



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**DEVELOPMENT OF SMART HELMET USING RADIO  
FREQUENCY TECHNOLOGY**

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

by

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## **APPROVAL**

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

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## **ABSTRAK**

Dalam usaha ini, cubaan dibuat untuk membangunkan topi keledar pintar menggunakan Teknologi Frekuensi Radio (RF). Kemalangan jalan raya di negara kita meningkat setiap tahun dan ini termasuk kemalangan yang berkaitan dengan motosikal. Penyelidikan menyatakan bahawa kemalangan motosikal berlaku kerana menunggang cepat dan juga penunggang tidak memakai topi keledar. Oleh itu, projek ini dapat mengurangkan dan membendung jumlah kemalangan yang melibatkan motosikal. Projek ini melibatkan penggunaan Arduino UNO dan sensor IR yang akan meningkatkan ciri keselamatan dalam topi keledar untuk penunggang motosikal. Projek ini akan memastikan helm diberi keutamaan sebelum menaiki motosikal yang akhirnya akan mengakibatkan penurunan kadar kemalangan jalan raya. Keseluruhannya, projek ini menggunakan bekalan kuasa bateri 9V, mikrokontroler, sepasang Pemancar Frekuensi Radio dan Penerima, sepasang Pengekod Frekuensi Radio dan Decoder, sebuah geganti dan butang tekan yang biasanya terbuka. Proses ini melibatkan pengesanan topi keledar yang memakai sensor IR. Maklumat yang dikesan kemudiannya dihantar kepada pemancar melalui Frekuensi Radio. Isyarat yang dihantar kemudian dihantar ke litar penerima dengan itu menghasilkan output ke relay penyalaan. Akhirnya, relay akan mengunci atau membuka kunci sistem penyalaan bergantung kepada pengesanan topi keledar. Sekarang pelumba akan dapat memulakan motosikal apabila topi keledar telah dikesan.

## **ABSTRACT**

In this work, an attempt is made for developing a smart helmet by using Radio Frequency (RF) Technology. Road accidents in our country increases yearly and this includes accidents related to motorcycles. Researches' states that motorcycle accidents occur due to fast riding and also riders not wearing a helmet. Therefore, this project will be able to reduce and curb the number of accidents involving motorcycles. This project involves the usage of Arduino UNO and IR sensor which will enhance the safety features in a helmet for motorcycle riders. This project will ensure that helmets are given priority before a motorcycle ride which will eventually lead to a decrease in the road accidents rate. Overall, this project uses power supply of 9V battery, microcontroller, a pair of Radio Frequency Transmitter and Receiver, a pair of Radio Frequency Encoder and Decoder, a relay and a normally open push button. The process involves the detection of helmet wearing through an IR sensor. The detected information is then sent to a transmitter through Radio Frequency. The transmitted signal is then sent to receiver circuit thus produces an output to the relay of ignition. Finally, the relay will either lock or unlock the ignition system depending on the detection of helmet. Now the rider will be able to start the motorcycle as the helmet has been detected.

## **DEDICATION**

To my beloved parents Mr & Mrs. Nadarajan Vaithilingam

My supportive supervisor Miss Gloria Raymond Tanny

My faithful panels, lectures, and staffs of FTK

My BEET Cohort 5 classmates



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## LIST OF SYMBOLS

s	-	Time
Hz	-	Frequency
MHz	-	Frequency
m	-	Distance
l	-	Length
m	-	Mass

## **LIST OF ABBREVIATIONS**

RFID	Radio Frequency Identification
IOT	Internet of Things
RF	Radio Frequency
GSM	Global System for Mobile
GPS	Global Positioning System
PIR	Passive Infrared
IR	Infrared
FSR	Force Sensing Resistor
LED	Light Emitting Diode
SMS	Short Messaging Service
PIC	Programmable Integrated Circuit
ASK	Amplitude Shift Keying

# CHAPTER 1

## INTRODUCTION

### 1.1 Introduction

Accidents and road fatalities are one of the most worried issues nationwide. Especially in our country Malaysia, statistics prove that as per 100, 000 populations, we are the leading country among ASEAN countries to top the highest number of road accidents, especially which road fatalities involve motorcyclist which is said to be 50 % of the whole comprising of car, lorries and bicycles [1]. Thus due to this issue, there are lots of lives that have been perished with deaths included per 100,000 populations since the year 1996. It is also said to be proven that, motorcycle fatalities are 3 times higher than car mishaps, 6 times higher than pedestrian fatalities and approximately 50 times higher than bus accidents. As per reports, the main factor in motorcycle accidents is not wearing a helmet. A study conducted by an Australian media Weiss shows that majority accident that occur in their country are based on bike and bicycle users who fail to wear safety helmets [2]. Since these statistics seem to be getting from bad to worse, it must also be noted that these statistics tends to be rapidly increasing from year to year. In 2015, a study in the United States of America proves that at least 15% of among all the road mishaps that occurred were all motorcyclist fatalities [3]. In Kenya, which is a developing country road traffic fatalities have even been one of the serious issues nowadays which records at least 11 deaths among 100,000 populations [4]. In 2008, it was reported that 14,960 fatalities in Vietnam due to road mishaps. It was also known that once helmet law was brought there were a massive increase in the usage of helmets to prevent head injuries

[5]. Vietnam is also known as the country with the rapid usage of motorcycles and also dependent on it. Thus, it has also become a law, especially for children to wear a helmet in the country to cope with accidents [6]. To prevent this from happening thus a project has been proposed which is Smart Helmet using RF technology.

## **1.2 Overview of Project**

A helmet is a basic protection for a human's head. A helmet can be categorized as one of the most sought items nowadays. This is because the revolution of helmets ever since the first development back in 900 B.C by the Assyrian soldiers for the purpose of protecting their heads from wounds and attacks had created a massive impact where the number of injuries and deaths that occurred during the war were reduced by a big margin when compared to those who did not wear any head helmets for safety. Thus, helmets that were worn for safety by soldiers have then been developed in terms of safety in the past decade and still been improvised in each aspect that is concerned to safety. Now, from helmets used in war by soldiers to helmets for motorcycle users and also bicycles users are widely being used to reduce the accident rates in our country. Basically, accident rates in our country are very high compared to other countries and where accidents related to motorcycles are leading the statistics in high numbers. Thus, based on few types of research conducted by the country's analyst, it is believed that the main reasons for motorcycle accidents to happen are riding too fast and also riding without wearing a helmet. Thus, in order to prevent this from happening, a Smart Helmet project had been proposed to reduce and curb the number of accidents involving motorcycles.

### **1.3 Problem Statement**

Motorcycle accidents are said to be one of the most worrying issues nationwide nowadays. It somehow has much difference in characteristics when compared to accidents involving other vehicles. This is because they include in taking the correct and exact way of accidents especially accidents which occurs at the sharp bends and frequent overtaking without taking precautions. Thus, among all the factors that lead to motorcycle accidents, one of the main factors that can be said to be the most influential factor is motorcyclist not wearing any safety head gears for protection or better known as Helmets. As per quoted in The Insurance Institute for Highway Safety, reports show that “helmet usage can reduce the odds of head injury up to 50 % and the odds of face or neck injury by 33%[2]. Thus, in order to prevent this from happening and to enhance the safety measures of a bike user, a simple concept and idea had been brought to develop a Smart Helmet using RF Technology specially for all the motorcycle users which gives priority to helmets.

## 1.4 Objectives

There are some objectives that need to be achieved in this project:

- To develop a smart helmet by using Arduino UNO and IR sensor integrated with Radio Frequency (RF) Technology.
- To enhance better safety features in a helmet for the rider's safety through Radio Frequency technology.
- To ensure that the helmet is worn and given priority before riding a motorcycle so that carelessness can be avoided.

## 1.5 Scope of Project

This project involves several parts including:

- Identifying the detection of helmet wearing through an IR sensor.
- Sending the detected information by the IR sensor through Radio Frequency through transmitter.
- Failure to start the motorcycles when the helmet was not detected or the belt was not clipped.
- The project works in a simple process which is a two-way process which is detection of helmet through the IR Sensor and push button which is in the transmitter circuit and the receiver circuit where it receives the signal from the transmitted signal and then produces the output to the relay of the ignition.
- The components that were used were such as a 5V relay module, an Arduino Uno kit which an operating microcontroller ATMEGA 8051 and a pair of Radio Frequency Modules such as transmitter and receiver that comes together with Radio Frequency Encoder HT12E and decoder HT12D.
- At the end of the semester, the initial results for this project will satisfy the problem statement stated above in order to proceed to complete it during the next semester for full usage that obeys the objectives and suits the best solution for the problem statement.