# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## PROTOTYPE DEVELOPMENT OF COLLISION PREVENTION SYSTEM DURING TRAFFIC JAM SITUATION

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering (Automotive Technology) with Honours.

by

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# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Tajuk: **Prototype Development of Collision Prevention System during Traffic Jam Situation**

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# APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours. The member of the supervisory is as follow:

Signature: ……………………………………………….

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# ABSTRAK

Kebelakangan ini kadar kemalangan yang berlaku dijalan raya meningkat lebih-lebih lagi akibat pelanggaran yang melibatkan ketika menunggu lampu trafik atau dalam kesesakan lalulintas. Matlamat kajian ini adalah untuk membina satu sistem bagi mengelakkan perlanggaran berlaku diatas kesilpan pemandu dalam menekan di antara pedal kelajuan dan pedal berhenti. Walaupun kemalangan ini jarang didengari tetapi apabila ia berlaku ia akan melibat kerugian kepada pemilik kederaan yang melanggar dan dilanggar. Objektif utama projek ini adalah untuk mempamerkan idea mengenai sebuah sistem yang mampu menyelesaikan masalah perlanggaran secara tidak sengaja ini. Laporan lengkap ini adalah bertujuan untuk memberi gambaran jelas tentang konsep reka bentuk prototaip sistem ini. Kaedah kajian terbahagi kepada beberapa bahagian iaitu kajian ilmiah, rekabentuk produk kaji selidik sistem pengesan, reka bentuk komponen, konsep reka bentuk keseluruhan dan akhir sekali pembangunan prototaip.

# ABSTRACT

Currently, the rate of accidents occurred in the streets are increase due to the violations involved while waiting for traffic lights or in traffic jams. Hence forth, this study aims to develop a system to prevent collisions occurring over the drivers who accidently pressing wrong pedal between the pedal throttle and pedal brake. Although we rarely heard of this type of accident, but when it happens, it will be a waste to the owner of the violation that violates and violated. The main objective of this project is to present the idea of a system that capable of solving this accidental collision problem. This complete report is intended to give a clear picture of the concept of this prototype design system. The research method is divided into several parts, which contains background study, product design survey system detector, component design, overall design concept and finally the prototype development.

# DEDICATION

I would like to say that I am grateful for all the support my parents had given me until now. To my beloved mother and father, Ibrahim bin Hamid and Sharifah binti Ghazali.

# ACKNOWLEDGEMENT

I would like to express my deepest appreciation to all those who provided me the possibility to complete this report. A special gratitude I give to my final year project supervisor, Puan Nurul Amira binti Zainal, whose contribution in stimulating suggestions and encouragement, helped me to coordinate my project especially in writing this report. Some special thanks go to my panel, Encik Khairul Amri bin Tofrowah and Encik Mohd Idain Fahmy bin Rosley, who help me give the idea about the improvements of the project development and suggestions. Finally, many thanks go to the lecturer who teaching about Arduino to me, Encik Herdy Rusnandi whose have invested his full effort in teaching student to understand the Arduino process. I must appreciate the guidance given by other supervisor as well as the panels especially in my project presentation that has improved my presentation skills thanks to their comment and advices.

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| | |
|---|---|
| AC | Alternative Current |
| AT | Automatic Transmission |
| AUTOSAR | Automotive Open System Architecture |
| CMMI | Capability Maturity Model Integration |
| DC | Direct Current |
| ECU | Electronic Control Unit |
| GPS | Global Positioning System |
| IDE | Integrated Development Environment |
| LED | Light-Emitting Diode |
| LCD | Liquid-Crystal Display |
| LIN | Local Interconnect Network |
| LPVs | Low Price Vehicles |
| MT | Manual Transmission |
| P2P | Peer to Peer |
| SPICE | Software Process Improvement and Capability Determination |
| SUVs | Sport Utility Vehicles |
| USB | Universal Serial Bus |
| V2I | Vehicle to Infrastructure |
| V2V | Vehicle to Vehicle |

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# CHAPTER 1

# INTRODUCTION

## 1.0    Introduction

This chapter studied about the background study of the project, the objectives of the study, problem statements that related to this project goals, and also the scope of the study is presented in this chapter.

## 1.1    Background of Study

The ultrasonic proximity detectors system is used to measure the distances to nearby objects via sensors located in the front or rear bumper fascias or visually minimized within adjacent grills or recesses. The sensors emit acoustic pulses, with a control unit measuring the return interval of each reflected signal and calculating object distances. The system in turns warns the driver with acoustic tones, the frequency indicating object distance, with faster tones indicating closer proximity and a continuous tone indicating a minimal pre-defined distance. Systems may also include visual aids, such as light-emitting diode (LED) or liquid-crystal display (LCD) readouts to indicate object distance. A vehicle may include a vehicle pictogram on the car's infotainment screen, with a representation of the nearby objects as colored blocks. Rear sensors may be activated when reverse gear is selected and deactivated as soon as any other gear is selected. Front sensors may be activated manually and deactivated automatically when the vehicle reaches a predetermined speed to avoid subsequent nuisance warnings. The disadvantage of this sensor is it is not applied when the car (automatic car) is in waiting for traffic lamp.

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There are several accidents occur while queuing at the traffic lamp, and most of the minor accident came from driver's careless mistakes which either to press the throttle pedal or the brake pedal. Due to this situation, this project aims to avoid this case of accident by adding the sensor distance system in the car. The purpose of adding this sensor system is to prevent the signal from the throttle body to surge the fuel into the combustion chamber if the driver pressed the throttle pedal when there is an object in front of the car in a certain range. So, when this sensor system detects this movement, it will automatically stop the car from moving but at the same time, the car is remains operating.

## 1.2    Problem Statement

Currently, there are so many factors that contribute to the statistical accident in Malaysia. Some case obviously comes from the driver's negligence, and sometimes, it is not even the driver's fault.  Additionally, there are also many accidents occur during waiting for the traffic lamp. Some drivers failed to recognize between the throttle pedal and the brake pedal because of their careless mistakes or perhaps they are on the phone. To avoid this, the current car safety factor should be improvised so that there exists a system that able to control the throttle body when the driver wrongly presses the throttle body. Hence, this project aims to solve this problem by adding the sensor distance system that can detect any objects that exist in front of the car and avoid the car from moving forward in a certain distance area.

## 1.3    Objective of Study

1.  To study the idea of the sensor system to overcome collision problem during traffic jam situation of automatic car transmission by using a prototype of car toys.

2. To develop a prototype sensor system of car collision warning by using ultrasonic sensor distance and alarm sensor in car toys.

## 1.4    Work Scope of Study

This project focuses on designing a sensor system to notify or to send a car collision warning by using the ultrasonic distance sensor. An Arduino UNO will be the main component in developing this project. The system is tested in car toys and a certain distance area is set to make sure the car toys will stop if they reach the specific gap area. This project development of prototype sensor system of car collision warning are focus on automatic car transmission.

## 1.5    Expected Outcome of Study

A successful prototype is developed ad functioning using car toys with a certain distance sensor and alarm sensor that can prevent the problem of collision.

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# CHAPTER 2

# LITERATURE REVIEW

## 2.0    Introduction

This chapter discussed the history of car creation, safety factor and electronic system of the electronic device, the software also the statistic of road accidents that motivate the development of this study are presented.

## 2.1    History of Car

In discovering the history of the first car to date, there are many changes and improvements that can be discussed. The first car was created in 1885 by Karl Benz which has only three wheels. The creation of the car greatly facilitates people to move from one place to the other. The first car was created with the fastest speed of 16km/h by using a four-stroke engine where the engine had a transmitted system mounted on the rear axle by using a lap of the chain connected to the pulley (Deffree, 2017). The vehicle further incorporated elements that would characterize the modern vehicle, including electrical ignition, differential, mechanical valves, carburetors, oil and grease cups for lubrication, and a braking system. As is often the case, Benz was not the only person working on such a design, but he patented his work first. As such, he patented all the processes that made the internal combustion engine feasible for use in an automobile. In 1879 his first engine patent was granted to him.

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In 1885 Benz was granted a patent for his first automobile. The engine has a 954cc cylinder, and use petrol fuel that can produce 0.75 horsepower. This car can accommodate two adults. The first car image created by Karl Benz is presented in Figure 2.1 below.



Figure 2.1: First Car Developed by Karl Benz 1885

(Source: http://neenatheejc.blogspot.com/2010/10/1885-car-from-gasoline-karl-benz.html)

In 1894, the car created by Karl Benz was renewed from three wheels to four tires. This car engine also upgraded from 0.7 horsepower to 1.5 powers with a speed of 20 km/h (refer to Figure 2.2).

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Figure 2.2: Second Car Developed by Karl Benz 1894

(Source: https://carfromjapan.com/article/industry-knowledge/everything-about-the-

first-car-in-the-world/)

In 1895, Karl Benz improves the car by putting the roof. This idea was ingenious because of the drop in sales of his automobiles were initially slow. It was quite soon after the invention of the automobile which makes Karl Benz started looking for further uses for the new technology (refer Figure 2.3). In order to make the concept of a motorized vehicle access to a wider public, Benz invented the bus. The world's first motorized bus went into service on 18 Marches 1895.

Figure 2.3: Third Car Developed by Karl Benz 1895

(Source: https://www.pinterest.com/pin/481885228856054794/?lp=true)

From time to time the enhancement of the car makes it even more perfect and it becomes a phenomenon for the car production industry to compete with each other in order to produce cars with safety aspects of including the drivers and passengers assurance. Due to this many security systems are installed in the car to make it safer to use nowadays.

In study, he says cars were and still is such a vital component in today's world (Nyamwange, 2014). In modern times, cars do much more than transport people from one place to the next but can represent one's wealth, profession, and in some cases even personality. The mission of this research is to piece together the original car from its inventive state and link various advancements that such cars experience and the effect socially and economically these advancements had.

### 2.1.1 Car Transmission System

Recently, there are two type of transmission system in the car that had been developed and implemented all over the world according to the study the power transmission system is a critical component of any machine. The main function of a transmission system is to transfer the required torque and power generated by the engine to the wheels as and when required by the driver (Patankar et al., 2016). Accordingly, the detailed analysis of this system is essential for both design purposes and the detailed assessment of machine performance. Due to a large number of possible power transmission system components and the nature of these systems, general power transmission system analysis methods have been difficult to develop. However, such analysis methods could meet a wide variety of needs for system design. This paper discusses the general power transmission system analysis approach developed by the authors over the last several years based on their study of vehicle powertrains. The formulation and solution of the governing equations are discussed, and the ability of the approach in addressing critical design related issues is demonstrated through an example system simulation (Freeman and Velinsky, 1995).

### 2.1.2 Information of Manual Car

A Manual Transmission (MT), otherwise called a manual gearbox, stick move, n-speed manual where n is its number of forwarding rigging proportions, standard, MT a stick for vehicles with hand-lever shifters, is a kind of transmission utilized as a part of engine vehicle applications. It utilizes a driver-worked grip drew in and separated by a foot pedal car, for directing torque exchange from the motor to the transmission and a rigging selector worked by hand car.

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