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DEVELOPMENT OF SAFETY SENSOR FOR MOTORCYCLE

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DEVELOPMENT OF SAFETY SENSOR FOR MOTORCYCLE

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

by

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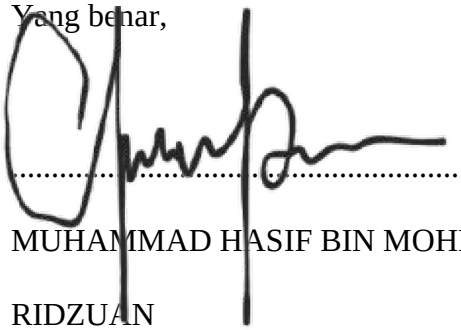

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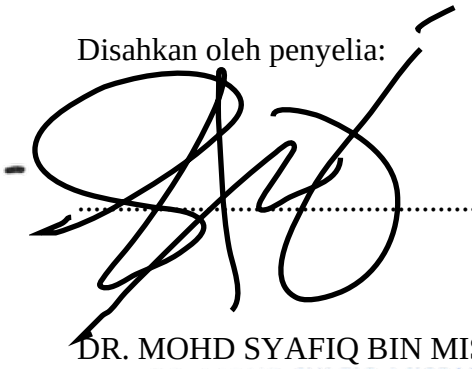

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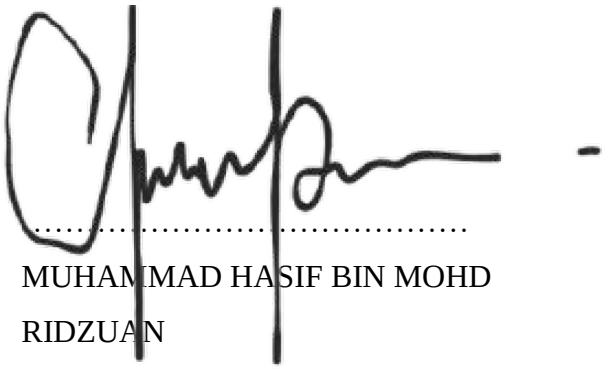

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APPROVAL

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

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ABSTRAK

Pada masa kini, terdapat banyak kes-kes motorsikal yang kemelangan di jalan raya, sebahagian daripada mereka mati di tempat kejadian atas sebab menlanggar halangan-halangan yang terdapat di jalan raya. Oleh kerana peningkatan jumlah penunggang motosikal, banyak penyelesaian telah dicadangkan untuk mengatasi masalah. Oleh itu, cadangan pembangunan yang telah di bangunkan harganya adalah tinggi dan kompleks. Objektif tesis ini adalah untuk mengkaji kaedah pengesanan anti-perlanggaran motosikal pada sistem amaran anti-perlanggaran rendah. Parameter yang akan dianalisis adalah pengukuran sensor ke jarak rintangan. Laporan ini membentangkan satu pendekatan untuk sistem anti-perlanggaran menggunakan peranti Arduino mikropengawal, sensor Ultrasonik, pembesar suara, dan diod pemancar cahaya dalam mendorong untuk menyokong sistem amaran bagi penunggang motosikal.Peranti yang direka ini adalah sebagai sensor keselamatan. Sistem ini terdiri daripada sensor jarak dan mikropengawal yang dipasang pada motosikal, dengan penggunaan sistem ini, halangan yang berdekatan dalam jarak yang tertentu boleh dikesan dan dapat memberi amaran melalui bunyi yang dikeluarkan oleh pembesar suara. Oleh itu, prototaip pengembangan sistem peringatan anti-perlanggaran telah dirancang dan diuji untuk sensor keselamatan kos rendah, ini memungkinkan untuk mencegah halangan statik dan langkah keselamatan dapat diambil oleh mana-mana penunggang motosikal.

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ABSTRACT

Nowadays, there is a high rate of road accidents happens in Malaysia where the highest numbers fall under the cases of motorcycles, some of them died on the spot due to unnoticeable obstacles which involve a rear-end crashes, head-on collision involving of motorcycle and another vehicle. Due to the growing population of the motorcyclist, many solutions have been proposed to overcome this problem. Therefore, does propose development are steeply priced and complex. The objective of this thesis is to study the method of anti-collision detection of a motorcycle at a low-cost anti-collision alert system. The parameter that will be analyzed are the measurement of the sensor to the obstacle distance. This research is presented on the approach of the anti-collision system using Arduino microcontroller, Ultrasonic sensor, buzzer, and led to support the alert system for the motorcyclist. The system interacting to the range distance sensor with microcontroller attached to the motorcycle detect the nearby obstacle within the range set notified the rider with the tone sound, buzzer. Thus, a development prototype of anti-collision alert system has been designed and test for a low-cost safety sensor, this makes it possible to prevent any static obstacle and safety precautions can be taken by any motorcyclist.

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DEDICATION

To my beloved parents, Mr. Hj Mohd Ridzuan bin Hamzah and Madam Hjh Azizah Binti Ab Majid who always motivate me along the period in finishing this project.

To my supervisor Dr. Mohd Syafiq bin Mispan who always guides me in completing this Final Year Project.

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENTS

		PAGE
TABLE OF CONTENTS		**ix**
LIST OF TABLES		**xii**
LIST OF FIGURES		**xiii**
LIST OF APPENDICES		**xv**
LIST OF SYMBOLS		**xvi**
LIST OF ABBREVIATIONS		**xvii**
CHAPTER 1	**INTRODUCTION**	**1**
1.1	Background	1
1.2	Objective	3
1.3	Problem Statement	3
1.4	Scope of Research	4
1.5	Thesis Organization	5

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 2 LITERATURE REVIEW 6

2.1 Vehicle Road Accident 6

2.1.1 Cause of Road Accident 8

2.1.2 Road Accident Statistic in Malaysia 10

2.1.3 Cause of Accident Involving Motorcycles 12

2.1.4 Prevention of Road Accident 15

2.2 Know of Anti-collision Techniques/Algorithm 16

2.3 Hardware Overview 19

2.4 Microcontroller 20

2.4.1 Arduino 21

2.4.2 Arduino UNO 24

2.5 Distance Sensor 27

2.5.1 Ultrasonic Sensor 29

2.6 Buzzer 30

2.7 Conclusion 31

CHAPTER 3 METHODOLOGY 32

3.1 Introduction 32

3.2 Hardware Description 32

3.2.1 Ultrasonic 33

3.2.2 Principles of Ultrasonic Distance Calculation 34

3.2.3 Microcontroller 36

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.2.4 Buzzer 37

3.3 Software Description 38

3.3.1 IDE (Integrated Development Environment) 38

3.4 How the System Works 39

3.4.1 Anti-collision Technique 41

3.5 Gantt Chart 44

3.6 Conclusion 46

CHAPTER 4 RESULT AND DISCUSSION 47

4.1 Introduction 47

4.2 Hardware Overview 47

4.3 Result 49

4.4 Project Analysis 52

4.5 Discussion 62

4.6 Conclusion 63

CHAPTER 5 CONCLUSION AND RECOMMENDATION 64

5.1 Project Conclusion 64

5.2 Limitation of project 65

5.3 Future Project Recommendation 66

REFERENCES 67

APPENDIX 70

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF TABLES

TABLE	TITLE	PAGE
Table 2.1	Road Accident Data by Malaysia Institute of Road Safety Research	12
Table 2.2	Comparison of three types of Arduino board	23
Table 2.3	Types of distance sensors	28
Table 3.1	Gantt Chart	45
Table 4.1	Differences distance between LCD and Serial Monitor	57
Table 4.2	Total cost of the Safety Sensor System	60

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 2.1	Percentage of Fatalities According to Type of Vehicle	11
Figure 2.2	Cause of Accident	13
Figure 2.3	Microcontroller elements. Red lines represent the address bus and blue lines represent the address bus and blue lines represent the data bus.	20
Figure 2.4:	Arduino Uno board	25
Figure 3.1	Transmit and receive the working principle of HC-SR04	33
Figure 3.2	(a) Ultrasonic sensing model, (b) Distance Calculation	34
Figure 3.3	Arduino Uno connection with HC-SR04 sensor	36
Figure 3.4	Buzzer connection to Arduino UNO	37
Figure 3.5	IDE Software Interface	38
Figure 3.6	Flowchart for Development of Anti-collision system	40
Figure 3.7	Block Diagram for Development of Anti-collision system	42
Figure 3.8	Vehicle safety distance and alarm system flow chart	43
Figure 4.1	(a) Finish hardware without prototype vehicle (b) Finished hardware with prototype vehicle	46
Figure 4.2	(a) Far output (b) Mid output (c) Near output	49

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 4.3	(a) Far Event (b) Mid Event (c) Near Event	51
Figure 4.4	Ultrasonic sensor reading	52
Figure 4.5	The change reading from the ultrasonic sensor	53
Figure 4.6	Output line of the rear Ultrasonic sensor	55
Figure 4.7	(a) Movement facing on the road (b) Movement facing on the vehicle.	56
Figure 4.8	Analysis between Ruler and Serial Monitor/LCD	58
Figure 4.9	Chart of differences in distance value LCD and Serial Monitor	58

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Thinker Card Design	70
Appendix B	Schematic Diagram of the Safety Sensor	71
Appendix C	Schematic Diagram of Dummy Vehicle	72
Appendix D	Project Coding	73
Appendix E	Dummy Vehicle Coding	80

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF SYMBOLS

D, d	-	Distance
Ds	-	Safety distance
v	-	Speed of sound
t	-	time
s	-	Second
µ	-	Micro

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LIST OF ABBREVIATIONS

PCA	Principal Component Analysis
ASEAN	Association of Southeast Asian Nations
WHO	World Health Organization
AEC	Advanced Economic Country
RTD	Road Transport Department
MIROS	Malaysian Institute of Road Safety Research
SPAD	Public Transport Commission
MOW	Ministry of Works
PWD	Public Works Department
MHA	Malaysian Highway Authority
MOE	Ministry of Education
MOT	Ministry of Transport
JKJR	Road Safety Department
UN	United Nations
RMSE	Root Mean Square Error

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CHAPTER 1

INTRODUCTION

This chapter is aimed to provide a brief description of the project, its objectives, problem statement, scope of the research, and the organisation of the paper which is useful in helping readers to navigate the whole concept of the paper.

1.1 Background

In recent years, numerous analysts about improvement in the innovation of driving safety have given the endeavours to vehicle anti-collision but not for motorcycles. According to the statistic shown by Global Status Report on Road Safety by MIROS (Malaysian Institute of Road Safety Research) in the past year, Malaysia recorded the fifth-highest accident fatalities involving motorcycles in the world behind Thailand and Cambodia. As well as, by comparing between other road users such as a van, pedestrian, Bicycle, Car, Lorry, Bus and others, Motorcycle has accounted 62.7% and 21 % involved forward collision, hence motorcycle has the most fatalities on the road and its keep on increasing by 1.8% every year. Based on the statistics it is obvious that motorcycles are the highest contributors to road accidents and if this situation is not handled diligently fatalities due to motorcycles accident will be the national leading problem by 2020 and beyond (Predicted by MIROS).

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In the meantime, several systems have been created such as the contemporary model of a motorcycle which is equipped with all sorts of measuring and alert systems to help the rider in security driving caution, that as of now given by enormous company such as Bosch. Today Bosch has already developed a secured system that assists riding on two wheels with a system impressively secured such as Automated Breaking system (ABS) and Motorcycle stability control (MSC). Bosch has also developed other innovations to support the system with a combination of a radar sensor, brake system, engine management, Human Machine Interface (HMI) that react as a tactical radar that will assist motorcycles rider in identifying an exact objects pictures within the surroundings. The systems have proven to be effective safety assistance to the riders.

The purpose of this paper is to propose a new anti-collision sensor for a motorcycle which considers the cost of the system. Its reason is to identify cars within the collision range of a motorcycle so that the rider can incite a decision for the next action he or she ought to take in an emergency circumstance. This is not intended to replace the human brain but to take a step at on option action to be taken to avoid collision or accidents, there is two option of action:

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1) such as used of brake
2) taking action of changing lanes.

It takes one second on average to respond to any stimuli, another second to perform a head check. This anti-collision system will let the rider know if a vehicle is obstructing the lane in front of them, letting them take the appropriate action of braking, changing lanes with a head check, or a combination of the two.

1.2 Objective

The objective of this project:

1) To study the method of anti-collision detection of a motorcycle.
2) To design a low-cost anti-collision alert system for motorcycle.

1.3 Problem Statement

The Malaysian road safety study findings discover the highest rate of road accident are caused by motorcycle and often involves a rear-end crashes involving of motorcycles and other vehicles which account for about 56% of the accident are fatal and lead to deaths. The accidents that occurred were mostly due to the recklessness of the rider that caused the motorcycle to strike the car from the rear-end. The accident that involves a Head-on collision between a car and motorcycle are often fatal to the motorcyclist.

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1.4 Scope of Research.

This section clarifies the scope of work for this project. To realize the project's objective, an Ultrasonic sensor is used to detect potential collisions or to detect distance or range to the obstacles. One of the focus which relates to the range is to detect an object such as a stationary car in the middle of the street or highway. A safe distance will be set to ensure the rider have enough time to react to avoid an accident. Once the ultrasonic sense the level distance that is programmed, the rider will be notified by the buzzer alert system that is programmed. These sensors and buzzer alert systems can be program using Arduino. This project used Arduino UNO as the microcontroller card and act as the medium to link the Ultrasonic sensor and the buzzer alert system. Once the Ultrasonic sensor detects the obstacles surrounding, the Arduino will program the sensor to calculate the distance and give an alert sound from the buzzer as the rider will be alert of the obstacles front-end of the motorcycle.

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The most common motorcycle accident according to the statistic happened when the motorcycle fails to avoid slow-moving or stationary vehicles especially on the highway are on the rise. A motorcyclist crashing on the rear of a slow-moving or stationary vehicle on the emergency lane on highways is a typical scenario. Most of these types of crashes occurred during the daytime. An effective measure is much needed to mitigate this type of crash, considering the high possibility of a fatal outcome for the motorcyclists. Countermeasures to effectively warn the motorcyclists of an imminent collision and to prevent a potential crash should be explored.

1.5 Thesis Organization

The organization of this thesis paper comprises of 5 Chapter:

Chapter 1 is the introduction, which clarifies the project foundation, issue explanation, the goals of the project, the project's scope, and the significance of this project.

Chapter 2 is the literature review covered the literature review and citations around any information that is related to this project from references. In this chapter, the citation analysis of equipment also included.

Chapter 3 is the methodology, covered more detailed clarification of this project. Also, this chapter gives information about process flow in this project.

Chapter 4 is the result expectation, explain about the result of this project accompanied by several analysis.

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Chapter 5 is the conclusion, covered the conclusion based on the overall process that happened in this project from the beginning until the conclusion followed by a future suggestion of this project.