UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SLEEPING SENSORING AND ALERTING DEVICES FOR DRIVERS

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

By

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2015

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **SLEEPING SENSORING AND ALERTING DEVICES FOR DRIVERS**

SESI PENGAJIAN: **2015/16 Semester 1**

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This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Computer Engineering Technology (Computer Systems) with Honours. The member of the supervisory is as follow:

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ABSTRACT

This project was developed with the goal of reducing the incidence of road accidents especially during festive seasons and public holidays. Priority projects are generally for road users, especially to drivers to warn the driver to focus more on driving. Therefore, to achieve this, the device works when it detects a signal from the human body. The project is mainly aimed to develop a system using microcontroller PIC which is to create a device that can detect levels of driver drowsiness while driving. The main components used in this project is the sensor as a method for detecting heart rate response sleepy drivers by counting the pulse ticking in the prescribed ratio. Hardware part consists of an infrared transmitter circuit and the receiver circuit as simple infrared signal processing. Microcontroller PIC will receive a signal that drowsy drivers as well as input and output when the alarm device will warn sleepy drivers.

ABSTRAK

Projek ini telah dibangunkan dengan matlamat untuk mengurangkan kadar kemalangan jalan raya terutama pada musim perayaan dan cuti umum. Keutamaan projek ini secara umumnya untuk pengguna jalan raya, terutama kepada pemandu untuk memberi amaran kepada pemandu memberi tumpuan lebih semasa memandu. Oleh itu, untuk mencapai matlamat itu, peranti ini berfungsi apabila ia mengesan isyarat dari tubuh badan manusia. Projek ini terutamanya mempunyai tujuan dengan membangunkan sebuah sistem menggunakan micropengawal PIC iaitu untuk mencipta peranti yang boleh mengesan kadar mengantuk pemandu semasa memandu. Komponen utama yang digunakan dalam projek ini adalah sensor sebagai kaedah untuk mengesan tindak balas kadar denyutan jantung pemandu mengantuk dengan mengira detik nadi dalam nisbah yang ditetapkan. Perkakasan sebahagian terdiri daripada litar pemancar inframerah dan litar penerima sebagai pemprosesan isyarat inframerah sederhana. Micropengawal PIC akan menerima signal bahawa pemandu mengantuk sebagai input manakala output pula apabila peranti penggera akan memberi amaran kepada pemandu yang mengantuk.

DEDICATIONS

I dedicate this thesis to my mother Timah Binti Othman and my family. I hope that this achievement will complete the dream that you had for me all those many years ago when you choose to give me the best education you could.

ACKNOWLEDGMENTS

Alhamdulillah and praise to Allah, lord of the universe, and peace be upon Muhammad the prophet; praises befits His might and suffices. His Grace, peace and blessing are upon His generous Messenger, his family and companion, for giving the strength to complete this report.

I would like to express my deeply gratitude and appreciation to few person who help and assisted me through completion of this final year project report. I would like to thanks to my project supervisor Mr Zulhasnizam bin Hasan for his attention, patience, useful comments, advice, and guidance throughout my project.

Solely gratitude and personal appreciation to my family members especially my mother for their patience, advice, support and encouragement for completing my project.

Last but not least, a special thanks to all my course mates, friends and those who have been involve directly or indirectly in completing this project.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLE

LIST OF SYMBOLS AND ABBREVIATIONS

ADC	=	Analog to Digital Converter
BPM	=	Beat Per Minute
ECG	=	Electrocardiogram
EEG	=	Electroencephalography
EOG	=	Electrocolugram
HRV	=	Heart Rate Variability
HPF	=	High Pass Filter
HF	=	High Frequency
Hz	=	Hertz
IR	=	Infra-Red
I/ O	=	Input/ Output
IDE	=	Integrated Development Environment
LF	=	Low Frequency
LCD	=	Liquid Crystal Display
LED	=	Light Emitting Diode
MSSD	=	Master Synchronous Serial Port
PPG	=	Photo plethysmography
PIC	=	Peripheral Interface Controller
PCB	=	Printed Circuit Board
PWM	=	Pulse Width Modulation

PCD	=	Power Spectral Density
SWM	=	Steering Wheel Movement
SDLP	=	Standard Lane Position
USART	=	Universal Synchronous Asynchronous Receiver Transmitter
V	=	Voltage
VLF	=	Very Low Frequency
<=	=	Less than or equal
k Ω	=	Kilo Ohm
Cm	=	Centimetre

CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter will explain about the background and overview of this project. This chapter is include the objective of this project and scope. This chapter also will explain the problem statement for this project.

1.1 Project Overview

Since lately, the number of accidents was increase due to drivers feeling falls asleep while driving especially during the festive or public holidays. Hence, it brings to an increase in road deaths. Due to one careless person, many innocent lives are lost. The purpose of this system is to reduce the number of accidents by using a few methods that will discuss more details.

An important irony in driver's sleepiness is that the drivers may be too tired to realize their own level of vigilance. This serious problem is often ignored by the driver. Driving in tiredness not only affects those who are driving while drowsy, but it puts all other road users in danger as well. Therefore, it is important to use new technologies to design systems, which are able to monitor driver's level of vigilance through the whole driving process. Fortunately, people in sleepiness exhibit many visual clues that can be detected on human face.

Example:

- Yawning
- Eye blinking frequency
- Eye gaze moments
- Head movements
- Facial expressions
- Heart Rate
- Steering Wheel Movement
- Lane Position Movement

Taking advantage of these characteristics, computer vision is a viable technology and is perfect for tackling this problem. This study presents a fatigue detection system that detects fatigue by measuring heart rate using the pulse sensor. Counting pulse ticking is no way of knowing the driver's heart rate either sleepy or otherwise.

The goal of this project is to develop algorithms and simulations to detect tired and sleepiness driver. The focus will be on designing and simulation algorithms that will determine the proper heart rate drivers based on the pulse rate taken and will alert (written warning in the case of simulation) in case of detection of driver sleepiness.

1.2 Problem Statement

At present, due to sleepiness driving is a major cause or risk factor in road safety and it has been identified as a cause of accidents. Therefore, the system to detect driver drowsiness have been proposed to create an alarm to wake a sleepy driver while driving, especially late at night. The main factors that cause driver sleepiness while driving driver fatigue is probably due to insufficient rest coupled when driving late at night. Hence, the solutions to prevent drivers from sleep is to make the analysis and to apply concepts of engineering and electronic applications.

This project having the solution to overcome the problem by recognize the relationship between human bodies' characteristics. Therefore, design based on the detection of signal will encounter this problem. Therefore, this indispensable tool for us as a driver because it is useful and helps to keep the driver aware of their actions sleepy while driving when sleepy signal is sent to the PIC and the next alarm will be activated if the pulse reaches the level of sleepiness.

1.3 Objective of Project

To ensure that the work of this project goes according to plan, there are several objectives that are to be achieved the goal of this project:

1. To give precaution to driver to rest when they are tired during driving.
2. To develop a system that can reduce the number of accidents from sleep driving of vehicle.
3. To improve safety on the roads.
4. To indicate a system that using microcontroller PIC.

1.4 Scope of Project

The scope of this project is limited to the component that used in design and developed the sensor and alerting system for drivers while they are tired during driving which is PIC16f877a as a programmable integrated circuit which will be programmed in MPLAB IDE simulator. Besides that, this system consists of several devices that are consists of sensor will detect the pulse rate and send a signal through to the PIC. PIC (Peripheral Interface Controller) as a brain control all the system that will react after receive a signal and will make LED and alarm gives a warning to the driver to stay aware to the driving session. The sensor to detect sleepiness driver is the input in this creating system while the output is the alarm devices. Other than components or hardware, the scope for this project is in terms of the normal situation. The situation was reviewed at a state sleepiness driver. When the driver starts to fatigue and sleepiness, symptoms such as slow response, daydreaming, depressed mood, difficulty focused, and of course the lower the respiration and will product in a slow pulse. The scope of state driver drowsiness is based on research indicate that normal person of heart rate is 60 to 100 bpm (Morse et, al 2013). If the pulse is less than 60 beats per minute or up until 50 beats per minute, then it is classified as driver fatigue and sleepiness. In addition, the scope of this study does not include the speed when sleepy drivers for this project because its scope is based on the components used and the situation was that led to drowsy drivers. This system will be applied on the steering of driver.

1.5 Introduction of Methodology

The methodology procedure is to conduct the project in order to achieve the objectives are as shown in Figure 1.1. By completing each stage at its targeted time will guarantee that the project could be finished on time.

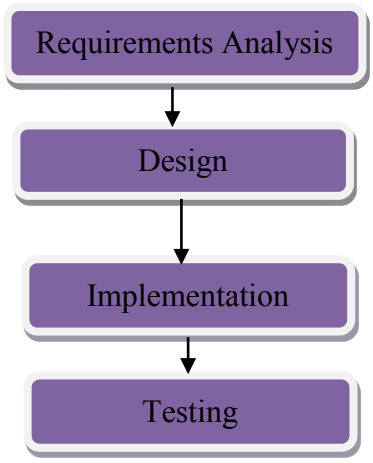

Figure 1.1: Flowchart of the project sequences.

1. Requirements Analysis - Find a research and literature review about the "Sensoring and Alerting System for Drivers" notification system on the internet, journal and book. From the research, we obtain information about the tools that can be used to complete this project. Watching you tube or video that relates to this project and gain more knowledge.
2. Design - In this stage, design the circuit "Sensoring and Alerting System for Drivers" by using PIC microcontroller and then try to do simulation of the circuit that is designed.
3. Implementation - Construct the hardware used in this project such as pic, IR sensor.
4. Testing - Process that covers all of the system that was designed and explained in this project. For this stage, the system of hardware and software able to operates well. The hardware component would be tested to see the result whether the project has achieve target or not.

1.6 Thesis Outline

This chapter is separated into three chapters described below:

Chapter 1: Introduction

This chapter presents about the problem statement and objectives of the study together with as overview of the thesis.

Chapter 2: Literature Review

The existing approaches and methods of driver alerting system were discuss details in this chapter.

Chapter 3: Methodology

This chapter explain details about the recommendation method of tiredness detection on the components and equipment needed for the experiment will be presented.

Chapter 4: Result and Discussion

This chapter explain details about the Result and Analysis. The result obtained regarding the performance of the system in universal term and overall systems operation.

Chapter 5: Conclusion

This chapter explain details about the conclusion and further development and future recommendation that can be practical in this project are being discussed in this last chapter.