EFFECT OF ONCOMING VEHICLE SIZE ON OVERTAKING JUDGEMENTS FROM MOTORCYCLIST PERSPECTIVE

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DECLARATION

I declare that this choose an item entitled “Analysis of Motorcycle and Prevent of Obstacle” is the result of my own research except as cited in the references. The choose an item has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature	:	ARIF AFIQ
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Date	:	26.1.2022

APPROVAL

I hereby declare that I have checked this thesis, and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : .....

Supervisor Name : Nur Hazwani Binti Mokhtar

Date : 27/01/2022

DEDICATION

This project report is dedicated with humbleness to my parents, Mr Ibrahim Bin Mat Nayan and Mdm. Rahayu@Juliana Binti Abd. Rahaman for giving their never-ending support and always be my side to motivate me during my tougher times. Moreover, I would like to include my siblings in the success of this project. Their unlimited support and love show me that I should never give up easily and should be trying harder in everything I do. Besides, I would like to take this opportunity to dedicate this project report to my classmates because of their teamwork for willingness to share information related to this project. I am not going to forget my supervisor, Mdm. Nur Hazwani Binti Mokhtar, who plays a vital role in the completion of this project. I appreciate sharing this success with her as she always supervises me constantly in using the simulation software from the beginning; even the simulation software is quite new for me. I always appreciate his generosity in guiding me when I am stuck using the software.

ABSTRACT

Motorcycle crashes and deaths remain a major public health hazard, as mortality rates significantly rose over other forms of vehicles. Due to the absence of good traffic volume data and a relatively tiny part of all traffic crashes, analysis of cause elements for motorcycle crashes is sometimes challenging. In view of these restrictions, on-scene incidents constitute an appropriate location for investigating motorcycle crashes triggering variables. In the high-end car market, crash warning systems have been used for some time and are being transported each year into further segments of the vehicle industry. However, the motorcycle industry does not have a crash warning system. Motorcycle riders have not been experimentally investigated in response to unexpected collision situations. This study explores alternative interface designs for crash warning systems for motorcycles and assesses their rider acceptance and efficiency in a connected vehicle context through the active development of next-generation crash Warning Systems based on the linked vehicles.

ABSTRAK

Kemalangan dan kematian penunggang motosikal menjadi punca bahaya yang besar, kerana kadar kematian meningkat dengan ketara berbanding kenderaan lain. Kerana ketiadaan data jumlah lalu lintas yang baik dan sebahagian kecil dari semua kemalangan jalan raya, analisis elemen penyebab kemalangan motosikal semakin mencabar. Insiden di tempat kejadian merupakan lokasi yang sesuai untuk menyiasat kemalangan motosikal yang mencetuskan pemboleh ubah. Di pasaran kereta mewah, sistem peringatan kemalangan telah digunakan untuk beberapa waktu dan di kemas kini setiap tahun ke segmen industri kenderaan yang lebih jauh. Namun, industri motosikal tidak mempunyai sistem amaran kemalangan. Penunggang motosikal tidak dikaji secara eksperimen sebagai tindak balas terhadap situasi perlanggaran yang tidak dijangka. Kajian ini meneroka sistem reka bentuk antara muka alternatif untuk sistem amaran kemalangan untuk motosikal dan menilai penerimaan dan kecekapan penunggangnya dalam konteks kenderaan yang disambungkan melalui pengembangan aktif Sistem Peringatan kemalangan generasi akan datang berdasarkan kenderaan yang dihubungkan.

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LIST OF SYMBOLS AND ABBREVIATIONS

CMBS	-	Collision Mitigation Brake System
LKAS	-	Lane Keeping Assist
ACC	-	Adaptive Cruise Control
RTA	-	Road Traffic Accidents
WHO	-	World Health Organisation
MPV	-	Multi-Purpose Vehicle
4WD	-	4 Wheel Drive
SBP	-	Systolic Blood Pressure
RR	-	Respiratory Rate
HR	-	Heart Rate
GCS	-	Glasgow Coma Scale
MCCS	-	Motorcycle Crash Causation Study
MUARC	-	Monash University Accident Research Center
CPU	-	Central Processing Unit
CAN	-	Controller Area Network
GNSS	-	Global Navigation Satellite System
MBD	-	Multi-Body Dynamic
CWS	-	Crash Warning System
IMA	-	Intersection Movement Assist
FCW	-	Front Collision Warning
LCW	-	Lane Change Warning
ANOVA	-	Analysis Of Variance
TTC	-	Time To Contact
DRF	-	Driver's Risk Field
GPS	-	Global Positioning System
HSD	-	Honest Significance Test
CWI	-	Crash Warning Interface

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CHAPTER 1

INTRODUCTION

1.1 Background

A recent phenomenon in the world is the development of technologies to maintain overall road safety. Vehicle to vehicle, vehicle to a person, vehicle to road connectivity is built into these systems to help reduce the number of traffic accidents. To keep traffic accidents from occurring, technologies that assist in keeping a vehicle in its lane or controlling the vehicle's speed, such as Collision Mitigation Brake System (CMB), Lane Keeping Assist System (LKAS), and Adaptive Cruise Control (ACC) system, are being used on the market. Although the development of accident prevention systems for motorbikes with high traffic accident and fatality rates is dormant, the initiative to research the feasibility of accident prevention systems for motorbikes in locations with high traffic accident and fatality rates has been commenced. To enhance motorcycle road traffic safety, it is necessary to recognize the causes and take appropriate measures to help reduce the hazard. Human variables, notably driving behavior, have long been proved to account for most traffic crashes.

Few studies have been completed to quantify the extent to which riders' previous actions contributed to the severity of the incident. Ignoring or being unaware of a rider's or other vehicle's illegal activity in the course of crash injury severity analysis may lead to inaccurate estimations, erroneous decisions, and suboptimal countermeasures.

Many sources of road deterioration exist, including rainy weather, oil spills on the road, car accidents, and damage from regular use and vehicle wear and tear. In 2017, 3597 people were killed, and 803 people were injured due to pothole-related incidents. There is currently no mechanism in place to alert concerned authorities and citizens about potholes or deteriorating road conditions, particularly over the internet. Traffic has been backed up on the roads due to the heavy vehicles. This is the major reason for building a vehicle system that helps drivers in numerous domains, for example, make their driving experience more enjoyable.

1.2 Problem Statement

The dramatic growth in motorcycle crashes requires MCAS to improve road safety for MBRs. Collisions with other vehicles constitute the greatest hazard to the rider, and emergency braking is the most frequently employed evasive maneuver. However, many riders are not sufficiently quick to act because of impairments in perception, cognition, and control that result from failures in these systems.

Nowadays, avoidance from front collision and accidents is one of the problems that motorcycle riders are facing now. Based on the statistical data and research, many riders cannot make a good decision and cannot deal with it while facing dangerous situation on the road that ends up with a fatal accident. A good system of accident avoidance or rider assist system is needed by motorcycle riders nowadays to help or assist them in avoiding a road accident. Vehicle traffic increased, resulting in damage to roadways and inadequate road upkeep. If you don't see the potholes and broken roads, you're more likely to be injured when driving. These issues are currently more important because of the recent increase in accidents and deaths.

1.3 Research Objective

The aim and the main objective of this research is to propose reasonably accurate, methodical, and effective methods of motorcycle accident avoidance. Specifically, the objectives are as follows:

a) To develop a set of motorcycle crash avoidance test procedure and establishing the relevant objective response criteria to measure crash avoidance capacity.

b) To simulate an accident scenario for the evaluation of motorcycle accident avoidance capabilities using an obstacle detection sensor from an Arduino device.

1.4 Scope of Research

The scope of this research are as follows:

a) Start with the benchmarking test of motorcycle accident avoidance.

b) Benchmarking test undergoes analysis using Arduino device.

c) To interpret the results from Arduino device testing.

1.5 Thesis Outline

Based on the thesis for Projek Sarjana Muda (PSM) I, an organization has been developed for the complete process of the degree course at UTeM. This chart depicts the organizational structure:

I. Chapter 1 presents the project, which includes details such as the objective, scope, and background. The background of motorcycle accident avoidance is described in this chapter.

II. Chapter 2 begins with the literature review by introducing the theories applied in this research. I am analyzing all the research, books, and websites on the project which had been connected to motorcycle accident avoidance.

III. Chapter 3 presents the methodology of this report which has the information of procedure on the project conducted.

IV. Chapter 4 present the outcome and discussion. This chapter will present the case study data that was collected based on a stage-by-stage analysis to show the excellent result. The collected data will be examined.

V. Chapter 5 is the project's conclusion which includes a summary of the report, and this chapter's purpose is to explain the project's goals, scope and to give recommendations for future work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The purpose of writing this literature review is to get the full knowledge and understanding about the topic, whether it is a methodological or theoretical approach. In order to get a full understanding of this project, research and studies have been done through the internet, journals, and article. Information and any details that useful for this project have been collected as a guide in making this project successful. Besides, analysis of motorcycle accident issues has been done to support the problem statement.

2.2 Motorcycle Road Accident Analysis

2.2.1 Clinical Characteristics of 1653 Injured Motorcyclists and Factors That Predict Mortality from Motorcycle Crashes in Malaysia

Malaysia has the highest risk of road fatalities among ASEAN countries (>15 fatalities per 100,000 people), with motorcyclists accounting for half of these fatalities. This has a huge impact on onward admissions and places a huge significant on general surgical services. One thousand six hundred fifty-three patients were treated for traumatic injuries caused by motorcycle accidents, with an average age of 35.17. A total of 142 people died, with an equal number of motorcycle riders (788) and pillion riders (865) being injured. About 1537 men were injured because of the road accident. For most of the ethnic that is Malays and Chinese, road accident recorded cases are 897 and 350.

For the majority of Malaysians, motorcycles are an essential mode of transportation. More than 12 million motorcycles have been registered in Malaysia, accounting for 45.8% of all registered vehicles. With 135 181 deaths in 2016, traumatic injuries suffered by motorcyclists are the leading cause of death in all vehicular accidents. The cost of these deaths is projected to be RM 8.58 billion, a significant financial loss for the Malaysian economy. Malaysia is one of the ASEAN countries with a high case fatality rate of >15 fatalities per 100,000 people, making it a middle-income country.

The physiological parameters on presentation amongst the 1511 survivors (93.4%) and 142 non-survivors (8.6%) were analyzed. Physiological parameters analyzed were age, systolic blood pressure (SBP), respiratory rate (RR), heart rate (HR), core body temperature, and GCS. Independent t-test revealed that older age≥35 years, lower SBP, higher RR, higher HR, lower core body temperature, and lower GCS were significant physiological parameters to predict traumatic motorcycle deaths. (Tan Chor Lip et al., 2019)

Variable	Survivor (n = 1511)	Non-survivors (n = 142)	p value
	mean (SD)	mean (SD)	
Age	37.47 ± 18.67	34.95 ± 15.92	0.001
SBP	126.29 ± 24.12	121.9 ± 36.5	<0.001
RR	20.16 ± 3.52	21.6 ± 4.49	<0.001
HR	92.61 ± 33.88	102.32 ± 31.08	<0.001
Temperature	36.69 ± 0.25	36.86 ± 0.34	0.002
GCS score	13.31 ± 2.96	10.36 ± 4.19	<0.001