DEVELOPMENT OF NEW THIRD LIGHT BRAKE SIGNAL ON MOTORCYCLE HELMET

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DECLARATION

"I hereby declare that the thesis is based on my original work except for quotations and citations which have been duly acknowledged"

Signature :……..

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Date : 18 MAY 2009

DEDICATION

My special dedication towards my beloved parents, family, Mr. Mohd Zakaria Mohd Nasir; my supervisor and all friends. May god bless them for all the help to complete this thesis.

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In the name of ALLAH s.w.t; I would like to express my first and foremost thankfulness for giving me the optimum health, courage and strength along the period of completing this project.

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ABSTRACT

A new third light brake system explore in this thesis is a new applications of the wireless technology. The light brake was attached at the back of the motorcycle helmet in order as warning signal to other road user about the appearance of motorcyclist. This device related to a transmitter unit placed at the motorcycle and the receiver unit at the back of the motorcycle helmet. When the motorcyclist press the front or rear brake, the red light illumination signal appear at the back of the motorcycle helmet. The illumination will represent the brake light as brake light at motorcycle.

ABSTRAK

Lampu brek ketiga yang direkacipta dalam Projek Sarjana Muda ini adalah salah satu aplikasi dari sistem tanpa wayar dalam industri automotif. Lampu brek ketiga ini diletakkan dibelakang topi keledar motosikal sebagai tanda amaran kepada pemandu lain tentang kehadiran penunggang dan pembonceng motosikal. Alat ini berdasarkan kepada sebuah unit pemancar yang ditempatkan pada motosikal dan unit penerima pada bahagian belakang topi keledar motosikal. Apabila pedal brek depan atau belakang ditekan, sinaran lampu berwarna merah akan terpancar. Sinaran lampu berwarna merah yang terhasil ini memainkan peranan yang sama seperti yang terdapat pada lampu brek motosikal.

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Z	=	Impedance
R	=	Resistance
X	=	Reactance

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CHAPTER 1

INTRODUCTION

Motorcycle is the most popular transport and become the main mode used by commuters in Malaysia. In 2007, about 7943,364 vehicles were registered with Jabatan Pengangkutan Jalan (JPJ) which was motorcycle. Not surprisingly, motorcycle consumed the highest road accidents compared to other vehicle involved in accident. From the statistic recorded, almost every year begin from 1993 until 2007, motorcycle have recorded highest road accidents compared to cars, van, bus and other vehicle that involved in accidents.(source: www.panducermat.org.my)

Table 1.1: Registered vehicle according type of vehicle(1993-2007)
(Source: JKJR (September 2008))

	REGISTERED VEHICLE				
Year	**Private Car**	**Private Motorcycle**	**Lorry/Van**	**Bus**	**Taxi**
1993	2,255,420	3,703,838	466,871	33,358	36,458
1994	2,426,546	3,977,047	495,736	34,771	40,088
1995	2,532,396	3,564,756	430,716	35,224	27,276
1996	2,886,536	3,951,931	512,165	38,965	59,456
1997	3,271,304	4,328,117	572,720	43,444	51,293
1998	3,452,852	4,692,183	599,149	45,643	54,590
1999	3,787,047	5,082,473	642,976	47,674	55,929

Year	Private Car	Private Motorcycle	Lorry/Van	Bus	Taxi
2000	4,145,982	5,356,604	665,284	48,662	56,152
2001	4,557,992	5,609,351	689,668	49,771	56,579
2002	5,027,173	5,859,195	714,796	51,251	58,385
2003	5,428,774	6,164,953	740,462	52,846	60,723
2004	5,911,752	6,572,366	772,218	54,997	65,008
2005	6,473,261	7,008,051	805,157	57,370	67,451
2006	6,941,996	7,458,128	836,579	59,991	70,409
2007	7,419,643	7,943,364	871,234	62,308	72,374

According to the road statistic which reported by PDRM, motorcyclist and pillions have involved at the highest road fatalities which consumed about 304 in Jun 2008 and 300 for the next month. (Source: www.panducermat.org.my (September 2008))

Table 1.2: Statistic of Road Fatalities from June to July 2008

Source: JKJR (September 2008)

	2008	2008
Category of road user	**JUNE**	**JULY**
Car driver and passenger	143	102
Motorcyclist and pillions	304	300
Pedestrians	47	47
Cyclist	13	21
Bus driver and passenger	10	1
Lorry diver	13	14
Van driver	5	12
Four wheel vehicle driver	11	11
Others	9	1
Total	**555**	**509**

In year 2005, from 6188 road fatalities, about 58% which consumed 3584 death involved motorcyclist and pillion. About 68% of the read fatalities recorded caused by the head injuries among the motorcyclist and pillion. Even the small accident can caused body injuries especially head and other important of body parts. (Source: www.panducermat.org.my (August 2008))

The usage of the motorcycle helmet was the effective way in order to protect and reduced head injuries. However, the usage of motorcycle helmet needs to fulfill the standard specifications which stated from Jabatan Keselamatan Jalan Raya(JKJR). The standards are related to the design of the helmet in reducing the impact to the head when the accident happens.

The Center of the Road Safety in Universiti Putra Malaysia (UPM) reported of suggestion of using the right helmet and the application of each type of helmet. The right application of helmet need to subjected because of the success of helmet used which can reduced almost 50% head injuries caused by road accidents.

In order to reduce the road accident among motorcyclists and pillions, a lot of method have been developed and derived. One of the way is by exposed the motorcyclist to used the recommended and standard which stated from JKJR.

In achieving the objective of reducing the road accidents among the motorcyclist, a lot of ways to improved the safety elements of the motorcycle helmet. One of the ways is develop the light brake at the back of the helmet. The relevant of this project which to mentions the other road user about the appearance of the motorcyclist and pillions especially during heavy rain and at night. The difficulties to mentions appearance of the motorcyclist will possibly consumed to road accidents and fatalities.

1.1 Problem Statement

There is a lot of problem facing in order to minimize the risk of motorcyclist and pillions involved in accidents especially at night and during heavy rain where the other vehicle hard to detect the appearance of motorcyclist. This is because the bad weather will interrupt other road user to see clearly towards the motorcyclist and pillions.

Besides, the appearances of single of brake light at the back of the motorcycle sometimes fail to function due to certain cases. This also contributes in road accident because the other road user can not see the motorcyclist clearly especially at night and bad whether. Also, the appearance of the dirt and luggage will act as barrier for the clear brake light illuminations in order to mentions other road user about the appearance of the motorcyclist.

1.2 Objective

1. Development light brake at the back of motorcycle helmet via wireless system.
2. Development of wireless system for flexibility and safety features for motorcyclist.

1.3 Scope

1. Literature review on wireless system and electrical system of motorcycle.
2. Literature review on the existing helmet design.
3. Fabrication of the motorcycle and helmet model for the light brake system.
4. Analytical study of the components for prototype fabrication.
5. Combination of existing design of helmet with the attachment of the wireless unit.
6. Study the effect of the wireless system to environment

CHAPTER 2

LITERATURE REVIEW

2.1 Motorcycle Helmet Design

Different helmets operated with different application of used such as hard hats on construction and heavy-industry heads and Kevlar caps on military heads. The compositions of the type material and design will not interchangeable. Motorcycle helmets are very sophisticated and specialized for the activity. They've been developed carefully and scientifically over the years.

There are four basic components which work together to provide protection in the motorcycle helmet. The components refer to an outer shell, an impact-absorbing liner, the comfort padding, and a good retention system.

2.1.1 Outer Shell

The outer shell usually made from fiber-reinforced family composites or thermoplastics like polycarbonate. This is strong material which designed and intended to compress when the helmet hits anything hard. This material will disperses energy from the impact to lessen the force before the force reaches the motorcyclist head, but outer shell must stand with other components of helmet to full protective.(source:www.msf-usa.org)

2.1.2 Impact-Absorbing Liner

Inside the outer shell there are components that equally important which referred to impact-absorbing liner. This impact-absorbing liner usually made of expanded polystyrene or commonly said as Styrofoam. This component will dense layer cushions and absorbs the shock as the helmet stops and motorcyclist head wants to keep on moving because of the inertia.

Both the shell and the liner compress if hit hard, spreading the forces of impact throughout the helmet material. The more impact-energy deflected or absorbed, the less there is of it to reach the head and do damage. Some helmet shells delaminate on impact. Others may crack and break if forced to take a severe hit; this is one way a helmet acts to absorb shock. (Source: www.msf-usa.org)

2.1.3 Comfort Padding

The comfort padding is the soft foam-and-cloth layer that sits next to motorcyclist head. It helps keep motorcyclist in comfortable and the helmet fitting snugly. In some helmets, this padding can be taken out for cleaning.

2.1.4 Retention System

The retention system, or chin strap, is very important component of the motorcycle helmet. It is the one piece that keeps the helmet on motorcyclist head during crash. A strap is connected to each side of the shell.

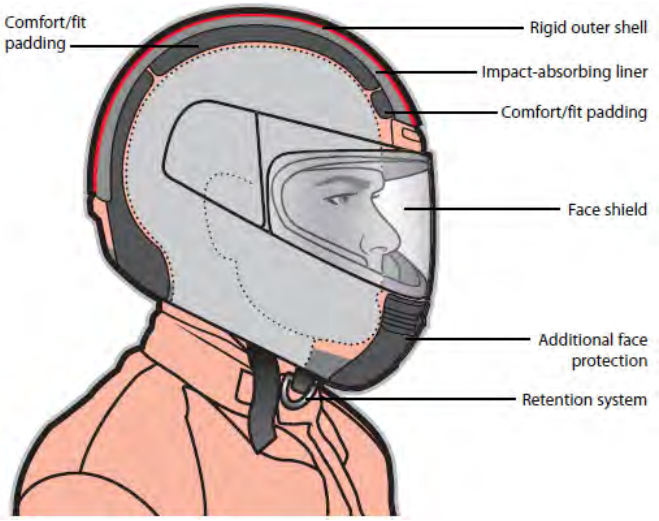

Figure 2.1: Basic components of helmet design
(source:www.msf-usa.org)

2.1.5 Choosing the Motorcycle Helmet

A full-face helmet gives the most protection since it covers more of motorcyclist face. Full face helmet usually has a moveable face shield that protects the eyes when it is closed. Racers prefer full-face helmets for the added protection and comfort.

A three-quarter, open-face helmet is also a choice of some motorcyclist. This type of motorcycle helmet is constructed with the same basic components, but this type does not offer the face and chin protection of full-face helmets. The use an open-face helmet should have a snap-on face shield in place during ride that can withstand the impact of stone or other debris.

A half-helmet protects even less of motorcyclists head. It is more likely to come off from head upon impact. Therefore, half-shell helmets are not recommended. (Source:www.msf-usa.org)

A lot of good helmets are available today, in a range of prices. The improvement of helmet made of lightweight, modern materials and additional

accessories. Manufacturers are working to make them less expensive, stronger and more comfortable.

Every single unit of helmet must meet minimum safety standards which recommended. The way to find reliable helmet is by look at the Standard and Industrial Research of Malaysia (SIRIM) sticker outside of the helmet. The sticker means the helmet meets the safety test standards of the JKJR recommendations

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Figure 2.2: SIRIM standard sticker for motorcycle helmet

The SIRIM sticker was mention that the motorcycle helmets have meet their specification in terms of safety features and testing. The SIRIM departments have these responsibilities in testing the helmet before it can meet the user. The principle and testing of Snell Memorial Foundation which used in West Country are close with the testing that be done in Malaysia in way of conceptuality and practically.

Each organization has rigid procedures for testing:

- Impact – the shock-absorbing capacity of the helmet.
- Penetration – the helmet's ability to withstand a blow from a sharp object.
- Retention – the chin strap's ability to stay fastened without stretching or breaking.
- Peripheral vision – the helmet must provide a minimum side vision of 105 degrees to each side.

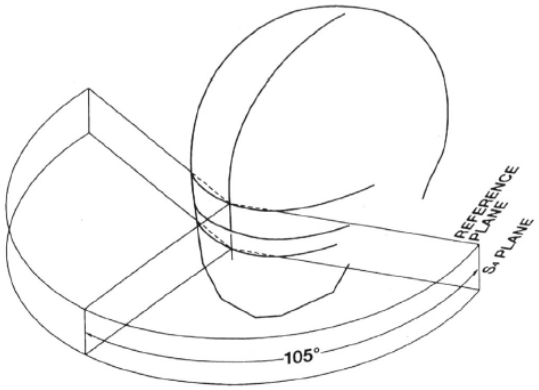

Figure 2.3: The peripheral vision of helmet
(Source: www.smf.org)

2.2 Overview of Wireless System

There is a lot of wireless system which used widely in this modern country including Malaysia. Most of the wireless system which recently use was Radio Frequency (RF), Bluetooth and Infrared (IR). In this project, one of the wireless system will adapted through objective and flexibility of the application of the system. There is a lot of factor should be in consider to choose either each of the wireless system are suitable with application of the project. In order to find out the most flexibility of the system, the system of RF, Bluetooth and IR advantages and disadvantages will be listed for comparison.

2.2.1 Radio Frequency(RF) System

Radio frequency (RF) is the one of the remote control application which uses widely such as radio, toys, sensor, mobile phone and many more. This remote control which use the radio frequency will send the alternating signal which produce from transmitter unit to the receiver unit. In other words, this system can be turn on