

# INNOVATIVE ANTI SLEEP ALARM SYSTEM FOR DRIVER

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This report is submitted in partial fulfillment of the requirements for the award of  
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**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**  
**FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER**

**BORANG PENGESAHAN STATUS LAPORAN**  
**PROJEK SARJANA MUDA II**

**Tajuk Projek** : INNOVATIVE ANTI SLEEP ALARM SYSTEM FOR DRIVER

**Sesi Pengajian** : 

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(HURUF BESAR)

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## DEDICATION

*I dedicate this report to my beloved family especially my parents, En Juremi Bin Jarkaseh and Pn. Siti Ruhimah Binti Marman, my brother, En. Mohd Elham for being so caring and have supported me to further my study until I manage to grasp a scroll of degree that every student dreams of it. Your patience and support have given me strength and energy. Love you all.*

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## ABSTRACT

This project is about developing the anti sleep device for any drivers via motion detector that has using the principles of electronic. The purpose of this project is to giving the warning to the driver that will get a sudden shock to give more concentration when driving. Thus, in order to achieve this aim, the device is functioning when the signal is detect from human body of driver which has been falls asleep while driving. This project mainly has a major section which is to develop the device. The hardware part consists of infra red transmitter circuit and infra red receiver circuit as a signal processing medium. The input is obtained by signal from human body while the output is providing by alarming system that will prevent the driver falling asleep with careful consideration of the consequences.

## ABSTRAK

Projek ini adalah mengenai membina alat untuk mengelakkan pemandu dari tidur melalui pengesanan pergerakan yang menggunakan prinsip elektronik. Tujuan projek ini adalah untuk memberi amaran kepada pemandu di mana pemandu akan mendapat kejutan secara tiba-tiba untuk memberikan lebih konsentrasi atau perhatian semasa memandu. Jadi, untuk mencapai tujuan ini, alat ini akan berfungsi apabila isyarat perubahan yang menunjukkan pemandu mengantuk secara perlahan-lahan. Isyarat ini dikesan dari bahagian anggota badan manusia yang berpotensi akan memberi isyarat tersebut. Projek ini secara umumnya ialah membina perkakasan. Bahagian perkakasan terdiri daripada litar penghantar inframerah dan litar penerima inframerah sebagai medium memproses isyarat. Masukan isyarat ditentukan dari pergerakan anggota badan manusia manakala, keluaran isyarat dihasilkan melalui sistem amaran yang akan dapat mengelakkan pemandu dari tertidur.



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## LIST OF ABBREVIATION

IR	–	Infra Red
GUI	-	Graphic User Interface
BPM	-	Bits per minutes
ECG	-	Electrocardiograph
ASK	-	Amplitude Shift Keying
FSK	-	Frequency Shift Keying
PSK	-	Phase Shift Keying
BPSK	-	Binary Phase Shift Keying
PIR	-	Passive Infra Red
LED	-	Light Emitting Diode

## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

The number of deaths on the road is alarming especially during the festive seasons. One of the reasons that an accident happens is because the driver falls asleep while driving. Due to one careless person, many innocent lives are lost. Such instances like express buses with many passengers crashed head-on with other vehicle. This innovative project is to be undertaken based on highly involved electronic engineering principles and application. Human body signal transmitted and detected in relation to the state of consciousness will be analyzed and correlated for the purpose of the system design and application.

The purpose of anti sleep device for drivers via motion detector is to give warning to the driver from falling asleep while driving. The function of device is detecting human motion when falling asleep such as the head bending forward.

When the sensor detects a forward motion, bending to left and bending to right, it will interpret the driver is falling asleep and will trigger a signal to the receiver or detector. In the detector there is an alarm in the form of buzzer being incorporated. When the signal is detected from transmitter, the buzzer will sound thus waking up the driver as well as the other passengers.

## **1.2 Problem Statement**

The reasons that an accident happen is because the driver falls asleep while driving. The accident happened is unexpected think of routine people. However, by manipulating the features of human characteristic from research, it was giving an idea of how to make the device. The way is to prevent the driver from asleep by analyze and manipulate the electronic engineering principles and application. Also how recognize the relationship between human bodies characteristic. So, the design based on detection of signal will encounter this problem.

## **1.3 Objectives of Project**

To make sure this project work as planned, a few objectives were determined where these objectives will be followed as a guide through the whole completion process of this project in order to achieve the desired output. These objectives were provided by sequence of project from beginning until the end of project. A detailed explanation for each objective will be discussed.

There are several objectives that are to be achieved at the end of the project which includes:

- i. To study and understand the symptoms of fatigue driver that can cause of accident and implementation.
- ii. To design the anti sleep alarm system that is capable for fatigue driver.



- iii. To develop anti sleep alarm system by using Infra Red Transmitter and Receiver system that is connected to anti sleep device.

#### **1.4 Scope of Project**

As to ensure the completion of project achieves the stated objectives, the project shall be completed within these scopes:

- i. To analyze input signal that is detected from driver to motion detector.
- ii. To develop the hardware of warning alarm system for fatigue or sleepy driver.

#### **1.5 Brief Methodology**

To achieve the goal that has been set in the objectives of this project, there are so many works that need to be done. The first stage is learning the concept of fatigue driver and human body characteristics and how the implementations. The second stage will be more on choosing the best algorithm that been used for fatigue detection. Finally, use the Infra Red Transmitter and Receiver that are connected to anti sleep device to give warning to the driver. A detail explanation for the parts will be explained in Chapter 3.

#### **1.6 Thesis Structure**

Chapter one shows the introduction of this project. It contains the background of the project and briefly explanation about the project methodology.

Chapter two consists of literature review of project. It covers the study of the project such as the normal heart beat rate, the fatigue driver, the heart beat and eye

shape, the sensor which are related when applying to the project, an Infra Red Sensor Transmitter and Receiver and also the RF Transmitter and Receiver used in the project for the future plan. After that, it shows the choices can be made after all the study have been finished.

Chapter three shows about the methodology of the project. This chapter includes the K-Chart of the project that shows the process of this project from start till the end. By using the K-Chart, it can reduce an assumption that can be made when doing the analysis.

Chapter four covers the result of the project. It is consists the outcome from the motion detector that created by anti sleep device, to warning for driver from falling asleep while driving. It also contains the discussion about the project.

Chapter five contains of the conclusion and the recommendation that can be made about this project.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Literature Review**

This chapter discuss about reviews of existing project created to get an idea about the project design, conception and any information that related to improve the project. With different concept and design, there are other creations and innovations of projects done by other people.

## 2.2 Driver Fatigue

Fatigue is a normal situation for human in daily live. People can't control this situation even though they are trying to prevent from feeling sleepy. Normally, the peoples will start a daily routine beginning from early morning until late afternoon. That is why, the whole day, the peoples will use a full energy at daytime and the rest for relaxing at night. In real situation, a driver will easy to feel fatigue and at the same time the weather is not constant and very hot outside the vehicle. During the time, driver will easy to feeling sleepy and especially at long distance. This is the normal situation and always happened at highway road which are use for long distance journey.

The phenomenon of fatigue is quite different from that of distraction. The term fatigue refers to a combination of symptoms, such as impaired performance and subjective feeling of drowsiness [1]. Even with intensively researched, the term of fatigue still does not have a universally accepted definition [2]. So it is difficult to determine the level of fatigue related accidents, but studies shows that 25-30% of driving accident is fatigue related [3]. The ETSC define the fatigue as “concerns the inability or disinclination to continue an activity, generally because the activity has been going on for too long” [4]. There are the different kinds of fatigue from the view of individual organ functionality, such as local physical fatigue, general physical fatigue, central nervous fatigue and mental fatigue. Central nervous fatigue and mental fatigue is the most dangerous type for driving, which will eventually become sleepiness and commit an accident with great probability.

When a driver get fatigue and begin to fall asleep, the following symptoms can be observed such as feeling depressed and irritable, slower reaction and responses, daydreaming, hard to keep eyes open and burning sensation in the eyes, lazy steering, hard to keep concentration, breathing become shallow and heart racing. Different individuals show different symptoms, so there is no concrete method to measure the level of fatigue. Show that the level of fatigue or sleepiness is a function of the amount of activity in relation to the brain's physiological waking capacity [5]. Several factors can influence this physiological waking capacity and hence lower the fatigue threshold [1,2,4,6], such as disturbed sleep, the low point in the circadian rhythm, hard work prior to driving. These factors are independent of the activity, but

result in the fatigue effect appearing more quickly. Thus fatigue cannot be seen simply as a function of the duration of time engaged in driving.

### **2.3 Heart beat and Eye Shape**

The palpitation regarding the state of mind is very sensitive [6,7]. In fact, when the people are in the situation which the spirit bad or dozes off, heart been along with it fluctuation, judgment driving present situation. When the people occupy under the condition which naps or sleeps, eye's shape will change, many sleepy warning research emphatically in image analysis [8,9], but will drive always looks straight ahead by no means that driving must give dual attention to incoming vehicle all around.

- i. The database can accommodate the number of total number of data is high.
- ii. User-friendly GUI.
- iii. Reasonable prices for commercial purposes.

### **2.4 Heart Beat Rate**

Heart rate is the number of heartbeats per unit time which means can vary as the body's need to absorb oxygen and excrete carbon dioxide changes, such as during exercise or sleep. Heart rate is measured by finding the pulse of the body. This pulse rate can be measured at any point on the body where an artery pulsation is transmitted to the surface.

In medical terms, normal heart beat rate refers to normal heart beat per minute, which should be between 70-75 beats per min. However, the rate between 60 and 80 is considered normal. Table 1 shows the normal heart beat rate divided by group.

Table 2.1: Normal heart beat rate

<b>Age Group</b>	<b>Normal Beats per Minute (BPM)</b>
Babies (under 1 year)	100 to 160
Children (1 to 12 years)	60 to 140
Children (above 12 years) and adults	60 to 100
Well-trained athletes	40 to 60

A slow heart rate is condition where the number of times the heart pumps blood out of body goes down to anything below 60. A slow heart beat can be either normal or abnormal. However, in most normal people, if the heart beat rate below 66 to 60, it is cause of worry. There are many symptoms can occur due to a slow heart beat. This includes feeling dizzy and lightened and also fatigue is commonly seen, as the person feels tired such as shortness of breathing.

Resting heart rate is a person's heart rate when they are at rest, meaning that the person is in awake but lying down condition and they are not consistance to do any work. Typical healthy heart rate in adult is 60-80 bpm and the rate below 60 bpm is referred as bradycardia. While the rate is above 110 bpm is referred as tachycardia. Actually, tachycardia is a resting heart rate more than 100 beats per minute. This number can refer to smaller people and the children have faster rates than average adults. For bradycardia, it is defined as a heart rate less than 60 beats per minute although it is seldom until below 50 bpm when a human is at total rest. However, the rate of heart beat is normally can measure by using an electrocardiograph (ECG) to state the approximately rate for any purpose especially in medical side.

## **2.5 Anti Sleep using RF Transmitter and Receiver**

Refers to the previous study, heart beat rate is difficult method to measure the fatigue. By using the motion detector used to detect the head position, it can be the other alternative to prevent the accident. The combination of RF Transceiver module, PIC Microcontroller and Alarm System, it can be achieved as input parameter to produce output as a result.

### 2.5.1 Introduction

Wireless RF transmitter receiver is to require reducing the wiring inside the car. Thus, the selection of type wireless RF transmitter receiver is important in order to transmit and receive the signal with minor distortion. The type of modulation is divided into three which are amplitude shift keying (ASK), frequency shift keying (FSK) and phase shift keying (PSK). Here are the differences between the types of modulation.

### 2.5.2 Amplitude Shift Keying (ASK).

Amplitude shift keying - ASK - in the context of digital communications is a modulation process, which imparts to a sinusoid two or more discrete amplitude levels. These are related to the number of levels adopted by the digital message. For a binary message sequence there are two levels, one of which is typically zero. Thus the modulated waveform consists of bursts of a sinusoid.

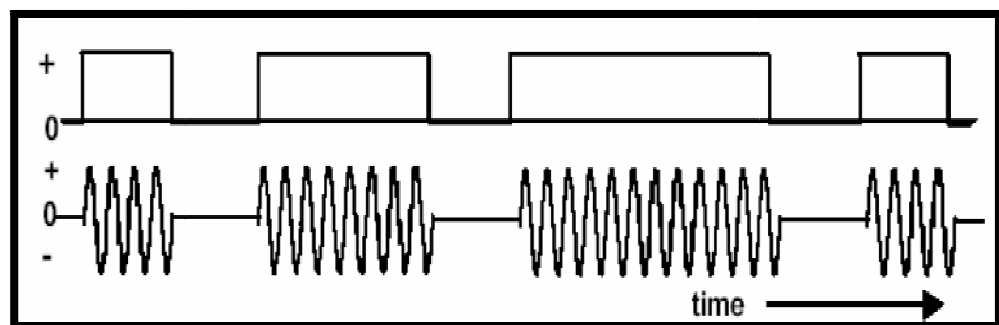


Figure 2.1: an ASK signal (below) and the message (above)

### 2.5.3 Wireless RF transmitter.

The type of wireless RF transmitter is Amplitude Shift Keying (ASK) with frequency 315M Hz. Compare with RF transmitter type Frequency Shift Keying (FSK), type FSK is better than type ASK. It is because it can be implementing in large area. However, transmitter types ASK was choose because the application of this project is in small area which is in the car. Beside, the frequency selected is 315M Hz because only two signals will be transmitting. The antenna length should be 8 cm to 10 cm.

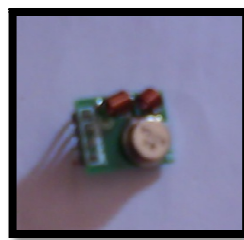


Figure 2.2: Wireless RF Transmitter

### 2.5.4 Multiplexer IC PT 2262

PT 2262 is a remote control encoder paired with PT 2272 utilizing CMOS Technology. It encodes data and address pin into a serial coded waveform suitable for RF or IR modulation. PT 2262 has a maximum bits of tri-state address pin providing up to 531,441 address codes.