



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF AUTOMATIC HAZARD LIGHT  
SIGNAL SYSTEM IN VEHICLE**

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

by

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**BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

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## ABSTRAK

Kemalangan jalan raya adalah salah satu punca utama kematian di Malaysia. Statistik menunjukkan bahawa kemalangan meningkat tahun ke tahun di Malaysia. Kegagalan mekanikal, kecuaiannya pemandu, keadaan cuaca dan jalan raya adalah beberapa faktor yang mempengaruhi dan menyumbang kepada peningkatan kemalangan. Jenis kemalangan yang paling biasa adalah pelanggaran dari belakang. Keadaan menjadi lebih teruk jika pemandu tidak dapat menghidupkan lampu kecemasan atau memberi amaran kepada pemandu lain mengenai kemalangan yang telah baru berlaku disebabkan kerosakan teruk atau mangsa pengsan. Dalam projek ini, lampu bahaya kecemasan automatik kenderaan telah direkacipta untuk membantu mangsa kemalangan dengan memberi amaran awal kepada pengguna jalan raya yang lain sejurus sahaja kemalangan berlaku. Sistem ini menggunakan mikropengawal sebagai komponen utama yang mengawal sistem secara automatik. Manakala sensor pecutan (accelerometer) sebagai peranti yang mengesan pergerakan abnormal pada kenderaan. Sensor yang telah diletakkan pada badan kenderaan dan akan menghantar isyarat kepada mikrokontroler untuk mengaktifkan sistem apabila kemalangan berlaku. Ujian fungsi dan kejelasan juga telah dijalankan untuk mengenal pasti keberkesanan sistem ini. Analisis juga dilakukan pada sistem ini dan mampu mengurangkan risiko kemalangan yang disebabkan oleh kemalangan kecil yang berlaku.

## **ABSTRACT**

Road accidents are one of the leading causes of death in Malaysia. Statistics show that accidents increase year-over-year in Malaysia. Mechanical failures, driver negligence, weather and road conditions are some of the factors that affect and contribute to increased accidents. The most common type of accident is the rear crash. The situation becomes worse if the driver is unable to turn on emergency lights or warn other drivers about the accident. This can cause other road users involved in accidents. In this project, the automatic hazard lights signal system in vehicle has been created to help victims of the accident giving early warning to other road users after the accident. This system uses a microcontroller as the main component that controls system functions automatically. Sensor accelerometer as a device that detects impact and abnormal movement on the vehicle. The sensor on the bumper vehicle will send the signal to the microcontroller to activate the system immediately during accident occurs. Impact and clarity tests have been conducted to identify the effectiveness of this system. Based analysis has been done, the system is able to reduce the risk of accidents caused by the overlapping of other accidents.

## **DEDICATION**

To my beloved parents



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## LIST OF SYMBOLS

<b>I</b>	-	Current
<b>V</b>	-	Voltage
<b>R</b>	-	Resistance
<b>mA</b>	-	Milliampere
<b>l</b>	-	Length
<b>m</b>	-	Mass
<b>t</b>	-	Time
<b>Hz</b>	-	Hertz
<b>V<sub>cc</sub></b>	-	Voltage common collector
<b>V</b>	-	Velocity
<b>g</b>	-	Gravity (9.81 m/s)
<b>x</b>	-	Angle

## LIST OF ABBREVIATIONS

<b>FWC</b>	Front Clash Warning
<b>RTA</b>	Road Traffic Accident
<b>RTI</b>	Road Traffic Injuries
<b>DC</b>	Direct Current
<b>AC</b>	Alternate Current
<b>GND</b>	Ground
<b>LED</b>	Light-Emitting Diode
<b>IDE</b>	Integrated Development Environment
<b>PCB</b>	Professional Printed Circuit
<b>IO</b>	Input and Output
<b>RC</b>	Radio-controlled
<b>USB</b>	Universal Serial Bus

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Road accidents are undesirable events that lead to injury or death. It is arguable that every day there will be a road accident occurred either serious or not. In terms of logic, each accident will cause loss of accidents or other road users. It is becoming increasingly common for individuals to be involved in a road accident, whether as a driver, passenger or pedestrian. Highway traffic is very dense used as a reason why the freedom of movement of the driver is decreasing. Based on the data, as many as 5.1 million deaths due to road accidents in 1990 and this number is predicted to rise to 8.4 million by 2020 (World Health Organization, 2007). Although some new rules have been set up, accidents still occur, especially involving heavy vehicles such as trucks and trailers. The stopping distance is one of the factors of accidents. This is based on the behavior of the less-responsible driver, exceeding the specified load limit and exceeding the driving speed limit.

Road transport is a system that works to help and improve the effectiveness of movement from one place to another (Assum,2010). There are many approaches to improving the safety of roads, including road safety precautions, reactive accident reduction action, road maintenance and building new roads (Mustafa, 2010). Emergency braking systems and forward-looking warnings have been developed as a new system that can help reduce the number of road accidents. The most noteworthy example is the advanced (advanced) system of emergency (forward) brake system with front clash

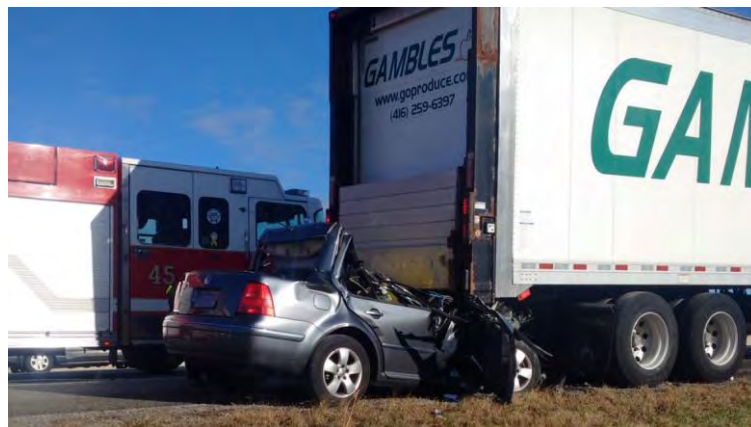
warning function (FCW) (Takeda et al., 2018). This system is very effective in helping to reduce rear end crashes. However, this system usually does not work after the accident occurs.

In practice, emergency vehicle lighting is used for road enforcement vehicles, health and fire, road and building maintenance vehicles and settings for road or building upgrades. There are two main functions for the use of emergency vehicle. First, is used to facilitate road users identifying special vehicles such as police, firefighters and ambulances. Second, using appropriate shapes and colors to inform other road users about the distance, direction and speed of the vehicle. It aims to enable them to take appropriate actions and identify situations around (Tunncliff, 2005).

The hazard light signal system is designed to provide a better opportunity that allows users to detect and quick respond to the presence of emergency response vehicles on public roads. If the vehicle ahead is in an emergency, appropriate response is necessary to slow down and prepared to stop the vehicle (Deepa, 2016). This applies either moving or static vehicles, blocking traffic or parking near traffic lanes. Now light designed should be able to provide an additional information other than attention concerns such as the use of light and light positions (Gibbons *et al.*, 2008).

## 1.2 Problem Statement

Road accidents can occur in various ways. Based on the study, Malaysia has one of the highest mortality rates in the world due to road accident (Akmal, 2016). The usual type of collision is head and rear-ends accident. Rear-end collision includes by driver inattention or distraction, panic stop and a sudden deceleration. Figure 1.1 shows the rear end collision of the heavy vehicle. Most accidents occurred when the driver cannot see the vehicle stop or damaged especially at night or heavy rain. Rain and wet roads are hazardous to driving (Hazard, 1988). This accident is getting worse as drivers cannot get out of the car to warn other drivers. In addition, for some driver's situations it is unable to push the emergency hazard light button due to injuries and collapse. The next car does not pay attention or realize that has car in front involve on crash accident.



**Figure 1-1: Rear end collision of the heavy vehicle (CBC News, 2015)**

Most accident occurred when the driver cannot see vehicle in front of them stop especially after accident due to there is no alert signal or lighting system to warn others. This could be danger to other road user particularly at night and heavy rain. Another situation is when the accident occurs at night and heavy rain. Figure 1.2 shows rear-end accident at night. This is very dangerous to other road users if no warning is shown or given just after collision occurs. Therefore, the new development safety system of automatic hazard light signal system in vehicle is required to enhance current technology and safety. This system can be significantly contributing to managing, improving and minimizing the rates of the road accident. This system allows other road users especially the rear car driver to correctly judge whether the vehicle is in front of a moving, slow or in urgent situation. To take corresponding measures in time to effectively reduce the probability of the car crash.



**Figure 1-2: Rear-end accident at night (jalopnik.com, 2013)**