik mengesan objek yang jaraknya kurang daripada 6 meter, iaitu untuk mod memandu. Manakala bagi mod meletak kereta, sistem akan memberi amaran kepada pengguna apabila jarak kereta adalah kurang dari 0.5 meter daripada objek. Bagi penderia karbon monoksida, ia akan memberi isyarat kepada pengguna apabila penderia mengesan kandungan gas karbon monoksida lebih daripada

37 bpj yang mana ia merupakan pendedahan yang maksimum dibenarkan kepada tubuh badan manusia.

ABSTRACT

Cars and vehicles have been incorporated into culture as one of the most resourceful, easiest and accessible means of transportation available. But besides being a suitable and common means, it is equally an incredibly dangerous mode of transport. Thousands of people die in vehicle accidents each year, whether it is accident with another vehicle or with a motionless object. A method of early accident exposure and evasion can control several accidents that may be associated to factors such as loss of control, careless driving, tired or intoxicated drivers, and not paying concentration to the road. As the old market does not present a normal safety feature in any old cheap car, the use of sensory tools to detect the distance of car in front, rear, left and right. The CO sensor can also detect the presence of carbon monoxide gas inside the car. For this project, a safety alert system for car based on android is designed. Four ultrasonic sensors are used to sense obstacles and one carbon monoxide sensor to sense carbon monoxide gas. By implementing a possible improvement in safety system in vehicles, the vehicle and sensor would be able to operate normally until the sensor detects possible risks. In this project, the system does not alert the user when the ultrasonic sensor sense the objects until the car comes within 6 meter of an object, which is for driving mode. While for parking mode, the system will alert the user when the distance of car is below than 0.5 meter of an objects. For carbon monoxide sensor, it will alert the user when the sensor detects the carbon monoxide gas above than 37 ppm which is the maximum permissible exposure to the human body.

DEDICATION

I would like to dedicate this project to my beloved supervisor, Mr. Khairul Azha Bin A. Aziz who give extra knowledge to assists me develop this project. I also want to thanks to my family members, lecturers and friends that give me extra spirit to continue develop this project.

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TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS. SYMBOLS AND NOMENCLATURE

ABS	-	Antilock Braking System
CC	-	Cruise Control
CO	-	Carbon Monoxide
C02	-	Carbon Dioxide
DARPA	-	Defense Advanced Research Project Agency
ESP	-	Electronic Stability Program
OS	-	Operating System
PPM	-	Parts Per Million
PSM	-	Projek Sarjana Muda
BPJ	-	Bahagian Per Juta

CHAPTER 1
INTRODUCTION

Most of car users on the road ignored road safety in spite of there had been many deaths that caused by negligence of the drivers. Even though some vehicles were equipped with the latest technology and sophisticated systems but there are still a lot of vehicles that are not equipped with safety systems to warn the user especially for those using cheap cars or that are not installed with the safety features that only affordable by low and medium income consumers.

1.1 Project Background

With the current fast development in information technology, there has been a tremendous increase in the number of cars. Market research results show that in 2010 the world's car number hits 6.9 billion, the number of cars yet to appear in the next 8 years will be 1.16 times the current one because of driving is a compulsory activity for most people. Cars have become a major tool of transportation in the current society. So, the number of vehicle is increasing day by day. People use their car to move from one place to other place. Thus, car safety system becomes perfect as its number soars nowadays.

Over the years, automotive safety has gained an increasing amount of interest from the general public, governments, and the car industry. As noted by Alonso, Milanes, Torre-Ferrero, Godoy, Oria and Pedro (2011) states that traffic accident statistics more than justify this focus, as each year around 1.2 million people die due to road traffic accidents. The high number of accidents has led to the increasing use of increasingly intelligent and efficient driving-aid systems. Accident will occurs every

time and everywhere and cause worst damage, serious injury and dead. These accidents are mostly caused by delay of the driver to hit the brake because the driver do not keeping the distance in a safe distance. Furthermore, there are also death caused by PPM content of carbon monoxide is too high in a driver's car because of leakage such as gas from the car exhaust, cigarette smoke and others.

The vehicles that driving on the roads would still be considered to get threat of road accidents, but in recent years, a certain steps are being taken toward this goal. In this sense, several applications, such as Cruise Control (CC) can be found in the market. Vehicles equipped with new active electronic safety systems are constantly appearing, in an attempt to reduce the risk of accidents. Most of these systems are not very efficient in preventing accidents in urban environments because the speeds and distances between vehicles are relatively low. They all use different kinds of sensors to continuously monitor the status of both the vehicle and the surrounding environment. Examples include:

- The control system of lights, using Tilt sensors.
- Electronic Stability Program (ESP), that used high pressure sensors.
- Steering systems, using torque sensors.
- Steering and ESP systems, that used steering wheel angle sensors.
- Airbag control systems, that used acceleration sensors and seat occupation sensors.
- ESP systems, that used wheel rotation angle sensors.
- ABS systems and their associated systems, that used wheel angular velocity sensors.
- Parking aid systems, that used ultrasonic sensors.
- ACC systems, that used radar sensors.
- new pedestrian detection systems, that used vision sensors.

All these systems increase the final price of the vehicle, and are thus are typically only offered in some high-end models.

This project is designed to develop a new system that can solve this problem where drivers will be more sensitive to the obstacles or the car in front and behind of driver car. So, the driver can manage their distance between their car with others car

in a safest distance and control the brake if there is something happened in front or behind of driver car. These sensors can detect any obstacle within a distance range of a few tens of meter, including both vehicles and pedestrians. Ultrasonic sensors are inexpensive and their hardware is simple, compared with other systems, such as those based on radar sensors or computer vision. Moreover, the original material is cheap and production cost is low, making its price more widely acceptable.

This project also can alert the driver if there is high level PPM of carbon monoxide that contain inside the car that can make the driver or passenger dead. A lot of news about carbon monoxide poisoning that caused to death is heard in our country. The recent case highlighted in newspaper reports about the 3 deaths in a Perodua Kancil should serve as a wake-up call to all Malaysian motorists on the dangers of carbon monoxide poisoning. Motor vehicles are a source of carbon monoxide, even though levels have been reduced over the years, it is therefore important that motorists are aware of how they can reduce the risks of carbon monoxide pollution and poisoning from their vehicles. The symptoms may include headaches, dizziness, tiredness, flue-type symptoms, nausea and even loss of consciousness.

1.2 Objectives of Projects

(i) To develop a system to keep the car in the safest distance on the road.
(ii) To develop a system that detect the high level of PPM content of carbon monoxide inside a car.
(iii) To develop a system to assist driver park their car.

1.3 Problem Statements

A lot of accident in the road is caused by the car that not keeping their distance in a safe distance. The driver cannot manage the safe distance on the road especially at a night. So, a lot of accidents are happened due to this problems. It also can help the driver to park their car using the parking mode interface. Besides that, the high content

of carbon monoxide inside a car also can make the driver fainted due to the poisonous gas in too high in the car. Through research and design wise, the system to control the alert car system are very useful especially for the old car owner that does not equipped with the latest safety system because the systems are normally provides for a high-ends models and latest car model.

1.4 Scope of project

Develop an android application by using Basic4Android software. Basic4Android software is used to create an android application to alert the user in a car. It using IOIO board as a controller to give the signal through the application by using Bluetooth signal. So the distance between the user and a car must not too far because the Bluetooth signal will not function properly. Besides that, the project also using 4 ultrasonic sensor for several interfaces that created in the application such as it tell the distance between user car and others car front and rear in a range of 6.4 meter. When a distance is below than 6 meter front and rear, beep sound will warning the user to keep their distance safe. It also can set the parking mode in the application interfaces as an assist for the driver to park their car. So the distance for parking is set in a range of 1 meter. Furthermore, an alert for carbon monoxide detector also installed and will only alert the user when the detector detects the carbon monoxide gas in a range of 70 PPM because it was the maximum permissible exposure towards the human body.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In order to make this project successful, some studies and information has been done. The information is fetching from many sources such as books, articles, journals and internet. All of this information is very useful as a guide in doing this project. This studies of information based on some major component and topic that related to the project that will be used in the project such as software and hardware.

2.2 Evolution of Car Safety Features

Since the introduction of the first automobile in the late of 1800s, car manufacturers have been constantly working on new techniques and technologies to improve the safety and comfort of their cars. Most of the safety system changes have occurred within recent decades as shown in the following outline of car safety features. Table 2.1 shows the evolution of car safety features according to the year it were introduced.

Table 2.1: Evolution of car safety features

Years	History
1898	Electric Headlamp An electric headlamp is created. It is the optional extra design that introduced on Columbia Electric Car in United States.
1903	Windscreen Wipers Windscreen Wipers is made. It was the first hand operated windscreen wipers
1926	Electric Windscreen Wipers Electric windscreen wipers that created by Bosch. In the same years, rain sensing wipers also had been introduced by Cadillac.
1930	Safety Glass Car for Window The safety glass for car window is introduced. It became standard on all Ford cars.
1949	First Crash Test Dummy First crash test dummy also known as “Sierra Sam” that created by Samuel W. Alderson.
1951	Airbags An airbags for safety is introduced. Walter Linderer gets German patent for airbag. It was released by bumper contact or by the driver.

1952	Crumple Zone The crumple zone. The concept invented by Bela Barenyi and patented by Mercedes-Benz for the Ponton.
1958	Anti-lock Braking System (ABS) Anti-lock braking system (ABS) is introduced. It was tested in the Royal Enfield Super Meteor motorcycle.
1959	Three Points Seat Belts Three Points Seat Belts is created. Volvo 122 first to fit three point seatbelts as standard safety for car.
1987	Traction Control Traction Control was the secondary function of the anti-lock braking system (ABS).it was introduced by Mercedes-Benz and BMW.
1995	Electric Traction Control Traction control went electric. It was the first electric stability control system that introduced by Bosch on the Mercedes-Benz W140 S-Class.
1996	Brake Assist Brake Assist is introduced. Mercedes invent the brake assist system because even with quick reactions, people still do not apply enough pressure to the brake pedal.

1998	Blind Spot Warning System First Blind spot warning system on the Volvo S80 sedan. In this year, gas inflated airbags also become mandatory in all cars in United States of America.
2002	First Lane Departure Warning Systems First lane departure warning systems introduced in Europe for Mercedes Actros trucks.
2005	Driverless Car Nevada legalizes driverless cars for testing from 1 March 2012. In this year, Google also won the DARPA Grand Challenge for their driverless car concept.
2010	Pedestrian Detection System Volvo develop a pedestrian detection system that automatically brakes a car to a halt whenever someone steps out in front on it.

2.3 Android Devices

Android is an operating system based on the Linux kernel with a user interface based on direct manipulation, designed primarily for touchscreen mobile devices such as smartphones and tablet computers, using touch inputs, that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on-screen objects, and a virtual keyboard. Despite being primarily designed for touchscreen input, it also has been used in televisions, games consoles, digital cameras, and other electronics. As reported by the Victor (2013) argues that android has the largest installed base of any mobile OS and as of 2013, its devices also sell more than Windows, iOS and Mac OS devices combined. As of July 2013 the Google Play store

has had over 1 million Android apps published, and over 50 billion apps downloaded. A developer survey conducted in April–May 2013 found that 71% of mobile developers develop for Android.

Android is popular with technology companies which require a ready-made, low-cost and customizable operating system for high-tech devices. Russakovski (2012) states that androids open nature has encouraged a large community of developers and enthusiasts to use the open-source code as a foundation for community-driven projects, which add new features for advanced users or bring Android to devices which were officially released running other operating systems. According to Perry (2011) mentions that the operating systems success has made it a target for patent litigation as part of the so-called "smartphone wars" between technology companies.

2.3.1 Android Version History

The version history of the Android mobile operating system began with the release of the Android beta in November 2007. The first commercial version, Android 1.0, was released in September 2008. Android is under ongoing development by Google and the Open Handset Alliance (OHA), and has seen a number of updates to its base operating system since its initial release. Table 2.2 showed the android versions that have been developed under confectionery-themed code name and released in alphabetical order.

Table 2.2: Android version history

Version	Features
Android 1.5, Cupcake	Right from the start, Android is an open OS that can run almost any app or widget so user can do what they want to do.