UNIVERSITI TEKNIKAL MALAYSIA MELAKA

WARNING ALERT SYSTEM FOR MOTORCYCLIST RELATED TO REAR END CRASHES

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

by

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TAJUK: **WARNING ALERT SYSTEM FOR MOTORCYCLIST RELATED TO REAR END CRASHES**

SESI PENGAJIAN: **2019/2020 SEMESTER 2**

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I hereby, declared this report entitled “Warning Alert System for Motorcyclist Related to Rear End rashes” is the results of my own research except as cited in references.

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Date : 20 January 2021

APPROVAL

This report submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirement for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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(Norlezah Binti Hashim)

ABSTRAKS

Malaysia adalah negara yang mempunyai masalah kadar kemalangan dan kematian tertinggi di Asia. Mengikut statistik kemalangan yang direkod oleh PDRM, bilangan kemalangan jalan raya berada di kedudukan yang tertinggi dimana lebih daripada setengah juta kemalangan jalan raya yang direkodkan pada 2018. Bilangan pengguna jalan raya yang menggunakan motorsikal lebih tinggi berbanding pengguna kereta. Kemalangan berlaku dan membabitkan pengguna motorsikal dengan kenderaan yang dalam keadaan perlahan atau statik. Matlamat projek ini adalah untuk membina sistem alat pengesan jarak jauh antara motorsikal dan kenderaan yang lain dan menghantar data tersebut kepada pengguna motorsikal sebagai amaran. Sistem ini menggunakan ultrasonic sensor, Arduino, LCD beserta lampu LED untuk memberi amaran kepada pengguna motorsikal. Projek ini telah dibangunkan dan dipercayai membantu kepada pengguna motorsikal untuk lebih berhati - hati dan peka di atas jalan raya.

ABSTRACT

Malaysia is the one of country where road accidents are the highest rate in Asia. According to the PDRM crash statistics, the data of road accidents in our country is on the upward graph, include more than half of million road accidents cases recorded in 2018. Motorcyclist is the one of the active group road users in Malaysia. Road accidents happened and it is involving by motorcycles and slow moving or stationary vehicles. Create warning alert system to detect the distance between motorcycles and other vehicles and send the warning alert to motorcyclists is the main focus in this project. This system includes ultrasonic sensor, Arduino, LCD and LED to give warning alert to motorcyclists. This project is created and help motorcyclist for cautious and focus on the road. The objective of this project is to create a compact with a low-cost warning alert system for motorcyclist to avoid road accidents, create a system that could send warning messages with location to selected contact if an accident occurred and analyze the system designed in term of its functionality. The project result show that if the motorcyclist had accident, the warning messages will be send to selected contact. The results of this project are monitored using the Arduino IDE serial monitor and plotter.

DEDICATION

This research is wholeheartedly dedicated to my beloved mother, Mrs. Bizarjan Binti Kalunder Shah who are strongly support, pray, and never leave me behind like the rest.

An appreciation for my supervisor, Puan Norlezah Binti Hashim for guiding to complete this project.

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Thankful to Allah S.W.T because here I am completing this project with His blessing. Thank you to Puan Norlezah Binti Hashim for fully cooperation in to create this project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

ASEAN	-	Association of Southeast Asian Nations
LCD	-	Liquid Crystal Display
LED	-	Light-Emitting Diode
USB	-	Universal Serial Bus
MNL	-	Multinomial Logit
HEV	-	Heteroscedastic Extreme Value
BVP	-	Bivariate Probit
PC	-	Passenger Car
LTV	-	Light Truck Vehicle
LnADTMC	-	Average Daily Traffic of Motorcycles
LnADT	-	Average Daily Traffic
PDO	-	Property Damage Only
MNL	-	Multinomial Logit

CHAPTER 1

INTRODUCTION

1.0 Introduction

Chapter 1 explains the project introduction in full detail. The background of project, problem statement, objective and scope of project will then be covered by this first chapter.

1.1 Project Background

There are a lot of road accident cases that involving motorcycles, cars, and public transport. Malaysia is the one of ASEAN countries that has the highest rate of deaths from roads, with over 50% including motorcyclists. Figure 1.1 reveals that most road accidents include motorcyclists, accounting for more than 50 percent of the overall number of fatalities. On 2009, the number of motorcycle deaths reached 4070. Figure 1.1 below shows the data of fatality distribution. (Abdul Manan and Várhelyi, 2012). Road accident happens due to slow moving or stationary vehicle. Usually happens when the other vehicles are not giving a signal and sometimes a rider is not focus on the road and this can causes severe injuries and fatality. To prevent and reduce the problem, this system has been made to detect the distance between other vehicles.

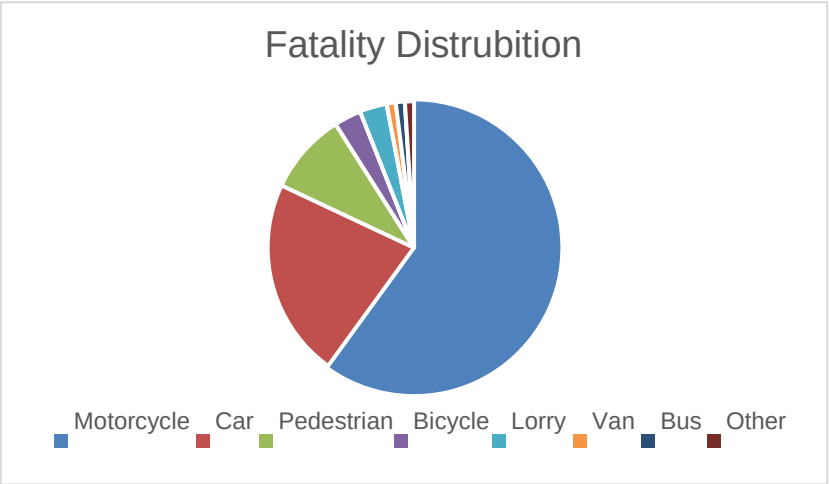

Figure 1.1: Fatality distribution by variety of transport (Abdul Manan and Várhelyi, 2012).

1.2 Problem Statement

An accident usually happens when a motorcyclist is not focus during riding a motorcycle that can cause into accidents by involving other vehicle(s) but it also can happen because of slow moving or stationary vehicle that can make rider confuse the position or movement of other vehicle. Nowadays, warning alert system that can be found are too costly and not convenient. This can bring a difficulty to rider to apply the warning alert system on motorcycle. At the same time, the system of other warning alert system is not requiring safety terms to rider. This kind of situation can be handled and preventable with certain appropriate measures and procedures.

1.3 Objective

Below shows the objective of the project:

- To create a compact with a low-cost warning alert system for motorcyclist to avoid road accidents and could send warning messages with location to selected contact if an accident occurred
- To analyze the system designed in term of its functionality

1.4 Scope of Research

This is the section where boundary or limitation in developing a system is explained. It is important because to obtain the output in experimental test of the prototype, boundary must be made to justify the output of the experiment on a certain level. The project scope below is as follows:

a. The distance will be determined by Ultrasonic Sensor JSN-SR04T.
b. GSM Module SIM800L are used to send the warning messages with location occured that built with the Arduino Uno Rev3.
c. Crash sensor designed to detect the collision and transfer the data to signals within in milliseconds.

On the first scope, the detection of the distance must be at least 2.5m and below to alert the motorcyclist. In addition, the equipment must can alert motorcyclist quickly once the distance detection of data need sends through the output.

For the second scope, warning messages with location that occurred are the most important if any kind of accident happened to motorcyclist. This can take least time for selected

contact to know that the motorcyclist had an accident.

Other than that, the portability and the lightness of the prototype would be the one of the aspects that need to be research more. This is because the prototype will be applying on motorcycle so that motorcyclist can use it without any burden on it.

1.5 Expected Result

It is expected to detect distance between motorcyclist and other vehicles to avoid road accidents and to send warning messages to selected contact. Detection of distance between motorcyclist and other vehicles will be monitored by applying the project to motorcyclist and it will be determined by using Ultrasonic sensor (JSN-SR04T). Sending a warning messages if an accident occurred will be monitored by using Crash Sensor and GSM Module (SIM800L).

1.6 Thesis Organization

The introduction of the problem, objective, and scope to provide project overview are explained in Chapter 1. Described in chapter 2, literature on current approaches and various techniques used in the previous research on distance detection between motorcyclists and other vehicles. Promptly, the definition of the components will be explained in Chapter 3 in keeping with the experimental planning necessary prior to the project implementation and briefly explain the project's description of how it works. Chapter 4 summarizes the results of the research studies, which will be systematically analysed and compared with the graphs and tables followed by discussions. Finally, Chapter 5 will conclude and sum up all the information and observations

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

The recent article that has already been conducted by previous researchers on the work are going to be discuss in this chapter. Chapter 2 are going to clarify and summarize article project on road accidents involving motorcyclists. This chapter will also identify the Arduino Uno and the Ultrasonic sensor.

2.1 Previous Related Research

Numerous researchers were used to identify road accidents involving motorcyclists. Earlier research may be submitted by different authors and by a wide range of sources, such as articles, journals, books, websites, and newspapers.

According to the paper studied, road accidents and deaths are increasing with more than 6000 deaths and bigger than 25000 injuries reported during the past 5 years. Road fatality for the past 7 years have stated rises of 4% per year, up to 6745 in 2009. Since 1996, Malaysia has the biggest rate of fatality in the world that is death per 100000 populations. The aim project was to model warning alert system that can preventing crashes and reducing severity. Another aim was decreasing warning rates, because the potential nuisance of this sort of system could scale back its long-term effectiveness. (Abdul Manan and Várhelyi, 2012)

This research estimated random logit model parameters with heterogeneity of mean and variance to classify major factors contributing to the severity of motorcycle injuries. The unavailability of some key variables in our data set that may theoretically influence the

outcome of the injury to the motorcyclist that result in unobserved variability that may influence the effect of the variables observed on the severity of the injury and could lead to a twofold increase in the seriousness of the injury. (Waseem, Ahmed and Saeed, 2019)

The total driving metrics for each driver were calculated for each week. One-sample t-tests were used to assess if the presumption that the sample metrics varied significantly from zero could be dismissed. The finding of no change in the way forward was also made for men and women. In addition, no changes in the speed of the driver were found over time while driving with the FCW program, while evaluated as a whole, by term or by gender. Below shows the data of overall headway. (Fisher *et al.*, 2016)

Table 2.1: Overall Headway (Fisher *et al.*, 2016)

	DRIVERS	**LONG-TERM**	**MEDIUM-TERM**	**SHORT-TERM**
Mean Slope	0.001	0.001	0.000	0.002
sd	0.021	0.005	0.007	0.036
n	38	11	14	13
t Stat	0.355	0.783	0.113	0.239
p	0.725	0.452	0.912	0.815

Any of these accidents happened due to ambient situations like sunshine, smoke or fog, that can disturb the ability of the rider that sense any slow motion or halt traffic. This paper proposed by examination of all rear-end two-vehicle collisions, full details for all variables listed, driver interference and vision obstruction fields. The various types of accidents have patterned by using the MNL, HEV and BVP approaches. For one of the four setups, each driver (given that he or she has been involved in a rear-end collision) is likely to be involved in a PC PC, PC LTV, LTV PC, or LTV LTV rear-end collision situation. (Abdel-Aty and Abdelwahab, 2003)

During the 8-year study period (2001–2008), a total of 7,325 motorcycle accidents were recorded. In 2008, Iowa reported 1108 motorcycle crashes compared with 782 in 2001, representing an increase of 42 percent. Note that registrations for motorcycles rose from 120,961 to 162,662 between 2001 and 2008 (34%). The analysis presented herein is focused on two-vehicle crashes, which account for half of the total of crashes reported during the study period. The first motorcycle collisions are with a non-motorcycle vehicle. Contingency tables were created to assess the connection between crash methods, helmet use and light conditions as well as between possible factors related to complicity and crash severity outcomes in two vehicles crashes, and chi-squared test statistics were calculated. Contingency tables are also used to monitor and evaluate the relation between two or more types of factors, such as light (daylight or dark) and accident (two traffic crashes). Contingency tables show the variable distribution in a matrix format. This paper also calculates a multinomial logit (MNL) for possible variables linked to five motorcycle accident gravitational outcomes: catastrophic, major, minor, probable / unknown and property damage only (PDO). (Saad, Corresponding and Hans, 2011)

According to this research, for safety driving lateral collision avoidance is critical as there are blind areas on either side of the vehicle while driving. In order to enhance visibility and avoid this blind zone, a growing number of motorcycles, bicycles and pedestrians are important to drive in urban areas at low speeds. For large cars, such as buses or trucks, blind regions are comparatively larger where lateral collision sometimes contribute to serious injuries in transport. The ultrasonic sensor is installed on a vehicle to check the performance of the developed side-of-the-way safety warning system. (Song, Chen and Huang, 2004)

Several alternatives of alert mode (visual, auditory, haptical) have been selected, and four different motorcycles for on-road assessment have been selected based on this. During

research, it was determined that it was difficult to detect alerts under direct sunlight, even

when looking directly at the mirror-mounted bars, although their brightness was found to be comparable to some OEM mirror blind spot indicators. Alternatively, use three type of warning mode which are two 3-LED light strips were mounted inside a motorcycle helmet on the viewfinder as a wearable warning display, the audio warning monitor was a Sena SMH10 Bluetooth headset that can be conveniently mounted on any full face or 3/4 helmet with two speakers close to the ears and a volume dial and a haptic alert built into the wristband that was worn under the riders' gloves and jacket sleeves. (Song, McLaughlin and Doerzaph, 2017)