

**DESIGN AND DEVELOPMENT OF WIRELESS BRAKING SYSTEM FOR
MOTORCYCLE HELMET.**

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**A report submitted
in fulfilment of the requirements for the degree of
Bachelor of Mechanical Engineering (Automotive)**

Faculty of Mechanical Engineering

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DECLARATION

I declare that this project report entitled “Design and Development of Wireless Braking System for Motorcycle Helmet.” is the result of my own work excepts as cited in the references.

Signature :

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Date :

APPROVAL

I hereby declare that I have read this project report and in my opinion this report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering (Automotive).

Signature :

Supervisor's Name : MOHD ZAKARIA B. MOHAMMAD NASIR

Date :

DEDICATION

To my beloved mother and father

ABSTRACT

Road accident is one major factor death causes in Malaysia. There are many factors that cause the accident such as driver attitude, weather, and road condition. One of the most victims in the fatal accident happen mostly involves the motorcyclist. Critical situation accident could happen at night or dark condition due to low sight, where the motorcyclists are difficult to see their absent on the road. These situations are very dangerous to the road user especially to the motorcycle and bicycle at night condition. In this project, adding the LED light blinking system to the helmet to make sure motorcyclist will easy to spot by another road consumer. This system used the Arduino microcontroller to used wireless connection and control the LED blinking. The LED light will be located on the back of the helmet that is parallel to the sighting of the driver eyes from behind. Based on analysis, this Smart Safety Helmet can improve the visibility of the other vehicle to rider when using this helmet when low light and bad weather conditions. Construction prototype of the Smart Security Helmets and wireless systems functioning and tested.

ABSTRAK

Kemalangan jalan raya adalah salah satu punca utama penyumbang kadar kematian di Malaysia. Terdapat banyak factor yang menyebabkan kemalangan seperti sikap pemandu, cuaca and keadaan jalan raya. Jumlah mangsa yang maut apabila berlakunya kemalangan kebiasaannya melibatkan penunggang motosikal. Tambahan lagi, faktor waktu kemalangan biasanya berlaku pada waktu malam atau keadaan gelap apabila jarak penglihatan menjadi rendah menyebabkan motosikal sukar untuk dilihat di jalan raya. Situasi ini amat bahaya kepada pengguna jalan raya terutama sekali kepada motor dan basikal. Dalam projek ini, menambah sistem lampu brek berkelip LED pada helmet adalah untuk memastikan penunggang motosikal akan lebih senang untuk diperhatikan oleh pengguna jalan raya yang lain. Sistem yang menggunakan pengawal mikro Arduino adalah untuk menghubungkan brek menggunakan hubungan tanpa wayar dan mengawal kelipan LED. Lampu LED akan dipasang pada belakang topi keledar yang kedudukannya adalah sejajar dengan mata pemandu daripada belakang. Berdasarkan analisis, Topi Keledar Keselamatan Bijak ini boleh mempertingkatkan kepekaan pemandu lain terhadap motorsikal apabila waktu gelap dan cuaca yang buruk. Pembinaan prototype Topi Keledar Keselamatan Bijak dan sistem tanpa wayar yang berfungsi dan diuji.

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LIST OF ABBREVIATIONS

WHO	World Health Organisation
PDRM	Polis DiRaja Malaysia
IC	Integrated Circuit
USB	Universal Serial Bus
LED	Light Emitting Diode
Wi-Fi	Wireless Fidelity
RFID	Radio Frequency Identification
PNP	Positive-Negative-Positive
NPN	Negative-Positive-Negative
PVC	Poly Vinyl Chloride
MOSFET	Metal-Oxide-Semiconductor Field-Effect Transistor
WPAN	Wireless Personal Area Network
UWB	Ultra-Wide Band
FFD	Full Function Device
POS	Personal Operating Space
RFD	Reduce Function Device
AP	Access Point
DC	Direct Current
AC	Alternating Current
VCC	Verified Concurrent
MOSI	Master Output Slave Input

MISO

Master Input Slave Output

GND

Ground

LIST OF SYMBOLS

V	=	Voltage
I	=	Current
R	=	Resistance
P	=	Power
Ω	=	Ohm
F	=	Farad
m	=	metre
A	=	Amplitude
C	=	Capacitance
d	=	Distance
l	=	Length
W	=	Watt
Hz	=	Hertz
V _{in}	=	Input Voltage
V _{out}	=	Output Voltage

CHAPTER 1

INTRODUCTION

1.1 Background

Accidents in Malaysia are the one of main cause of death among the road user. According from the statistic shown in Table 1.1, Malaysia is top five very popular in the ASEAN countries that had the higher motorcycle fatalities. Motorcyclists are the most of the victim of the death and serious injury accident that had always happen nowadays. There are many factors that cause the accident such as driver attitude, weather, and road condition. Based on the statistical from the PDRM, the major death accident happens at night and also when heavy raining condition. Road condition as know are the main factor can cause accident to all user of the road. Road that has hole, unfinished road and, bad condition can cause fatal accident to user. Besides that, road without importance facilities such as separated line, signboard, road reflector and road lamp also can increase the factor of accident (Erhardt, Rice, Troszak, & Zhu, 2016).

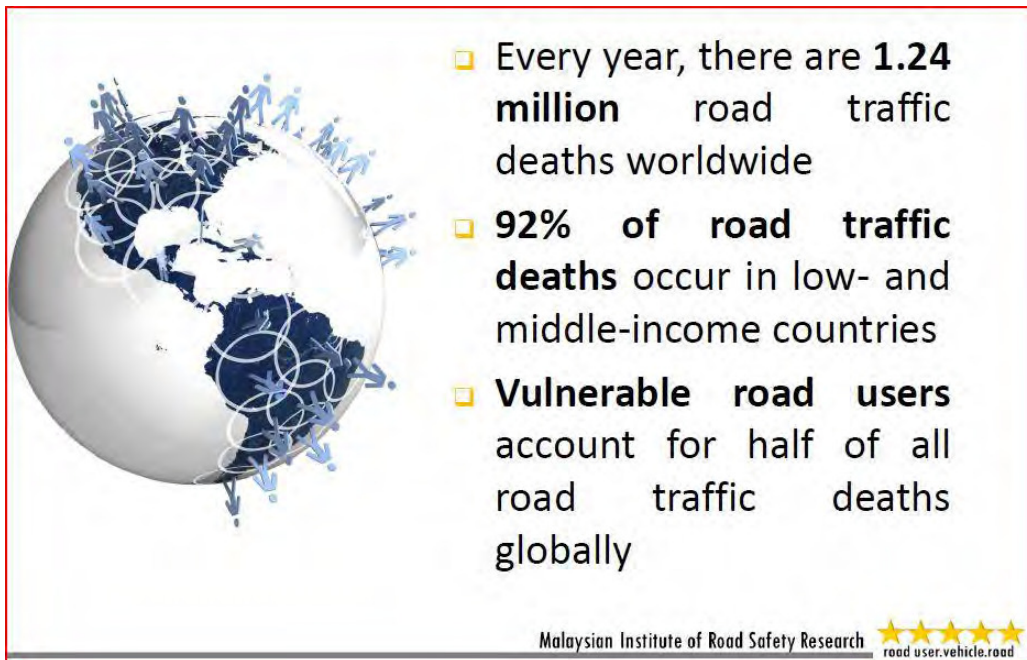


Figure 1.1: statistic road traffic death by MIROS.

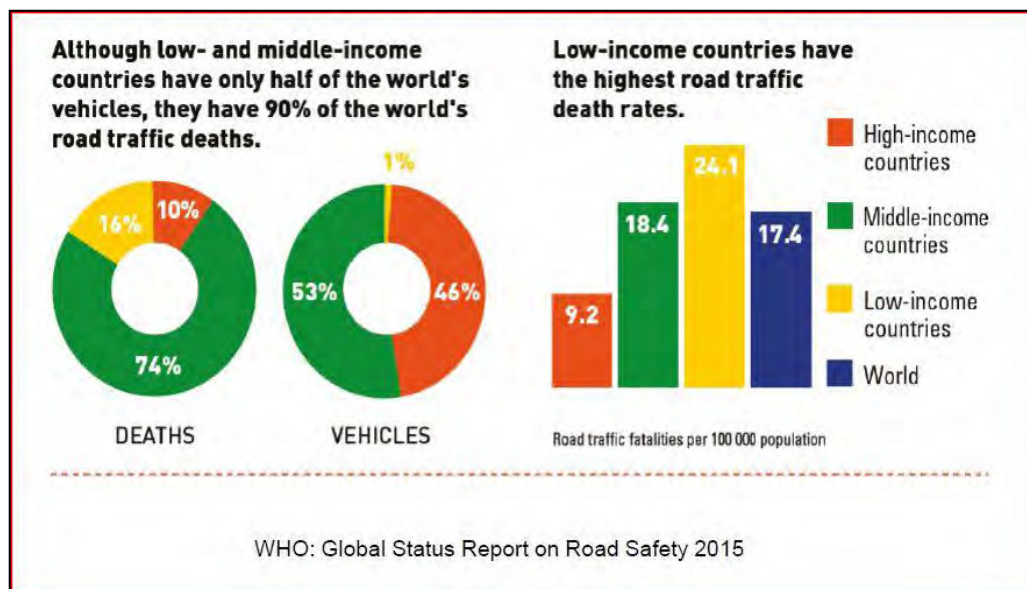


Figure 1.2: World Health Organisation (WHO) report on Road safety 2015.

Table 1.1: Death road user in various region in 2012 (Polis DiRaja Malaysia)

No.	ASEAN country	population	Registered motorcycle (2012)		Report fatalities (2012)		Road fatalities per 100000 populations	Motorcycle fatalities per 10000 registered motorcycle
			Total (million)	(%)	Total	%		
1.	Brunei	390056	0.01	4	54	11	13.8	4.9
2.	Singapore	4436281	0.14	17	214	48	4.8	7.1
3.	Lao P.D.R.	5859393	0.51	79	608	80	10.4	9.6
4.	Cambodia	14443670	0.13	84	1545	63	10.7	75.1
5.	Malaysia	26571879	7.91	47	6282	58	23.6	4.6
6.	Myanmar	48798212	0.68	65	1638	10	3.4	2.4
7.	Thailand	63883662	16.14	63	12493	70	19.6	5.4
8.	Vietnam	87375196	21.78	95	12800	80	14.6	4.7
9.	Philippines	87375196	2.65	48	1185	37	1.3	1.7
10.	Indonesia	231626978	46.22	73	16548	61	7.1	2.2
Total		571345453	96.17	58	53366	52	-	-

In Malaysia, the death of the road user always increasing and growing by years. Although, the Road Safety Index in Malaysia based on the Figure 1.3, the road value decreasing and lower per 10000 vehicles. From the data shows that the accident happens become lower over years because of the improving the safety equipment and developing new system by the vehicle and motorist company. Based on the scientific study by MIROS, road fatality in Malaysia is projected to reach 10,716 in 2020. The fatalities will cause minimum loss to Malaysia that estimate at RM 20.6 Billion in 2020.

Other than that, motorcycle at night are very hard to see from far away distance because the tail light is too dim and not give attraction to the other vehicle from back. From that, the main factor to focus are sighting of the other vehicle when the motorcyclist used the road at low light condition. One of the alternative to reduce the factor of the accident is motorcycle's user can wear the safety reflector vest or at least wearing bright and attracted colour to make sure the other user can spot motorcyclist in low light. Attitude of the motorcyclist in Malaysia are bad because they are always overlook about their own safety while using carriageway. Uncomfortable, unattractive, and difficult to use are some reason that make mostly motorcyclists are not using safety vest. Existing safety vests are not interesting and looking like contractor worker are main reason claim by the user especially by youth and middle age.

Based on government and safety law, all motorcyclist or cyclist must wear helmet (Buckley, 2016). From that, redesign and make improvement to existing product by adding some LED light at the back of the helmet can improve the safety to the motorcyclist. Other than that, adding some blinking light when crash to make sure the other vehicle from back slow down. The accident occurs when the other vehicle could not the motorcycle crash or stop at the middle ways (Buckley, 2016).

Year	Total death for Road User in Malaysia	Road Safety Index in Malaysia		
		Per 10,000 vehicles	Per 100,000 population	Per Billion VKT (Vehicle Kilometre Travelled)
1999	5794	5.83	25.5	26.79
2000	6035	5.69	26.0	26.25
2001	5849	5.17	25.1	23.93
2002	5891	4.90	25.3	22.71
2003	6286	4.90	25.1	22.77
2004	6228	4.52	24.3	21.10
2005	6200	4.18	23.7	19.58
2006	6287	3.98	23.6	18.69
2007	6282	3.74	23.1	17.60
2008	6527	3.63	23.5	17.65
2009	6745	3.55	23.8	17.27
2010	6872	3.40	23.8	16.21
2011	6877	3.21	23.71	14.68
2012	6917	3.04	23.61	13.35
2013	6915	2.90	23.1	12.19
2014	6674	2.66	22.0	10.64
2015	6706	2.55	21.5	9.6

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Malaysian Institute of Road Safety Research  road.user.vehicle.road

Figure 1.3: Total death and Road Safety Index in Malaysia.

1.2 Problem statement

Motorcycle accident could lead to serious injuries and death. Severe situation of accident mostly happens at night and at heavy raining condition when the sight of the driver decreased and the motorcycles are hard to spot just by tail light from more than sighting distance. Sighting distance in normal are 10-20m, rainy condition less than 10m, heavy rain and storm less than 3m. The most dangerous when motorcycle had a crash on the federal highways, the motorcyclist on the road can crash by following vehicle if they cannot notice the injured men on the road.

The present helmet on today market that only used to protect head and face from injuries are not enough function. Reflected helmet or helmet with bright colour are not interested by young that always want to used simple and dark colour helmet especially black colour. Wearing black and dark colour of the helmet are not recommended because the motorcyclist can be hard to vehicle's driver to spot the rider at night or low light condition. Other than that, the accident that happen after first accident always happen. As known, the following accident can be preventing from happen if the other driver from behind are can see the signal from the accident area to decelerate the vehicles.

1.3 Objective

The objectives of this project are:

- 1) Design of brake light circuit system for motorcycle helmet.
- 2) Prototype development of safety helmet with wireless LED brake light.

1.4 Scope of the project

Scopes of this project are as the following:

1. Literature study of the helmet, wireless technology, radio frequency identification (RFID) system, Bluetooth, Wi-Fi, electrical system and microcontroller.
2. Design the bracket used safety feature for braking and signal LED light attached on current helmet.
3. Design and analysis on electrical system for blinking.
4. Fabricate the model and prototype.