UNIVERSITI TEKNIKAL MALAYSIA MELAKA

# SMART HELMET USING HEARTBEAT SENSOR TO PREVENT DROWSINESS FOR MOTORCYCLE USER



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BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY
(Industrial Automation & Robotics) WITH HONOURS

2020


## Faculty of Electrical and Electronic Engineering Technology

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**MUHAMMAD IRHAM ADLIN BIN MUTALIB**

**A thesis submitted**
**in fulfillment of the requirements for the degree of**
**Bachelor of Electrical Engineering Technology**
**(Industrial Automation & Robotics) with Honours**



**Faculty of Electrical and Electronic Engineering Technology**



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

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# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Sesi Pengajian: 2019/2020

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**APPROVAL**

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# ABSTRAK

Malaysia adalah negara yang sentiasa mengimpikan untuk menjadi negara maju di Asia Tenggara, dan disenaraikan sebagai salah satu daripada tiga negara teratas di dunia yang mempunyai kematian di jalan raya yang tertinggi mengikut daripada artikel yang terdahulu. Mengikut data, Malaysia mencatatkan kadar kematian kira-kira 23 setiap 100,000 penduduk. Penunggang motosikal adalah kategori tertinggi pengguna jalan raya yang menyumbang kepada kemalangan dan juga kematian di Malaysia. Salah satu punca kemalangan itu ialah penunggang berasa mengantuk semasa menunggang motosikal. Untuk mengatasi masalah ini, Helmet Pintar dengan Sensor Denyut Jantung untuk Mencegah Mengantuk dikalangan Pengguna Motosikal dicadangkan untuk projek ini. Projek ini memberi tumpuan untuk mengelakkan rasa mengantuk penunggang dengan menyedarkan orang itu jika orang itu merasa mengantuk atau orang itu sudah mengalami tidur mikro. Helmet pintar mengesan orang itu jika mereka mengantuk dengan menggunakan detak jantung atau denyutan sensor yang dilampirkan pada tali topi keledar. Sensor akan mengukur BPM nadi di sekeliling leher penunggang dan memicu sistem jika pengukuran nadi dalam keadaan mengantuk. Peranti keluaran akan menggunakan sistem penggera untuk mengelakkan rasa mengantuk. Sistem penggera adalah untuk menyedarkan pengguna itu ketika mereka merasa mengantuk di tengah jalan.

## ABSTRACT

Malaysia for a nation that is always aspiring to become a developed country in Southeast Asia, has been ranked as one of the top three countries in the world with the deadliest roads according to the article. According to the data, Malaysia registered a death rate of about 23 per 100,000 population. Riders and motorcyclists are the highest categories of road users contributing to accidents and even death in Malaysia. One of the causes of the accident is the riders are feeling drowsy while riding a motorcycle. To overcome these problems, Smart Helmet with a Heartbeat Sensor to Prevent Drowsiness for Motorcycle User is proposed for this project. This project focused on to prevent drowsiness of the riders by awakes the person if the person is feeling drowsy or the person already in micro sleep condition. The Smart Helmet is detecting the person if they are feeling drowsy by using heartbeat or pulse sensor that is attached to the helmet tie strap. The sensor will measure the BPM of pulse around the rider's neck and threshold the system if the pulse measurement in drowsy state. The output to prevent drowsiness by using the alarm system. The alarm system is to awakes the person when they are feeling drowsy in the middle of the road.

## DEDICATION

I would like to express my special dedication to people who support me with this thesis. I am grateful and acknowledge for both of my parent also sibling for gives me encouragement and endless support to me for complete this bachelor's degree Project (BDP). Without them, I probably not reach this stage. Besides, special thanks for all my fellow lecturer for advice, taught and guidance through my studies. Not forgetting, all my beloved friend throughout this wonderful journey. Finally, thank you to all people who help me directly or indirectly for the support in completing this project.

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# CHAPTER 1

# INTRODUCTION

## 1.1 Introduction

This chapter will discuss how accidents can happen due to drowsiness and what countermeasure can be taken regarding this issue. Thus, a smart helmet using a heartbeat sensor to prevent drowsiness for motorcycle users is approached. This smart helmet is designed with a heartbeat sensor or pulse sensor to measure the heart rate and can be used to detect drowsiness. The drowsiness issue is one of the popular issues that can be seen in Malaysia and contribute to the highest rate of accidents.

## 1.2 Background

Malaysia for a nation that is always aspiring to become a developed country in Southeast Asia, has been ranked as one of the top three countries in the world with the deadliest roads according to the article. According to the data, Malaysia registered a death rate of about 23 per 100,000 population. Riders and motorcyclists are the highest categories of road users contributing to accidents and even death in Malaysia. According to the statistics and analyzed data from the police and Road Transport Department (JPJ), more than 50% of the road accident fatalities involve motorcyclists, and the fatality rate on Malaysian roads is still considered to be very high. The main reason accidents happened was contributed to people riding motorcycles recklessly or ignoring traffic rules instead of road and vehicle conditions.

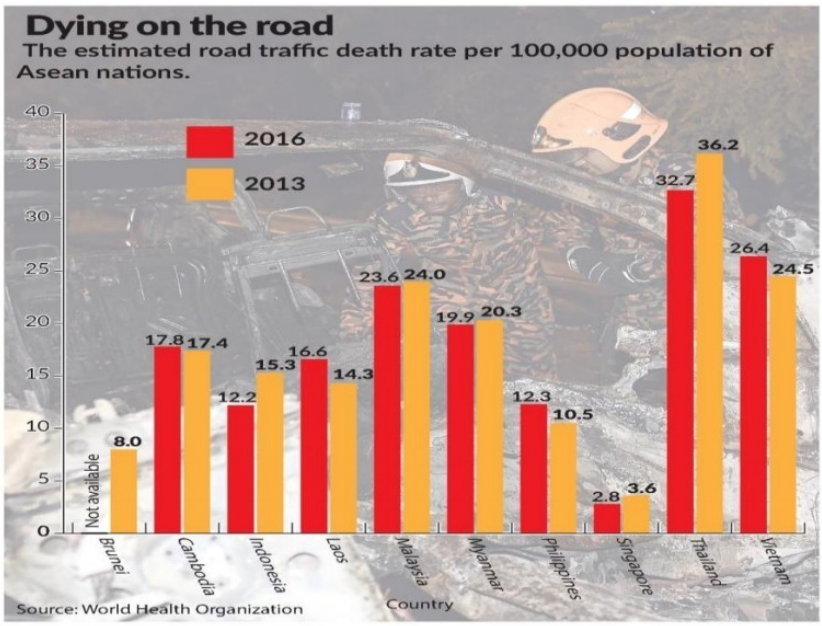


Figure 1.1: Road traffic death rate per 100,000 population Asian nations by WHO

Other than that, the reason that causes an accident fatality which people always overlook is coming from the state of the riders themselves. Most riders in Malaysia had to wake up early to go to work and had to come home late at night which cause a sleep problem. Sleep is essential for the functioning of the human body. The disrupted sleep may cause one person to suffer from sleep deprivation and drowsiness and this is what happens to the riders themselves. Due to this hapless condition, accident fatalities may occur and it's concerning the users of the road.

From these problems, some people have come out with the design to overcome this problem. One of the designs has been focused on doing a smart helmet that can prevent drowsiness for motorcycle users. The smart helmet is detecting by using a heartbeat or pulse sensor because the sleep rhythm of the person relates to brain and heart activities. Therefore, the pulse sensor is the most suitable component that needs to detect drowsiness.

The output to prevent drowsiness by using the alarm system. The alarm system is to awake the person when they are feeling drowsy in the middle of the road.

## 1.3 Problem Statement

Nowadays, the higher rate of an accident involving the motorcycle is because of drowsiness. Thus, there are common problems such as:

i. **The riders are lack of awareness during riding.**

Basically, the UTeM student's riders are lack of awareness during riding due to the drowsiness and the environment monotonous road. Drowsiness can be affected by sleep-deprived with 51 percent suffering from at least one dimension of work-related stress as well as 53 percent getting less than seven hours of sleep in 24 hours, according to a study. From these sleep deprivation factors, it important to give awareness to the riders due to the drowsiness while riding the motorcycle.



ii. **The condition of the riders cannot be identified.**

Sleep deprivation has been linked to stress response, body pain, memory loss, and poor thinking capability. Due to these factors, it will affect the condition of the riders and leads to drowsiness. Sleep deprivation attributable to sleep disorder, overworking, family obligations, and unhealthy lifestyles or sleep habits. Hence, it is vital to check the condition of the riders while riding a motorcycle.

iii. **The previous smart helmet has low effectiveness to prevent drowsiness**

There have many types of the smart helmet that has been developed to prevent drowsiness. One of the factors the previous smart helmet has low effectiveness which is the method that has been used for the detection of drowsiness. The most suitable method for the detection of drowsiness is related to brain or heart activities.

## 1.4 Objective

In order to overcome the problem, the objectives of this project are as follows:

i. To develop a system that can warn the male riders to be aware of the roads while riding.

ii. To integrate a low-cost intelligent helmet that capable of identifying the condition state of the male riders using a heartbeat sensor.

iii. To analyze the effectiveness of smart helmets to prevent drowsiness.

## 1.5 Work Scope



The work scope for this project is to gives awareness to the riders to stay focused on the road especially on male riders who are going back home while riding a motorcycle. Usually, the riders who are going back to their hometown facing challenges that are taking the longest period to arrive. Thus, it will be affected to their condition while riding a motorcycle which is drowsiness. The feeling drowsy among the riders who are riding a motorcycle needs special attention from everybody to secure the safeties while going back to their hometown. This drowsiness can lead higher rate of accident cases.

Besides, the effectiveness of the system for the motorcycle riders and their feedback to the system that had been created needs to be observed on this project.

## 1.6 Thesis Statement & Outline

The outline for this thesis is to explain all of the processes about the Smart Helmet Using Heartbeat Sensor to Prevent Drowsiness for Motorcycle User. This thesis consists of 5 chapter which is the introduction of the project, literature review, methodology, result of the simulation, and conclusion about the project. The chapter one, explaining about the introduction of this project. It states the background of the project and problem statement. Next, the objective is clearly defined also the work scope for this project.

Moreover, in chapter two focus about the theoretical research and literature review that connected to the project. The research of project Smart Helmet and the product similar also Arduino are the main background/literature review for this project.

For the chapter three, will discuss about methodology this project. Hence, the selection of the mechanism and the system to do this project are being finalized. The method also be chosen for this project in proper way, for example, figures, tables, and chart.



In addition, for chapter four where all the undertaking result and field test are being conducted. As for the functionality for overall project were defined. Next, the data has been analyzed and comparing with the objective for this project. At this, the project can be classified whether achieve or not.



The chapter five is the conclusion about this project. This chapter will conclude the achievement and brief comparing to the objective in this project. Finally, the future recommendations for this Smart Helmet are the upgrading to make the project better.