Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF EYES BLINKING TRIGGERED SYSTEM WITH VIBRATOR ALARM

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Bachelor of Electronics Engineering Technology (Telecommunications) with Honours

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A project report submitted
in partial fulfillment of the requirements for the degree of
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DECLARATION

I declare that this project report entitled “Development of Eyes Blinking Triggered System with Vibrator Alarm” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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APPROVAL

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DEDICATION

This study paper is dedicated to my father, Mohamad Azahari Bin Saris who has been a wonderful supporter until the end of my research, and to my mother, Hajijah Binti Kiprawi who has been encouraging me diligently with her whole and undivided attention for months to complete my work with true self-confidence. I also would like to dedicate this project to my sister, Fatin Areeba Syahirah Binti Mohamad Azahari who give a moral support and taught me that even the most difficult endeavour can be completed if approached in little steps.

ABSTRACT

In the new era of digital globalization, technology is the smartest way to save our life especially from road accidents. According to Bukit Aman Traffic Investigation and Enforcement Department (JSPT) director, in year 2020, Malaysia has recorded 418 237 accidents cases with 4634 of them resulting fatalities. One of the main caused found that microsleep and drowsiness was inviting the accidents. Drivers involved in car accidents was due to drive when sleepy and lack of sleep after a long road trip. Therefore, the main purpose of this project is to avoid self-accident due to microsleep and drowsiness. The objective of this project is to develop the eyes blinking triggered system with vibrator alarm based on the programme set in the Arduino Nano to detect on the eyes blinking by setting on the time. The alarm will active and act as the trigger when the driver closed their eyes in 3 seconds. This project used Arduino Nano as the controller that needed for the IR sensor to active the alarm and send the message. The GSM module used to send a message to the owner's registered number or family and they will know the condition of the driver. Based on the observation, this project worked well to wake up the microsleep and drowsiness driver by activate the alarm and sending the message will be the extra effort to wake the driver up. This new development is easy to use. It is basically designed for someone who is non glasses user.

ABSTRAK

Dalam era globalisasi digital yang baru, teknologi adalah kaedah paling bijak untuk menyelamatkan nyawa kita terutama dari kemalangan jalan raya. Menurut pengarah Jabatan Siasatan dan Penguatkuasaan Trafik Bukit Aman (JSPT), pada tahun 2020, Malaysia telah mencatatkan 418 237 kes kemalangan dengan 4634 daripadanya mengakibatkan kematian. Salah satu penyebab utama mendapati bahawa microsleep dan mengantuk adalah penyebab kemalangan. Pemandu yang terlibat dalam kemalangan kereta disebabkan oleh memandu ketika mengantuk dan kurang tidur setelah perjalanan jauh. Oleh itu, tujuan utama projek ini adalah untuk mengelakkan kemalangan kendiri akibat microsleep dan mengantuk. Objektif projek ini adalah untuk mengembangkan sistem pencetus berkedip mata dengan penggera penggetar berdasarkan program yang ditetapkan dalam Arduino Nano untuk mengesan pada mata yang berkedip dengan menetapkan masa. Penggera akan aktif dan bertindak sebagai pencetus apabila pemandu menutup mata dalam masa 3 saat. Projek ini menggunakan Arduino Nano sebagai pengawal yang diperlukan oleh sensor IR untuk mengaktifkan penggera dan menghantar mesej. Modul GSM digunakan untuk menghantar mesej ke nombor pemilik yang berdaftar atau keluarga dan mereka mengetahui keadaan pemandu. Berdasarkan pemerhatian, projek ini berfungsi dengan baik untuk membangunkan seseorang yang mengalami microsleep dan mengantuk hanya dengan mengaktifkan penggera dan menghantar mesej akan menjadi usaha tambahan untuk membangunkan pemandu tersebut. Ia pada asasnya direka untuk seseorang yang bukan pengguna cermin mata.

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Last but not least, I would like to thank all of my friends for their support, genuine friendship, and knowledge sharing from the day I started my project. Conducting a final year project while still in Movement Control Order (MCO) due to Covid-19 outbreak is not easy since there are many restrictions to the sources, laboratory use and even meeting the supervisor in person. Therefore, I would like to thank myself for the enthusiasm, positive attitude, patience and hard work to complete this project.

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CHAPTER 1

INTRODUCTION

1.1 Background

In Malaysia, road accident is the most famous issue that happen every day. Based on the statistic, as for the accident's victims, most of the fatalities cases was between the age of 21 to 25 years old with 385 cases recorded in 2020. One of the common issues that caused the accidents is due to microsleep and drowsiness. Microsleep happen within a short period of time may last for a fraction of a second or up to 30 seconds. Most of the person that experience microsleep and drowsiness is someone who having sleep deprivation. Some of them also happen due to insomnia. Having a microsleep and drowsiness while driving is the most serious issue. It can threaten the other road users.

The same eyes blinking sensor module used as the way to detect the drowsiness driver which consist of IR transmitter and IR receiver [1]. The output was interfaced with inside and out alarm. The inside alarm is for the drowsiness driver, while the outside alarm is to warn the other road users that the driver is in danger. The module is connected to the braking system and it can be used to reduce the speed of the car if the alarm is activated. It simultaneously can save the drowsiness driver from accidents and the other road users simultaneously. Next, they also used the eye blinks sensor to prevent the drowsiness driver from involved in accidents [3]. This project built a frame for the eyes blink sensor for the driver to wear and it is the easiest way to ensure the IR receiver and IR transmitter in parallel position. Any random changes in steering movement will automatically reduce the speed of the car. The vibrator alarm is attached at the eyes blink sensor's frame to wake up the driver

and the LCD will display the warning message. This project built in with GSM module for the owner to retrieve the car location. Other than that, the system used the camera and computer to detect on drowsy person [4]. When fatigue face is detected, then the warning signal will issue to alert the family member or person who related to the victim will get the SMS.

This thesis reports the findings of thorough study to develop the eyes blinking triggered system with vibrator alarm and how does it work for the driver especially who having microsleep and drowsiness. Based on the system, the IR sensor will detect on the eyes blink with infrared light then monitoring the changes in the reflected light. The Arduino nano module will detect the eyes blink to work by setting on the time in the program. If the users close their eyes in 3 seconds, the alarm will active and act as the trigger but if their eyes close less than 3 seconds, it will not activate the alarm. The GSM module will function as the indicator message to the owner's registered number or the family and they will know the condition of the driver.

The eyes blinking is controlled by the IR sensor in the construction of the eyes blinking triggered system with vibrator alarm project. The infrared rays will be transmitted to the user's eyes by the IR transmitter, and the infrared rays will be received by the IR receiver. If the eye is opened means the output of IR receiver is high otherwise the IR receiver output is low. This is the way to indicate whether the eyes closed or in an open position. Referring to this output the alarm will act either to activate or not activate and the GSM module will work based on the output of the alarm. If the alarm is activated the GSM module will sending the message and vice versa.

1.2 Problem Statement

Nowadays, accidents happen due to microsleep and drowsiness is not a new issue. This usually happen at the range of time from 2:00 am to 5:00 am where most of the people having their tight sleep. Other than that, there also some people who having a problem that they so easy to fall asleep at any time even in daytime. Microsleep and drowsiness while driving is not only dangerous for the driver but also for other road users. The car owner or family member cannot monitor the driver's safety while driving. That is the reason why the owner of the car or the family member need to know the driver's condition wherever they are either they in the save condition or not. If the driver not in the save condition, the car's owner or family need to give him a phone calls to wake him up. This will help the other road user from involve in accident too.

1.3 Project Objective

The main aim of this project is to avoid microsleep and drowsiness driver then simultaneously save the other road user. Specifically, the objectives are as follows:

a) To develop the eyes blinking triggered system with vibrator alarm.

b) To monitor and inform the driver of drowsiness and the owner or family member can be notified simultaneously.

c) To ensure the coding works as designed against the hardware.

1.4 Scope of Project

The scope of this project are as follows:

a) Arduino Nano as the brain to control all the component used in this project.

b) The circuit will be installed together with the LM2596 3A Step-Down converter and will be power up by 9V battery then step down to 4.1V.

c) The GSM module used is the SIM800L to send the message to the car's owner or family member phone based on the number set in the coding.

d) This project basically created for users who do not wear glasses.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In today's modern society, technology is one of the best ways to improve the lifestyle especially in term of the safety. In this project, the main safety to be focus on is the road safety. Microsleep and drowsiness are the most famous issues that inviting road accident. The most important part to avoid on this matter is by using the IR sensor. With comprehensive and accurate technique corrective and preventive solution of the microsleep and drowsiness can be planned and executed correctly.

2.2 An Introduction to Microsleep and Drowsiness Factors

Study found that every person needs to have a good quality of sleep in between seven to eight hours each night. Drivers with sleep debt will facing nodding off. While fatigue also will cause on road accident. They also indicated that if a motorist falls asleep for four seconds while driving at 100 kilometres per hour, the vehicle will have travelled 111 metres without the driver's control [1]. These findings are backed up by the fact that one of the leading causes of the collision is driver weariness [2]. It specified that the system must measure the driver's fatigue level and issue an alert if the driver becomes drowsy.

According to [3] vehicle accidents come from various factors such as over speeding, drunk driving, texting while driving and each other but one of the important factors is sleeping while driving. On the other hand, [4] suggested that increased tiredness impairs driving performance, resulting in mishaps accounting for more than 20% of all vehicle

accidents. This is backed up by [5], which claims that more than 20% of all automobile accidents show that increased tiredness causes driving performance to decrease, resulting in crashes.

They believe that anyone can be a victim of unconsciousness and drowsiness while driving, which can occur as a result of a lack of sleep, a deteriorated physical condition, or a long road journey. The sense of sleep reduces a driver's level of alertness, which invites a dangerous situation and raises the likelihood of a road collision [6]. According to several studies, driving while tired is riskier than driving while intoxicated. It will not only effect on the drowsy person but also affects the people around them [7].

The drowsiness of the driver can be encountered by detect on the actions took by the driver which includes the eye activities, the amount of time, how frequent the eyes closed and the head displacement which can be measured by considering the centre of gravity is the concept found [8]. In contrast to perception [9], which claims that drowsiness may be identified by the latera position, steering wheel movements, the driver's driving experience, and the road structure and geometric characteristics.

"Driving to save lives, time, and money regardless of the conditions around you or the actions of others" is the motto revealed [10] and noted in [11] for Defensive Driving Vehicle disasters are the most fundamental if there is a lack of driving. According to a study, the most well-known cause of traffic accidents is driver weariness or car overcrowding [12]. The growing population having and using car this has led to the increasing the number of accidents at the alarm rate [13]. Drowsy Driver Detection System (DDDS) is a system created by major automobile manufacturers such as Mercedes-Benz, Volvo, Saab, Nissan, and Hyundai that detects the driver tired state and prevents accidents [14]. Drowsiness of the driver when driving causes a significant increase in road accidents, which often result in fatalities because the driver is unable to control their car at high speeds. The lack of alertness of the driver is responsible for many incidents involving vehicle collisions. The rising

incidence of incidents on today's roads is largely due to driver fatigue caused by sleep loss or sleep disorders [15]. This finding is supported by statistics [16], which demonstrate that driver fatigue has resulted in a number of fatal accidents. The majority of studies look for a means to prevent drowsiness-related traffic accidents, and the majority of them are based on analysing the signal from the electroencephalogram (EEG) using various proposed methods [17]. Wireless communication is used to communicate with the accident detection system and the treatment center's pre-set. The treatment unit's Pre-set functions as an information processing unit. The vehicle is equipped with a technology known as the accident sense system, which includes GSM and GPS [18]. Inadequate driving is the leading cause of vehicle accidents. If the driver is tired or inebriated, this might happen for a variety of reasons [19]. Driving ability has been shown to degrade with growing tiredness, with crashes accounting for more than 20% of all vehicle accidents [20].

2.3 Methods of Project Implementation by Previous Authors

According to [1], a drowsiness-related mishap can be avoided by utilising an eye blink sensor with IR rays. The IR rays transmitted in the eye by using the IR transmitter. The closed eyes will result the high output and vice versa. The output is connected to an internal and external alarm system. This module is also linked to the car's braking system and can be utilised to slow down the vehicle. This project also built in with distance sensor. The distance sensor has been attached at the car’s bumper. The buzzer will active when the vehicle getting close to others and simultaneously can avoid the accident to happen.

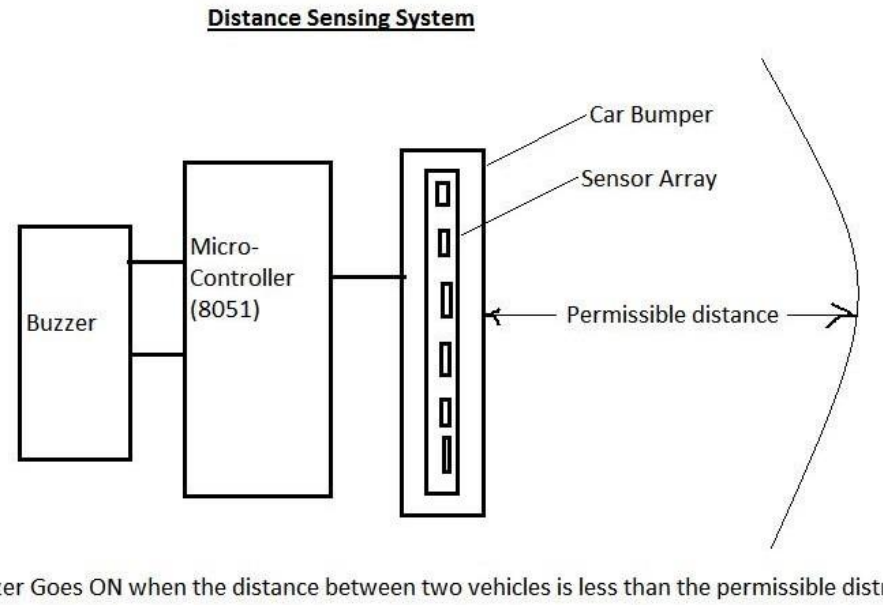

Figure 2.1 Distance Sensing System [1]

Besides, [3] found that the eye blink sensor act as the indicator to avoid from the accident due to drowsiness. The eye blink sensor frame supposed to wear during driving and based on the eye blink it will detect on the drowsy driver. Any erratic steering changes will result in a drop in wheel speed. The vibration sensor's threshold can be modified, and action can be taken as a result. The vibrator attached to the frame will vibrate if the driver falls asleep, and the LCD will display the warning message. The car owner will be notified through GSM module about the location, photograph and the nearest police station. A SST microcontroller with a large RAM and ROM is also utilised to make the application run faster and provide additional memory storage capacity.

The approach [7] implement their project is to develop drowsiness detection using the OpenCV library and deep learning algorithm, and then implement it using a night version camera and a computer camera to capture the face and eyes of the weary person or driver. The technology detects the state of the person's eyes and their level of tiredness by analyzing the web camera's face and eye movement. The eyes' aspect ratio has also been computed. When fatigue is detected, the victim receives a warning signal and an SMS is sent to someone

who is related to the victim, such as a family member or a friend.

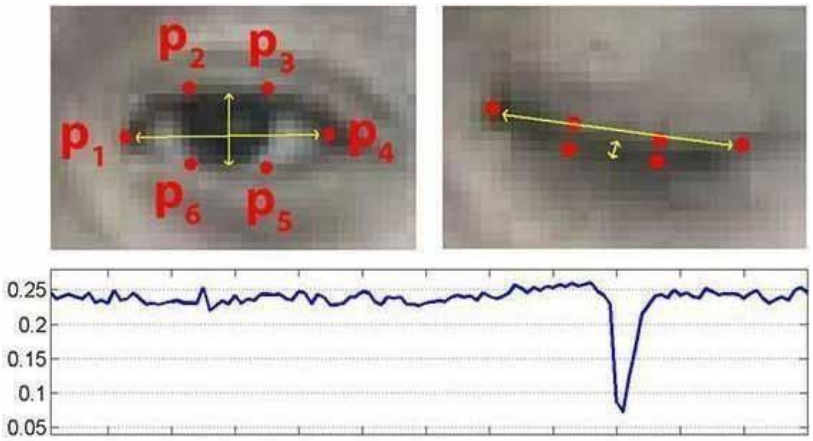

Figure 2.2 Visualization of eye aspect ratio [7]

Besides the drowsy driver or the drunken driver also inviting road accident. There is a different idea in [9] by install on the alcohol detector in the vehicle to detect on the drunken driver. It also used the eye blink sensor as the frame to wear. If the driver drunk, the buzzer will act as the indicator and the driver will not allowed to start on the vehicle. Drowsiness can be detected by using an infrared sensor, which is an eyeglasses frame, to measure the driver's eye blink closure and blinking frequency. The speed will be reduced when the system gave a buzzer signal due to the drowsy driver detected. If there is no vehicle on the left side of the road and the obstacle sensor detects a close car, the vehicle steers and controls itself to the left end of the road, where it parks according to previous directions.

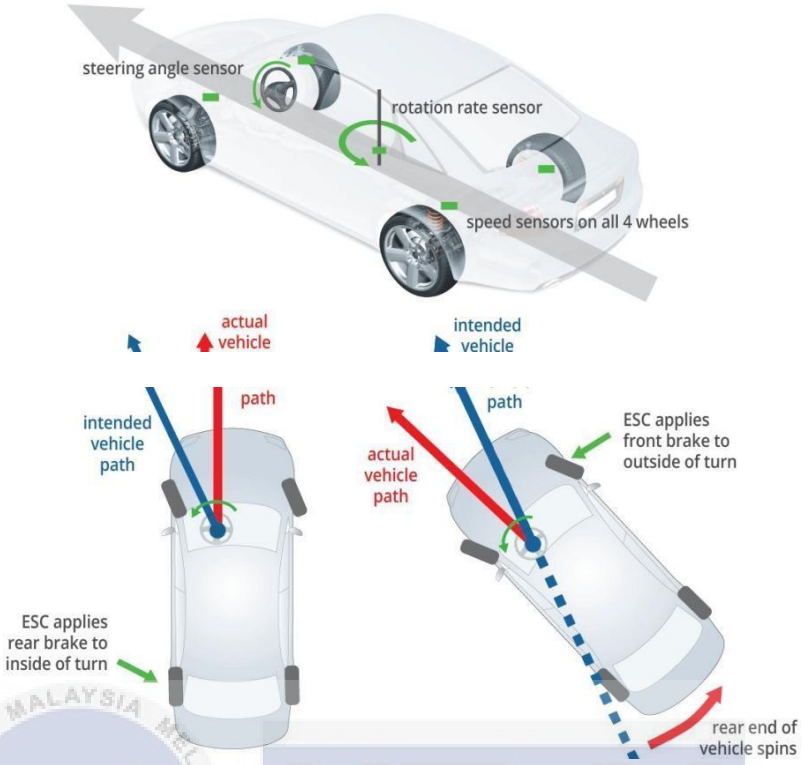

Figure 2.3 Automatic Wheel Steering scenario [9]

Sensor and microcontroller used to develop the system with different functionality. The system receives input in the form of a picture or video from a webcam positioned in the car. This webcam image was pre-processed with blurring, RGB to HSV conversion, HSV thresholding, and blob detection, among other image processing techniques, for drowsiness detection. The driver head movement also will be detect using the camera. The centre of gravity been calculated to determine the head displacement of the driver. The result will detect on the drowsiness of the driver [8].

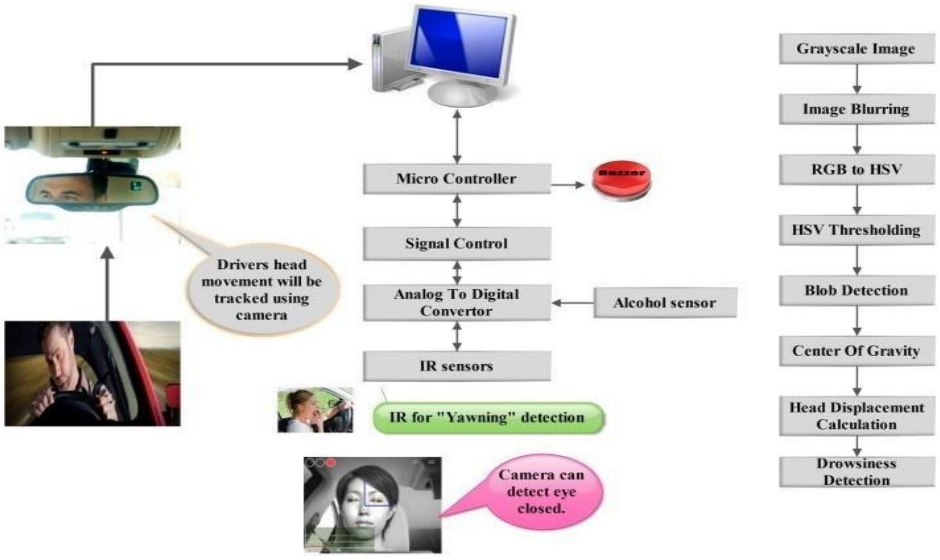

Figure 2.4 Drowsiness detection with hardware [8]

Aside from that, [10] proposed two segments: the transmitter section, which is located inside the vehicle, and the receiver segment, which is located outside the vehicle. To detect on the flicker tally, the eye squint sensor in the transmitter segment is put close to the eye. The information will then be transmitted to the microcontroller through heartbeats. The microcontroller then uses the information to contrast and adjust the device's usual eye squint. If something extraordinary happens, the automobile will come to a halt softly. This implementation totally different to the others project. Using various sensors, the driver's state is monitored to look for potential accident triggers such as alcohol in the breath, driver tiredness, and distraction. When the system detects an alarming state, it will warn the driver and make an attempt to alert them. If the driver goes over the time restriction, the system issues a distress alert to other road users and sends a text message to the driver's family. The design described in [12] would also cut down the vehicle's power, allowing for a critical window for preventive and migratory measures to be implemented.

Using an IR sensor, this project [4] measures and controls eye blinking. The IR transmitter transmits infrared light into our eyes. The IR receiver will pick up the eye's responded infrared photons. Closing eyes will resulting in high output of IR receiver and low output of IR receiver is due to open eyes condition. The braking system is the main component in this project. The braking system break the vehicle when the driver circuit give information to it. The braking system consist of the wheel and connected to the 1500 rpm motor for wheel rotation. This signal will be sent to the circuit to signal the alarm. These findings common to the findings [5]. The eye blinking sensor will also send signals to the dc motor, which will activate the dc gun, which will apply the brake, and the vehicle will come to a complete stop in 3 to 5 seconds. This concept also has been applied in the accident prevention using eye blink sensor project [11].

Detecting the accident and reporting the location of accidents to the previous coded number is the main aim [13]. The ambulance will be at the location of accidents in a short time. The car's location was relayed via SMS utilising GPS and GSM in the form of latitude and longitude coordinates. When the accelerometer is triggered, it helps to identify the accident and sends a signal to the Arduino in the system. This also aids in the delivery of the message to the intended recipient. When the sensor is activated, it combats drowsiness and alerts the driver to an impending collision.

Figure 2.5 Output send through SMS [13]

The proposed approach [14] uses the postulated horizontal symmetry property of the eyes to detect visual changes in eye positions. The most recent approaches use a normal webcam to detect eye blinks in real-time at 110 frames per second for a 320 x 240 resolution. The system that detects the eye blinks showed the accuracy at 94% with a 1% false positive rate.

The blink pattern of the driver will continuously monitor by a system which comprises of a camera installed in the car to detect on the driver drowsiness. The alert will be generated if the driver is feeling drowsy to avoid the accidents to happen. This initiative aims to contribute to the study of driver behaviour-based Eye Aspect Ratio (EAR) in order to reduce avoidable road accidents [2]. This project uses a live IR sensor device to regulate the attention blink mistreatment. Infrared rays are sent into our eyes by the IR transmitter, while reflected infrared rays are received by the IR receiver. The output will be sent to the logic circuit to pin on the alarm. This project [15] also mentioned when a driver falling asleep, an alarm is raised to warn the driver attached to the rear of the vehicle. The alarm will sound for at least 10 seconds, allowing the driver to wake up and prepare to take control of the vehicles. As a result, major accidents can be avoided. There are two monitoring steps that can give more

reliable detection, according to the conclusions of a study [16]. During the detection step, the eye blink sensor continually watched and recorded the eye blink moment. The acquired data will be sent to a microcontroller after the monitored moment has ended, and the microcontroller will digitise the analogue data. If the warning feedback system is triggered, the microcontroller will decide which alarm should be activated. The detection of alcohol content in the car, as well as any gas leakage, was also discussed. The LED light shines signaling an emergency if it is going to happen, and the greatest part is that this project also deals with the temperature sensor. The temperature sensor act as the sensor to sense in case there is any fire inside the vehicle and the engine will automatically stop. The beeper device is built for the alert system. The project code is written in C and then translated to hex code, which the microcontroller can understand.

According to their findings in the study [6,] the system incorporates eye closure duration and total eye blink in a minute. The detection of weariness requires the detection of the eye. The Eye Aspect Ratio (EAR) is a ratio that states that the height and width of an eye condition in terms of open and closure are different. At first, it read the frame from the webcam and search for face and detect on the eyes. If the eyeballs are discovered, the EAR is calculated and compared to a predetermined value. If the preceding step returns "yes," the eye closure time and total blinks per minute will be examined. The genuine state of affairs will be alert. If the time it takes for the eyes to close does not exceed the predetermined value, it will return to the starting stage of searching the face and detecting on the eyes. The camera was placed in various lighting positions by the system. For a drowsy person, the total blink during the day differs from the total blink at night.

Table 2.1 Error rates at different lightning conditions [6]

Category	Samples	Errors	% of Error
Light from front	40	3	7.5
Light from back	40	6	15
Light from side	40	5	12.5

Table 2.2 Number of blinks at different time [6]

Time Period	Samples	Average no. of blinks/min
Morning (8.00 am to 10.00 pm)	40	5.78
Evening (5.00 pm to 7.00 pm)	40	5.10
Midnight (11.00 pm to 1.00 am)	40	3.33

Aside from that, the LBP cascade for frontal face is one of three cascade classifiers offered by OpenCV sources for the steps of the eye identification procedure. For the eyes, the left and right HAAR cascades were classified. This method is very precise through the protruding eye. Separating on the areas, the colour structure of human eyes was also measured. The sclera, or white component of the eye, is referred to as the outer area. The iris and the large circle at the centre of the eye are referred to as the first inner area. The little circle in the centre of the eye is referred to as the second inner area. That is some of the way how the author in [17] detect on the drowsiness of the driver.

Figure 2.6 Three different parts of the eye [17]

Finally, the system creates the accident scene alarm system using the ARM and GPS. When an accident happens, both the manual and automatic alarms can be activated. The Pre-set of the treatment facility will receive information such as the vehicle state and user information, as well as alarm locations, and the information will be displayed on its map. While the employees at the treatment centre will see the handler who is near the accident

scene, they will rush to the scene to avoid a chain accident while also lessening the accidents' impact on traffic [18]. Based on ARM and GPS, this system [19] creates an accident scene alarm system. The manual and automatic alarms can be activated when an accident occurs. Using an infrared sensor, this project [20] measures and controls eye blink. The infrared rays in our eyes are sent using an IR transmitter. The eye's reflected infrared rays are received by the IR receiver. When the eye is closed, the IR receiver's output is high; otherwise, the IR receiver's output is low. This is used to determine whether the eye is shutting or opening. This signal is sent to the logic circuit, which signals the alarm.

2.4 A Review of Literature

2.4.1 Arduino Nano

The Arduino Nano is a compact, modular, and breadboard-friendly microcontroller board based on the ATmega328p. The Arduino Nano Pinout consists of 14 digital pins, 8 analogue pins, 2 reset pins, and 6 power pins. The Arduino IDE can be used to programme it. The Arduino Nano is a scaled-down version of the Arduino. Although the operational voltage is 5 volts, the input voltage can range from 7 to 12 volts. A crystal oscillator with a frequency of 16 MHz is included in the Arduino Nano and is used to generate a precise clock utilising continuous electricity.

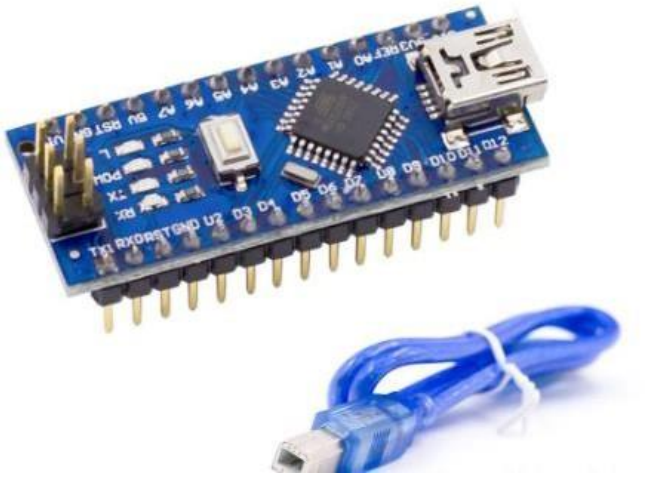

Figure 2.7 Arduino Nano module with USB cable

2.4.2 SIM800L GSM Module

The SIM800L GSM cellular chip from SimCom is at the core of the module. The chip's operating voltage is between 3.4 and 4.4 volts, making it ideal for direct LiPo battery power. The voltage utilised in this experiment is 4.1 volts. The module supports baud rates ranging from 1200bps to 115200bps thanks to Auto-Baud detection. A SIM card slot may be seen on the back of the phone. Any activated 2G mini SIM card will work perfectly great. The correct way to insert a SIM card is usually written on the surface of the SIM socket.

Figure 2.8 SIM800L GSM Module

2.4.3 IR Sensor

An optocoupler or a photo-coupler is a device that combines the emitter and receiver (transmitter and receiver) of an infrared sensor. An infrared LED serves as the emitter, while an infrared photodiode serves as the receiver. The photodiode used in this is highly sensitive to the infrared light produced by an infrared LED. The photodiode's resistance and output voltage can be adjusted in response to the amount of infrared light captured.

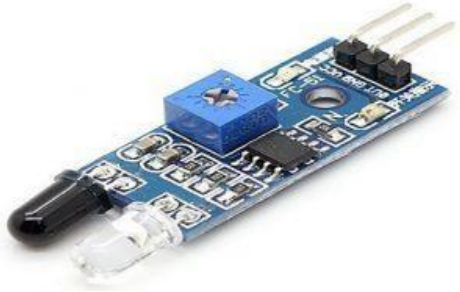

Figure 2.9 IR Sensor module

2.5 Table of Comparison between the Journals

Table 2.3 shows the comparison between 18 journals from previous research. There are some similarities on the hardware and software used in this project and the way of project implemented.

Table 2.3 Comparison table from previous researcher

Author's Name	Hardware used	Software used	Findings of the study
1)Pragyaditya Das and S.Pragadeesh (2015)	1) Eye blink sensor (IR) 2) 8051 microcontroller 3) Buzzer (Piezo) 4) LM358 comparator 5)Distance sensor	Python with OpenCV	This project consists of eye blink sensor using IR rays (IR transmitter and IR receiver). If the eyes shut, the output is high and if the eyes open, the output is low. The output and the alarm function together (inside and outside the vehicle). The module is linked to the vehicle's braking system, which reduces the vehicle's speed. The alarm in the vehicle will continue to sound until the driver regains consciousness. If the driver hit the limit of the setting time, the outside alarm will activate to warn the other for help.

2) A. Aravind and Aditya Agarwal (2019)	1) Camera 2) Computer	1) Phyton	The evaluation of the drowsy state is based on the comparison of the thresh value to the Eye Aspect Ratio (EAR). If the EAR value drops below a certain threshold, the eye status changes from 1 to 0, with 1 representing eye open and 0 representing eye closed, and the blink count rises. Once the driver's eye state reaches 0, a counter will be set to keep track of how long he or she has been awake. If the counter exceeds the stated limit, a warning will be created, alerting the driver.
3) Kusuma Kumari B.M and Sampada Sethi (2018)	1) PIC16F877A 2) CAN Transceiver 3) Alarm Circuit 4) SST Micro Controller 5) Power Supply 6) IR eye blink sensor 7) LM358 comparator 8) Accelerometer 9) LCD 10) Vibrator Output	1)Keil C compiler 2)Embedded C 3) Android studio	The eye blink sensor frame needs to wear and the drowsiness will be detect based on the blink. The speed of the wheel will reduce if there are any random changes in steering. The vibration sensor's threshold can be changed, and the action will be taken. The vibrator that attached to the frame will vibrate if the driver falls asleep and

	device		the car’s owner will be notified through GSM module.
4) Pratik S.Dange and Ajay B. Dongare (2016)	1) Eye blink sensor 2) Relay 3) Microcontroller	Not mention.	The main purpose is to have an advance system which can detect fatigue symptoms among the drivers and can control the speed of vehicle to avoid accidents. For driver eye blink acquisition, the key component is an eye blink sensor. The adaptive speed controller was created utilising a stepper motor to provide precise throttle valve location in order to adjust the vehicle's speed. This project's main controllers are an alcohol sensor and an IR sensor that detects eye blink.
5) Kusuma Kumari B.M (2017)	1) Eye blink sensor 2) LCD 3) Buzzer 4) Voltage regulator 5) LM358 Comparator 8051 Microcontroller	Proteus	The output of the eye blink sensor is used based on the IR transmitter and IR receiver that transmitted and received to and from the eyes. The output is then sent to the logic circuit, which signals the alert.

6) Arafat Islam and Naimur Rahaman (2019)	1) Eye blink sensor 2) Webcam	OpenCV	The main goal of this study is to construct an autonomous system that can detect the driver's consciousness utilising a single camera and a human-computer interface. Based on the facial landmark, two alternative methodologies are used: eye closure time and total eye blink per minute.
7) Ajay S. and Azariah John K. (2020)	Not mention.	1)OpenCV 2)Deep learning algorithm 3)Twilio api	The system will track a person's face and eyes to see whether they are drowsy, and if they are, an alert will ring and an SMS will be sent to the person concerned. By using the computer vision, the drowsiness detection can be and Twilio api is used for the SMS alert.
8) Tejaswini Jagdale and Pradnya Jadhav (2017)	1) Microcontroller 2) IR sensor 3)Alcohol sensor 4)Webcam	Image Processing software	System design to preventing major accidents caused due to driver drowsiness and alcohol consumption. Image processing related to algorithms a have been used to alert the drowsy driver. A

			camera with appropriate resolution is used to sense the movement of the eyes. There will be a proper distance between the sensor and the driver for accuracy. The alarm generated can be in form of audio as inspiration for the driver to reach their destination safely.
9) B. Praveenkumar and K. Mahendrakan (2014)	1) LM358 Comparator 2) Eye Blink Sensor (IR) 3) Alcohol Sensor 4)PIC16F877A Micro Controller 5) Obstacle Sensor	Mplab IDE	The drowsiness level detection through eye and the image will be process from the spectacle with the actual level using image processing. The driver will be identified and alerted through the LCD display and the buzzer according to the alcohol consumption by him. The vehicle's automatic parking controls adjust to the level of tiredness detected.

10) G. Rajkumar and C. Jagdeesh Vikram (2018)	1) LM358 Comparator 2) Eye Blink Sensor 3) LCD 4) 8051 Microcontroller Buzzer	1) Keil C cross 2) IDE 3)Project Manager 4) Simulator 5) Debugger 6) C cross compiler, Cross assembler, Locator/Linker	This work has measure and controls the eye squint utilizing IR sensor. The IR transmitter sends an infrared beam into the eyes, while the IR collector collects the reflected infrared rays. It also aids in the prevention of mishaps caused by the heedless via Eye flicker. The vehicles are also equipped with an eye squint sensor.
11) Sonali Shankar Chalwad and Snehal Bhimrao Gaikwad (2017)	1) LM358 comparator 2) Eye blink sensor 3) LCD 4) 8051 Microcontroller Buzzer	C compiler	This project also used the IR transmitter and IR receiver as the main key to observe on the output. Then it will be transfer to the microcontroller. The LCD will display on the result and the buzzer will alert on the condition.
12) Dibakar Barua and Pranshu Jain (2013)	1) Alcohol sensor 2) Gas sensor 3) Accelerometer 4)Infrared sensor breakout board 5) LM358 Op Amp	Proteus	This design monitors the driver's state by using multiple sensors and look for triggers that cause on the accident (alcohol in driver's breath and driver fatigue). When the system is detected, the system will

	Potentiometer		alert on the driver. If the driver do not wake up, the outside alarm will be active to inform nearby driver and send the text message to the person concerned with the victim.
13) S. Aysha Banu and M. Bhavani Jayashree (2018)	1) Arduino Uno 2) GPS and GSM 3) Eye blink sensor 4) Accelerometer 5) Buzzer 6) Potentiometer LCD	Arduino Integrated Development Environment (IDE)	The prototype automatic accident detection system has been designed which automatically detects on the accident using sensors (eye blink sensor) and the details about the location be informed which are taken from the GPS through the GSM to the desired person. Consequently, this will save the rescues time on searching the accident location.
14) Taner Danisman and Ian Marius Bilasco (Submitted 2018)	1) Infrared Camera 2) Glasses	1) Viola Jones OpenCV	The symmetry property has been offered as a new way for detecting eye blinks. It is unaffected by head movements because it is contained within the same frame. 94% accuracy in the 80 videos while 40 of them includes he users who wearing glasses. It can be categorized as accuracy is 94.8%,

			precision is 90.7%, recall is 71.4% and the false positive rate (FPR) is 1%.
15) Ms. M. Florence Dayanamca and Ms. R. Deviga (2019)	1) Eye blink sensor 2)Alcohol sensor 3) PIC16F877A Microcontroller 4) LCD 5) Alarm 6) Power supply	C compiler	The IR-based eye blink sensor is used. As a result of inherent reflex, the variance in attention can vary. The output is high if the attention is closed else, the output is low. In this project, if the motive force closes eye for over 3 seconds the alarm will active and the engine will stop simultaneously the message with location will be send to the owner.
16) Rajasekar. R and Vivek Bharat Pattni (2014)	1) Temperature sensor 2) Eye blink sensor 3) IR sensor 4) Alcohol sensor 5) LCD 6) ARM7 Microcontroller 6) Buzzer	C compiler	The system is used to avoid various road accidents caused by the drowsy driving. The technology served its aim of providing security in the event of a fire or a gas leak in the car. The eye blink sensor fixed in the vehicle and the buzzer will alert on the driver to prevent accidents if the driver lost his consciousness.

17) Caleb Vununu and Teak-Young Seung (2016)	1) USB Camera 2) Samsung Galaxy S3 Camera 3) . Pantech Vega R3 IM-A85OL	OpenCV 2.4.12.0	The drowsiness detection process is based on the movement of the Global Minimum Point that has been found on the eyes. The drowsiness sensing is performed to maximize the accuracy of the eye detection. Even when the resolution is very great, the likelihood of detecting the face was nearly the same with all previous systems. The face detection will success and same goes to the eye detection too.
18) Suhas Katkar and Mahesh Manik Kumbhar (2016)	1) GPS and GSM 2) Alcohol sensor 3) Obstacle sensor 4) Eye blink sensor Temperature sensor	Not mention.	Project involves measure and controls the eye blink using IR sensor. It comprises of an infrared transmitter that transmits infrared rays into the eyes and an infrared receiver that receives the reflected infrared rays. The eye condition either open or closed will be the output which will give to the logic circuit to indicate the alarm.

19) Suhas Katkar, Mahesh Manik Kumbhar and Priti Navanath Kadam (2016)	1) GSM 2) GPS 3) IR Sensor	Not mention.	This Eye Blink sensor is based on infrared technology. As the eye blinks, the variation throughout the eye will change. If the eye is closed, the output is high, and if it is open, the output is low. This is used to determine whether the eye is shutting or opening. If the driver closes his or her eyes for more than 3 seconds, an alarm will sound, the engine will stop, and a message with the driver's location will be sent to the owner.
20) Kusuma Kumari B.M (2017)	1) LM358 Comparator 2) Eye blink sensor 3) LCD 4) 8051 Microcontroller 5) Buzzer	Proteus	Using an infrared sensor, its measures and controls eye blink. The infrared rays in our eyes are sent using an IR transmitter. This is used to determine whether the eye is closed or opened. This signal is sent to the logic circuit, which signals the alarm.

2.6 Summary

According to the publication that was evaluated, the primary component for avoiding drowsiness or microsleep is the use of an eye blink sensor with infrared rays. Most of the author used the IR rays as the working input of the system which include the IR transmitter and IR receiver and then the output will be transfer to the microcontroller. 8051microcontroller is frequently used. The drowsiness avoidance system that has been build end up with the alarm or buzzer as the indicator to alert the driver.

Besides, there also a gap in author that used the webcam or video as the measured to detect on the drowsiness of someone. The famous software used for this system are the OpenCV software. This system detects eyes by using the facial landmark. Other than that, some of the author add on more sensor for more safety on the vehicles such as the alcohol sensor or gas sensor. Some of them add telecommunication features by adding the GPS and GSM module. This is used to send the message simultaneously the location of the driver and the car to the owner or the rescue. But at the end, the purpose of all the author were the same which is to avoid on the drowsiness, microsleep or drunk driver for the accidents and to save the other road users.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter explained the methodology used for conduction on the research to make sure the objective can be achieved. Accuracy and effectiveness are considered two opposite requirements of any sensor to ensure that the project obtains the desired results. The IR sensor and Arduino nano are a key part that serves as a direction indicator to this project to ensure that the next step can be implemented.

3.2 Methodology

In order for a project to be successful, the arrangement of work must be done wisely and with appropriate accuracy. There are many ways or technique used to implement this project. All of the technique has been carefully drafted to avoid any error or inaccurate result be taken.

3.2.1 Flowchart

A flowchart is a type of diagram that depicts a project's workflow or procedure. It demonstrates a step-by-step way to completing the assignment. The project's entire implementation path is depicted in Figure 3.1. It includes completing extensive study on the project, creating a literature review, software implementation, and finally, the final conclusion.

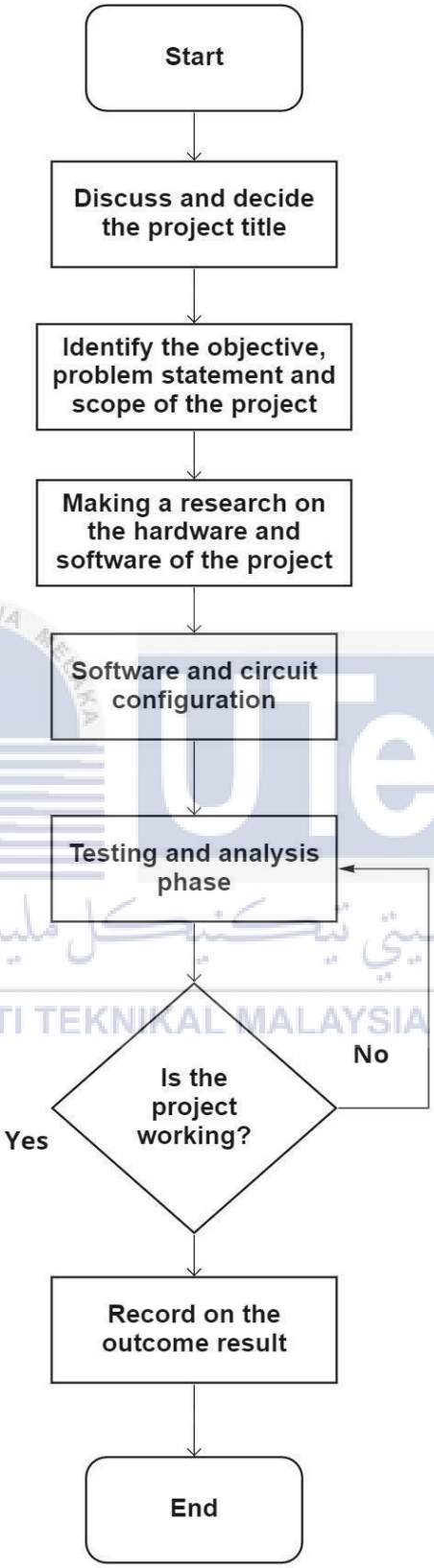

Figure 3.1 Project flowchart

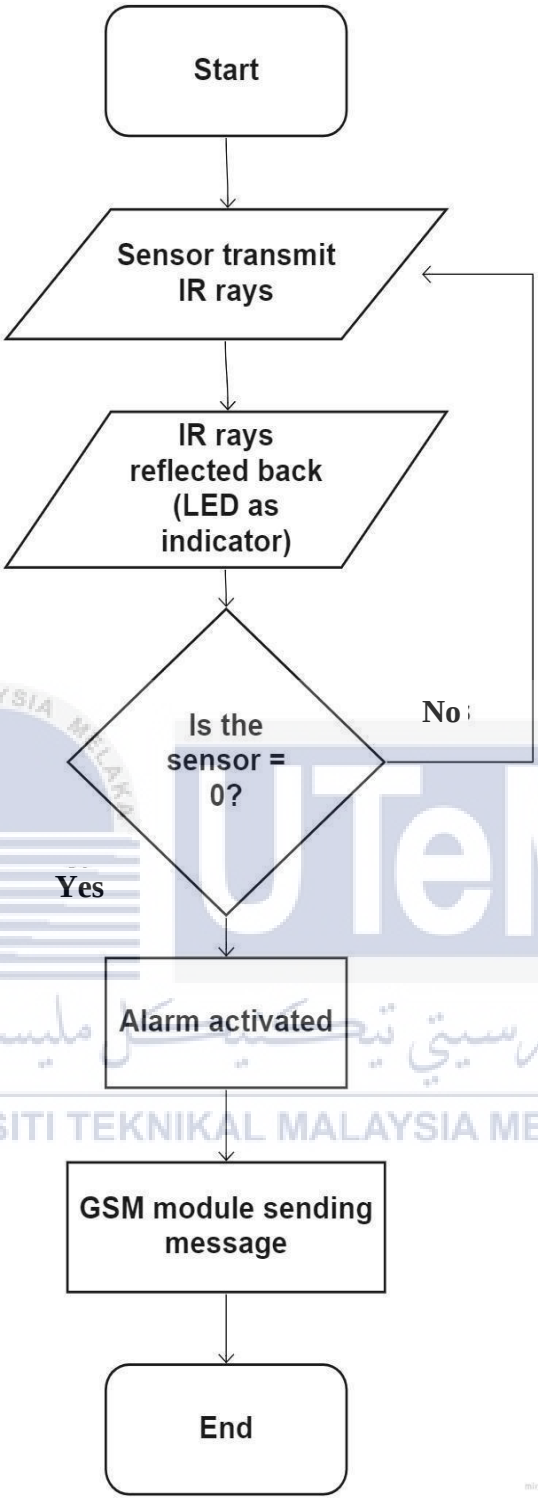

Figure 3.2 Flowchart of Project Implementation

The essence of the approach adopted in this project, as shown in Figure 3.2, is centered on the infrared rays detected by the IR sensor. The sensor output will be analyze by the HIGH (1) and LOW (0) indicator. If the output shows a LOW indicator the alarm will activated and vice versa as shown in table 3.1. The activated alarm will be detected by the GSM module then the GSM module will send a message to the phone number that have been set in the coding. The project will be implement based on the above framed flow.

Table 3.1 IR sensor output result

Condition	Output	Alarm
Eye Open	High (‘1’)	Not Activated
Eye Close	Low (‘0’)	Activated

3.2.2 Project Implementation

First and foremost, the block diagram is the main key to ensure the project is clearly setup. The main element in this project is the IR sensor. The output of the IR sensor will be control by the Arduino Nano. The program or coding will be set up in the Arduino Nano as per design to fulfil the project requirement. After that, the output will be the switch to activate the alarm or vice versa. If the alarm is activated, the GSM module will do its work to send a message to the phone. The block diagram of the project flow is shown in the figure below.

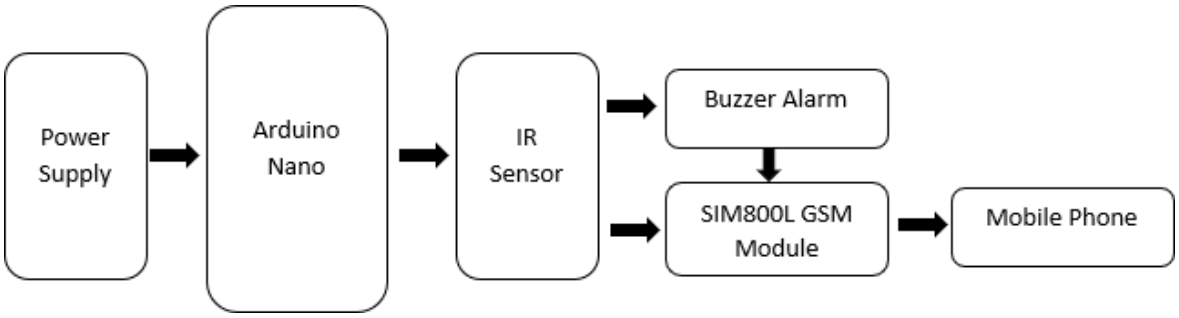

Figure 3.3 Project Block Diagram

3.2.3 Software used

In order to ensure the project is running smoothly, the software to be use must meet the requirement of the project. In this project there will be a lot of software used and it has been mentioned below.

3.2.3.1 Arduino IDE

The Arduino IDE is a cross-platform programming environment written in C and C++. It's used to create and upload programmes to Arduino-compatible boards as well as other vendor development boards that enable third-party cores. The coding will be done on an Arduino board. Transfer the coding to the Arduino board or module when it has been successfully verified. To control the program's operation, the Arduino board will act as a microcontroller.

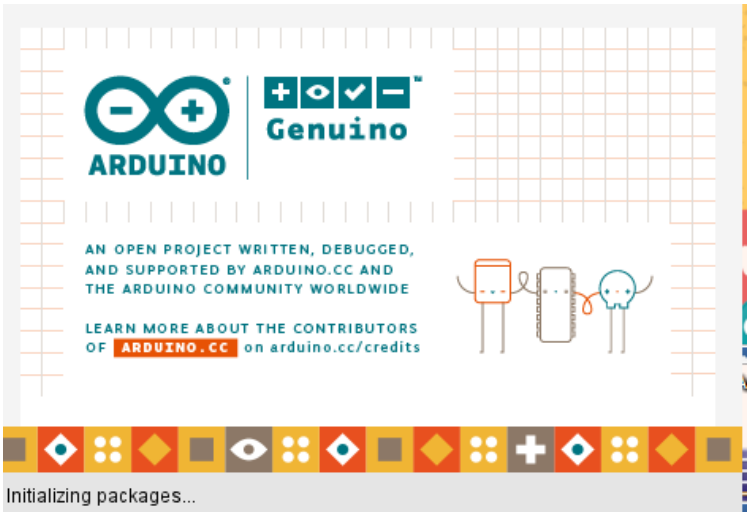

Figure 3.4 Arduino IDE Software

3.2.3.2 Proteus 8

Proteus 8 Professional is a programme that may be used to create or sketch schematics, PCB layouts, code, and even simulate schematics. Labcenter Electronic Ltd is the company behind it. Proteus software is used in this project to design the circuit before it is built on the breadboard for testing.

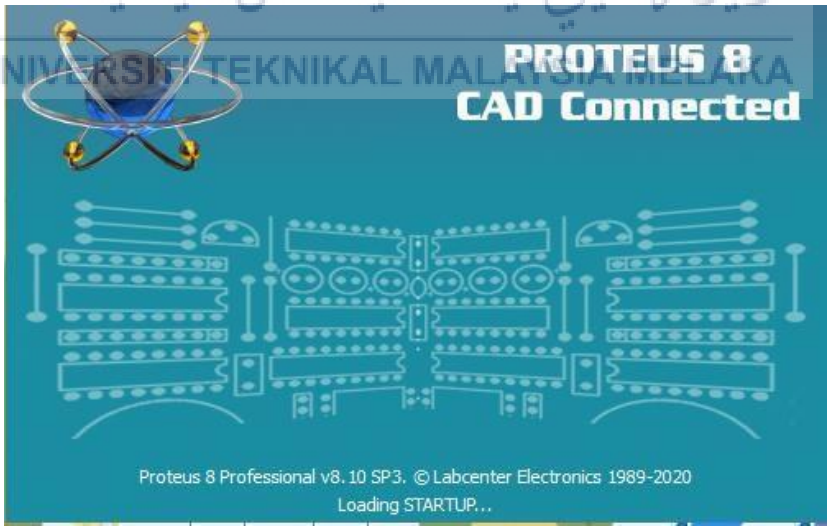

Figure 3.5 Proteus 8 Software

3.2.4 Hardware Used

After all the software simulation is completely done, the hardware needs to be implemented to ensure the project is working well as simulations. In this project there are a lot of hardware used and it has been mentioned below.

3.2.4.1 Circuit Construction Process

The circuit construction method in this project was accomplished by putting the components on the breadboard. This process purpose is to ensure that all the component working well as simulation before move to the next step which is soldering process. The component used are the Arduino nano, IR sensor, SIM800L GSM module, LM2596 3A Step-Down converter, buzzer alarm, 9V battery and push button switch.

3.2.4.2 Soldering Process

After the component arrangement process on breadboard is done and the circuit is working well as expected, the next step will be soldering process. The soldering process will be done on the single sided donut board. All the component will be arranged on the donut board then soldered. The soldering process must have soldering iron, soldering wire, soldering paste and solder sucker.

Figure 3.6 Soldering Process

Figure 3.7 Soldering Area

Figure 3.8 Soldering Temperature

3.2.4.3 Designing Process

Next step after completing the soldering process will be the circuit designing process. In this part, there will be two design that need to be done. First is designing the box to attached on the board that have been soldered. Below shows the box design dimension and the inner box design dimension.

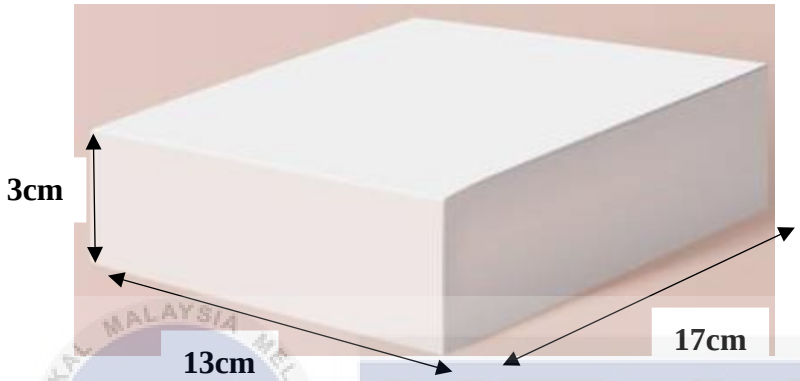

Figure 3.9 Box Design Dimension

Figure 3.10 Inner Box Design Dimension

Next, the design for the safety goggle that will be attached with the IR sensor need to be done. The spectacles need to have two small holes on the right side with a diameter of 0.4cm for the IR sensor (transmitter and receiver LED) to be placed. This step is necessary to guarantee that the spectacles do not block the IR rays from the eyes. The distance for the IR transmitter and IR receiver from the eyes will be 2.5cm.

Figure 3.11 Spectacles Design

3.3 Summary

The construction of an eyes blinking triggered system with vibrator alarm can be implemented using a variety of methods based on all of the methods and research that have been done in this technique. The methodology begin with creating the coding, then arrange on the circuit component. Then followed by soldering and designing process. The flow of the project have been followed firmly to ensure the project will running smoothly as in planned.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results and discussions on the development of eyes blinking triggered system with vibrator alarm. As mention before the output from the IR sensor will effect on the alarm and simultaneously effect on the GSM module also. Arduino Nano as the controller will control the whole project's functions. Then, by using the software that have been mention in the methodology that are Arduino IDE and Proteus 8 have been used to see on how it will be going on.

4.2 Results and Discussions

Below are the results and discussions on the coding for the development of eyes blinking triggered system with vibrator alarm that have been run in Arduino IDE and the circuit have been construct in Proteus 8.

4.2.1 Coding in Arduino IDE

NEW_CODING

```
#include <SIM800.h>

#define BUZZER 9
int flag = 0;
int count = 0;
unsigned long bauds = 19200;
char code[] = "0000";
char addr[] = "\"+60198541058\"";  //  MESSAGE RECEIPIENT NUMBER
char msg[] = "DRIVER QRC 6323 IS SLEEPING";  // MESSAGE RECEIVE
unsigned long Timer = 0;

void setup() {
  Serial.begin(9600);
  pinMode(8,INPUT);
  pinMode(BUZZER,OUTPUT);
  digitalWrite(BUZZER,LOW);
  while (!Serial) {;}
  SIM.begin(bauds);
  delay(100);
  SIM.pinCode(GET);
  if (SIM.reply("SIM PIN")) SIM.pinCode(SET, code);
}

void loop() {
  int IR = digitalRead(8);
  Serial.println("IR:" + String(IR) + " COUNT: " + String(count) + " FLAG:" + String(flag) + "  ");
  if(millis() - Timer > 3000 && flag == 0){
    count++;
    digitalWrite(BUZZER,HIGH);
    flag = 1;
  }
  if( IR == LOW && flag == 1){ //mata tutup
      Timer = millis();
      flag  = 0;
  }
  else if( IR == HIGH){ //mata buka
    Timer = 0;
    flag = 1;
    digitalWrite(BUZZER,LOW);
  }
  if(count == 1){
    count = 0;
    digitalWrite(BUZZER,HIGH);
    SIM.smsFormat(SET, "1");
    SIM.smsSend(addr, msg);
  }
}
```

4.1 Coding in Arduino IDE

Figure 4.1 shows the coding for development of eyes blinking triggered system with vibrator alarm. From the coding, the library used is SIM800 library. In the beginning of the coding started with declaration or defining on the buzzer. The pin used for the buzzer is pin D9 at the Arduino Nano module. In this program, baud rate 19200 used due to SIM800 comfortable to used that baud rate while Arduino Nano used 9600 baud rates.

Character code have been declared as “0000” due to sim card nowadays do not have a password for the sim. Years ago, sim card built in with password for each sim which is called as PUK or Personal Unlocking Key. Character address is set as the number of the message recipient number while for the character message set will be sending to the recipient number also.

Serial monitor will be activated by the coding of serial begin 9600. The serial monitor only can be display if the Arduino Nano board connected to the laptop or its port. The input of IR sensor has been set at D8 pin while the output set at the buzzer. At first, the buzzer set as LOW means the buzzer is not activated yet. The “while” term is used because SIM800 searching for the network, its will continuously searching until it finds the network to send the message.

Then the void loop area is where the coding do their main work. If the IR is HIGH, flag is equal to “1” means the eyes is open. The buzzer will be not activated. While if the flag equal to “0” means the IR is LOW, it will detect the eyes closed for 3 seconds then the buzzer will be activated. This is because of the setting timer set as 3000 milli seconds which is equal to 3 seconds. The GSM module will automatically sending the message to the number that have been set as soon as the buzzer activated.

4.2.2 Circuit Design in Proteus 8

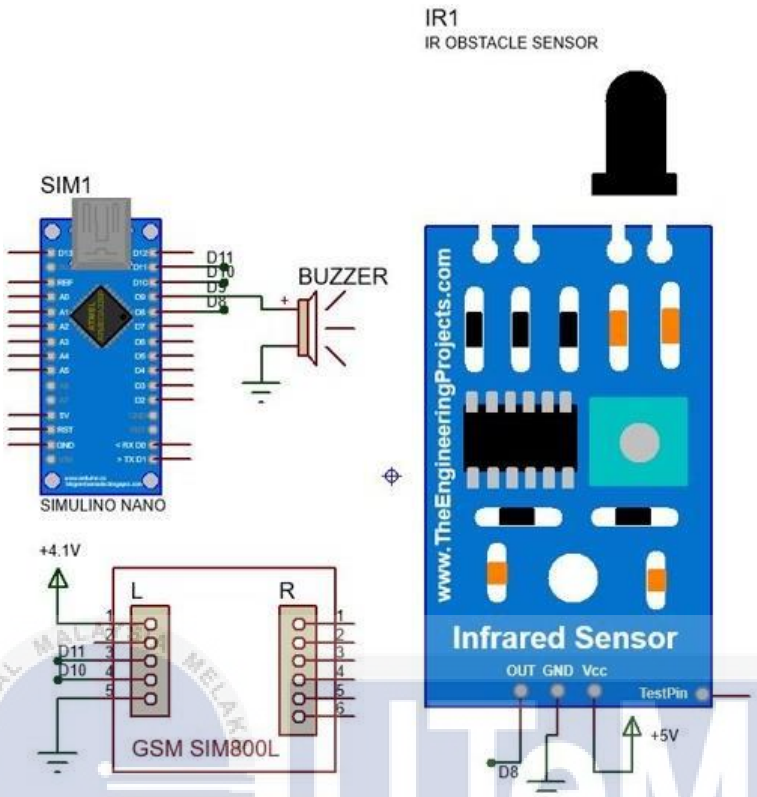

Figure 4.2 Circuit design in Proteus 8

Figure 4.2 shows the circuit design in Proteus 8. The design shows on the connection of the Arduino nano with the Buzzer, GSM SIM800L and IR sensor. The connection in this circuit design will be implemented in the breadboard. This circuit shows the buzzer connected to pin D9. While the GSM SIM800L have been connected to pin D10 and D11. The GSM will be power up by 4.1V. Means that from main power supply the power need to be step down because the main power supply is 9V. The step- down converter need to be add on to ensure the GSM SIM800L will not damaged. After that, the input of the IR sensor will be connected to pin D8 and power up by 5V power supply.

4.2.3 Circuit connection on breadboard

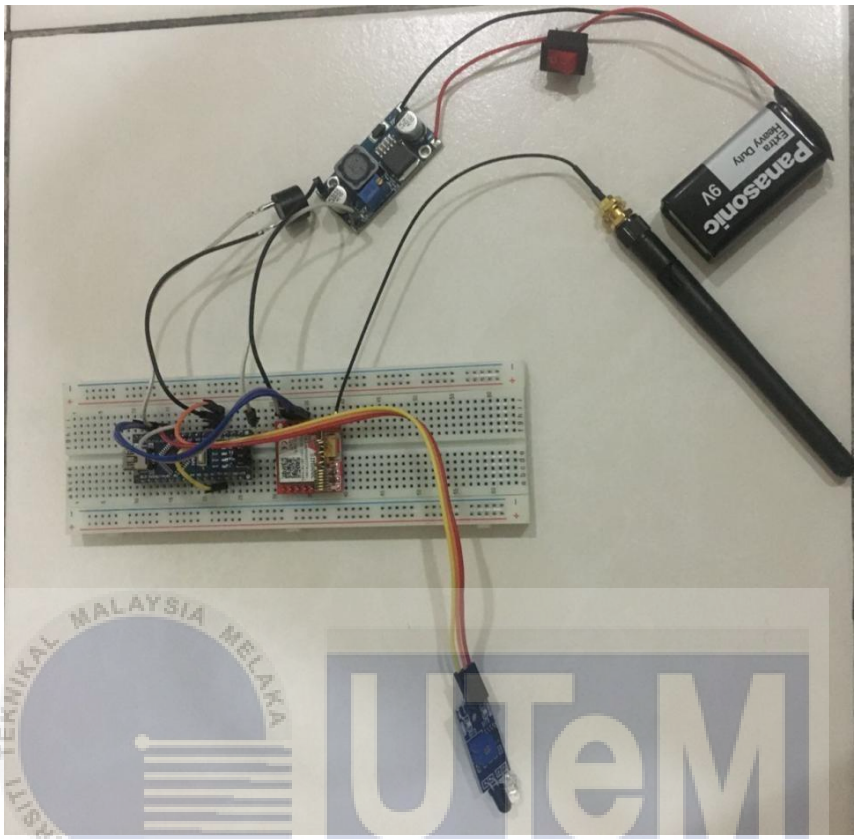

Figure 4.3 Circuit connection on breadboard

Figure 4.3 shows the circuit connection on breadboard. The sim card has been added in the GSM module for send the message. Battery 9V is used as the main supply to the circuit. DC step down converter module LM2596 have been connected after the main supply then entering the other components. Push button switch also connected as a purpose to switch on or off the main supply. At first, the circuit tested on the breadboard and will be soldered on the donut board if it works smoothly as per requested.

4.2.4 Soldered Circuit

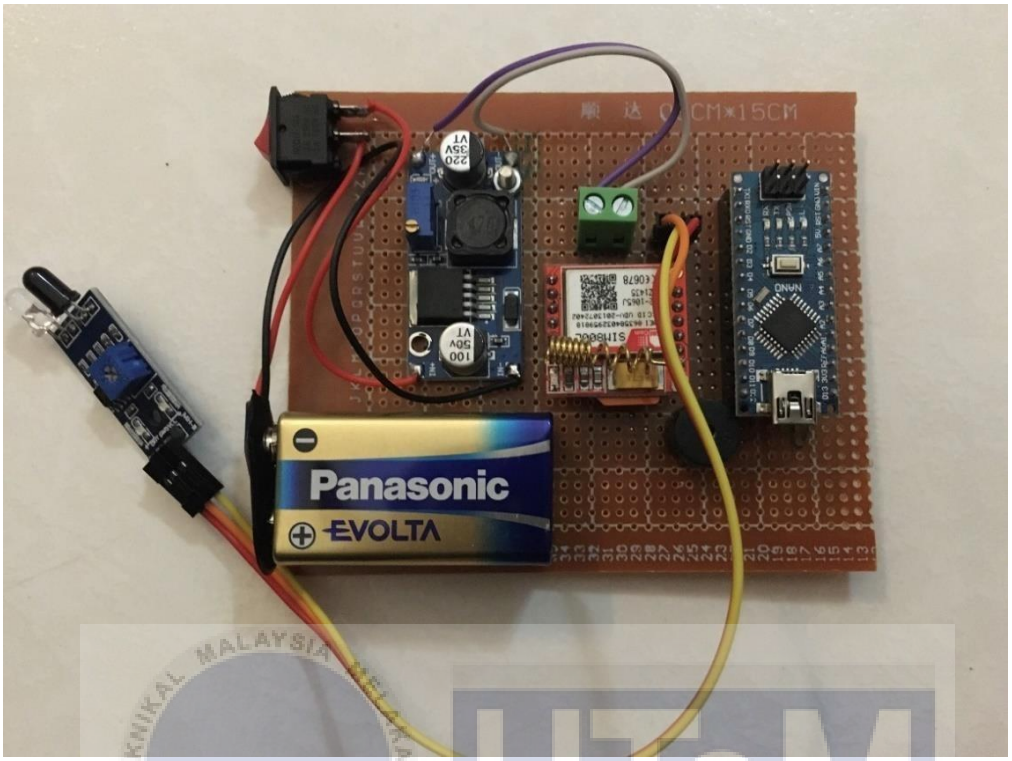

Figure 4.4 Circuit soldered on single sided donut board

In this project, the circuit that transferred from the breadboard have been soldered on the single sided donut board as shown in figure 4.4. All of the component has been arranged as the connection on the breadboard. Arduino nano, IR sensor, SIM800L GSM module, LM2596 3A Step-Down converter and buzzer alarm were soldered directly on the board while the 9V battery and push button switch have been glued on the board to ensure all the component attached together and look neat.

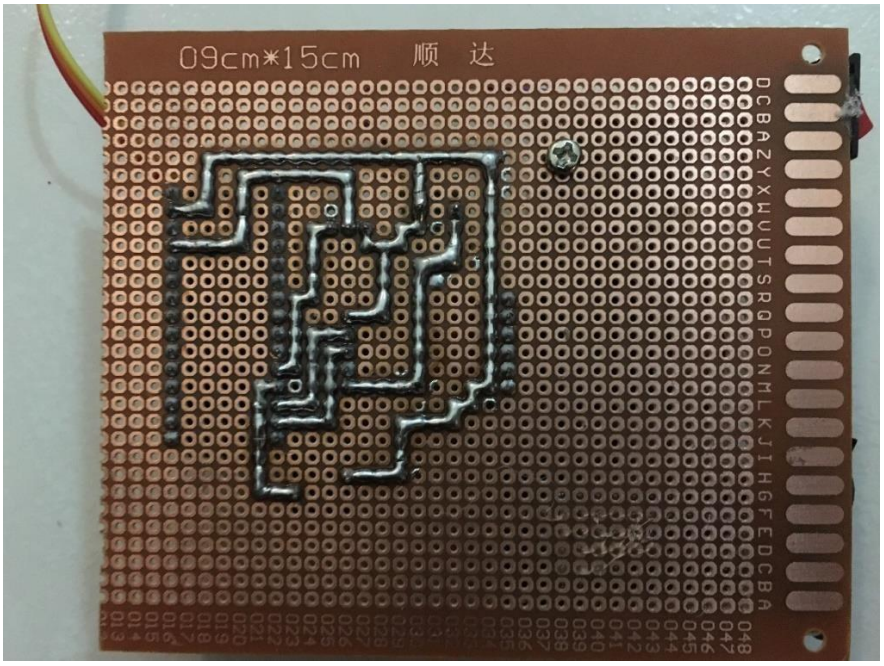

Figure 4.5 Back view of soldered circuit

Figure 4.5 shows the back view of the soldered circuit. The soldering process need to do neatly to ensure all the component have been perfectly connected and there is no short circuit happen between each component. The temperature of the soldering iron during the process also need to be aware to ensure the component are not damage.

4.2.5 Project Design

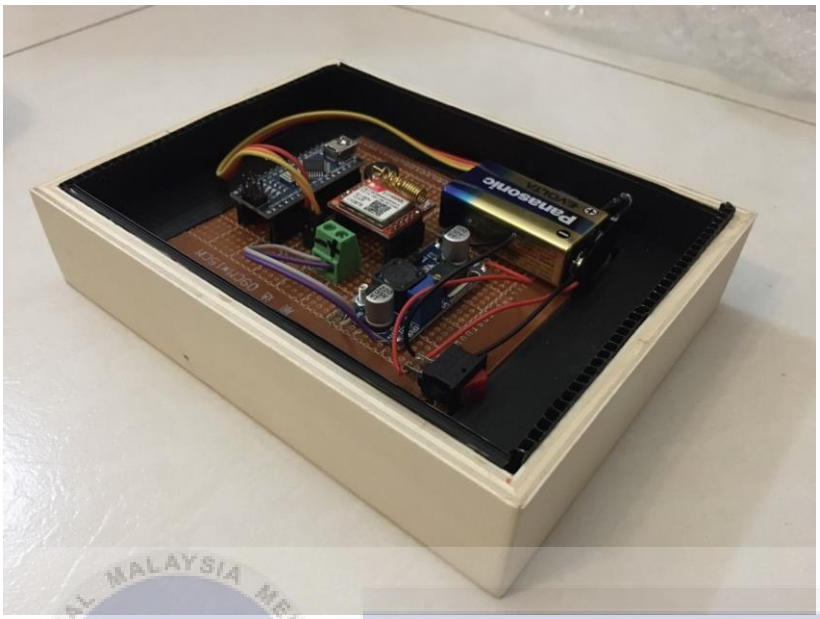

Figure 4.6 Box Design

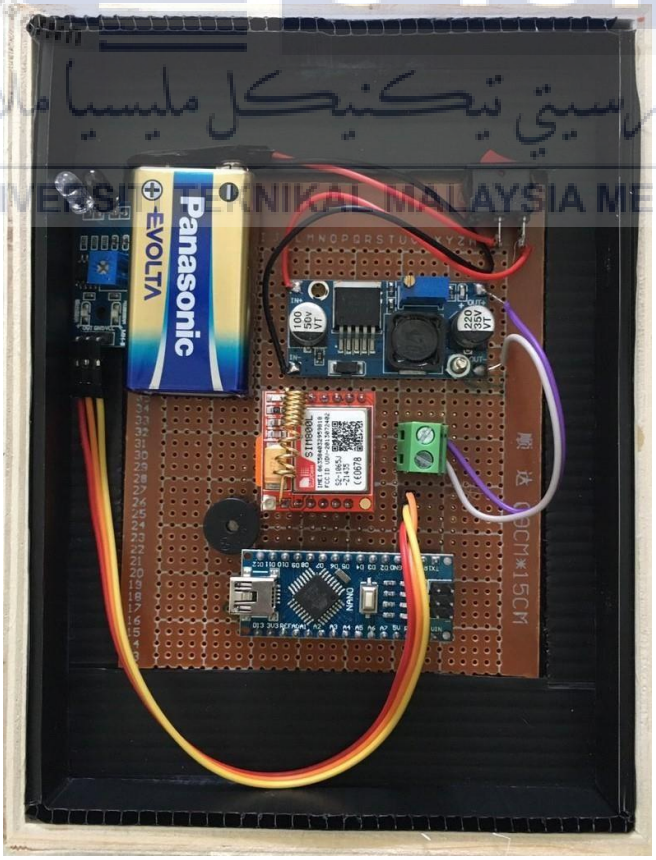

Figure 4.7 Inner Box Design with Circuit

Figure 4.6 shows the box that have been designed for the circuit to be placed on. The box dimension is 17cm x 13cm x 3cm which are represented by length x width x height. While the inner dimension for box shows in figure 4.7 where the circuit will be place on is 10cm x 9cm which is a length x width. The circuit has been attached tightly in the box.

Figure 4.8 Spectacles Design

Figure 4.8 shows the spectacle design that have been planned in methodology. Two holes with a diameter of 0.4cm on the right side of the spectacles will be the place where the transmitter and the receiver of the IR sensor be attached on. The distance of user eyes will be 2.5cm from the IR transmitter and IR receiver.

4.2.6 Development of Eyes Blinking Triggered System with Vibrator Alarm

Figure 4.9 shows the complete project circuit design for development of eyes blinking triggered system with vibrator alarm. This prototype design proved that this project working well as planned.

Figure 4.9 Development of Eyes Blinking Triggered System with Vibrator Alarm

4.2.7 Alert Message

The alert message received by the phone number are based on the message that have been written in the coding. Once the alarm activated, the GSM module will send two messages to the phone number that have been set in the coding. The GSM module containing the U mobile sim card as the sender. The recipient contact has been set as Smart Car Alert and the message received are as shown in figure 4.9.

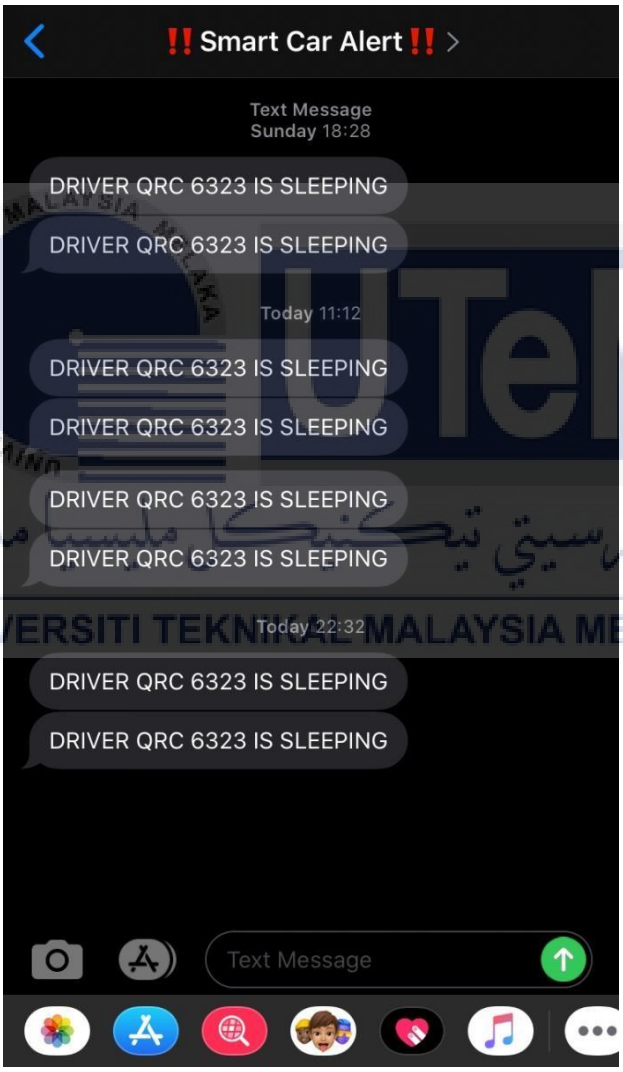

Figure 4.10 Message received

4.3 Summary

To be summarize, this chapter shows the results that have been planned as in methodology are working well. The main important part in this chapter are the coding or programme in Arduino IDE software. The Arduino Nano be the brain where the coding being process. In the hardware part, its start with circuit connection on breadboard then followed by the circuit that have been soldered on the single sided donut board. All the component has been soldered perfectly before inserted to the box that have been design. At last, after the circuit have been attached on the designed box, the IR sensor placed at the holes that have been design on the spectacles. Then the development are ready to used. All the results and discussions that have been shown in this chapter shows that the project objectives are successfully achieved.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, this report presents the results and the way of implementation to produce the eyes blinking triggered system with vibrator alarm. The proposed methodology is effective and robust for obtaining good results with only somewhat precise data and minimal network measurement information. Precise coding and circuits with the right components used in this project enable this project to be produced successfully. The results that have been obtain shown that the objective of this project have been achieved.

Other than that, this project can be improved to ensure the best product quality and also to sharpen the skill on constructing and designing the circuit simultaneously creating on the best coding. Overall, the literature review based on journal articles produced by other authors has greatly aided in the generation of ideas for this project report as well as the project hardware.

5.2 Future Works

For future improvements, there are many things that can be emphasized to ensure the best project quality such as:

i) By built our own eye blink sensor circuit that have less sensitivity rather than used the IR sensor.

ii) To redesign the project design that can ensure this project is easy to use for everyone especially for glasses user also so that it is user friendly.

iii) To design on the project placement in the car.

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APPENDICES

APPENDIX 1 GANTT CHART

No	Project Activity	Expected / Actual	Week														
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	Final Year Project briefing by JK PSM and reviewing PSM1 report	Expected															
		Actual															
2.	Testing on previous circuit simulation	Expected															
		Actual															
3.	Searching on new component	Expected															
		Actual															
4.	Construct component in Proteus	Expected															
		Actual															
5.	Create new coding in Arduino IDE	Expected															
		Actual															
6.	Construct circuit on breadboard and circuit troubleshooting	Expected															
		Actual															
8.	Planned on project design	Expected															
		Actual															
9.	Report Draft Submission to supervisor	Expected															
		Actual															
10.	Soldering Process	Expected															
		Actual															
11.	Design and build project casing	Expected															
		Actual															
12.	Submit report to panel with Turnitin report	Expected															
		Actual															
13.	BDP Presentation	Expected															
		Actual															
14.	Submit final softcopy report	Expected															
		Actual															